Department of

First Year B.Tech.

F.Y.B.Tech Course Book

(2016 Pattern)

(With effect from June 2016)

Department of
First Year B.Tech.

Under Graduate (UG) Course Book

F.Y. B.Tech. (Common)

Semester I /II

INDEX

About First Year Department

- Department provides a common platform to all branches students by imparting fundamental knowledge
- Involvement of Experts from IITs, NITs, Govt. Colleges, Reputed Industries, Alumni and Students in development of curriculum
- Choice Based Credit System (CBCS)
- General Proficiency - Foreign Language (German, French, Japanese and Spanish)
- Remedial Teaching
- Sponsorship for Publications and IPR
- Research Mentorship
- Industry Internship
- Provision of Credit Transfer Scheme (CTS)
- Peer Teaching Scheme
- Teacher Guardian Scheme (TGS)
- Various Clubs and Hobby Modules
- Emphasis on English Communication
- Activity based learning

INSTITUTE VISION AND MISSION

VISION

To achieve excellent standards of quality education by keeping pace with rapidly changing technologies and to create technical manpower of global standards with capabilities of accepting new challenges.

MISSION

Our efforts are dedicated to impart quality and value based education to raise satisfaction level of all stake holders. Our strength is directed to create competent professionals. Our endeavor is to provide all possible support to promote research and development activities.

DEPARTMENT VISION AND MISSION

DEPARTMENT VISION

To achieve excellent standard of quality education through effective teaching and learning process and to create technical manpower with capabilities of global standards.

DEPARTMENT MISSION

To impart quality and value education by providing high standard technical knowledge to create competent professionals.

To inculcate research amongst students and faculties.

Program outcomes

Engineering Graduate will be able to:

PO1	**Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO2	**Identify**, formulate, review research literature, and analyse complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences
PO3	**Design/development of solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
PO4	**Conduct investigations of complex problems**: Use research-based knowledge and research methods including design of experiments, analysis, and interpretation of data, and synthesis of the information to provide valid conclusions.
PO5	**Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.
PO6	**The engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
PO7	**Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and a need for sustainable development.
PO8	**Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO9	**Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO10	**Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions
PO11	**Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
PO12	**Life-long learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

First Year B.Tech Structure & Evaluation Scheme

Semester - I														
SN	Subject Code	Subject Name	Teaching				Credits	Evaluation Scheme (Marks)						ESE Duration (Hrs)
								Theory			Practical		Total	
			Lect.	Tut.	Pract.	Total		TAE	CAE	ESE	Cont. Assessment	Ext		
1	BEML101	Engineering Mathematics-I	3	1	_	4	4	20	20	60	_	_	100	3
2	BPHL102 BPHP102 / BCHL103 BCHP103	Engineering Physics/Engineering Chemistry	4	1	2	7	6	20	20	60	25	25	150	3
3	BITL104 BITP104 / BECL105 BECP105	Programming in C / Basic Electronics Engineering	2	_	2	4	3	10	10	30	25	25	100	2
4	BEEL106 BEEP106 / BCEL107 BCEP107	Basic Electrical Engineering /Engineering Mechanics	3	1	2	6	5	20	20	60	25	25	150	3
5	BMEL108 BMEP108/ BHUL113, BMEP111, BFYP112	Basic Mechanical and Engineering Graphics/ Communication Skills, Workshop, Mini modeling	2	_	2	4	3	20	20	60	25	25	150	3
6	BHUP109 / BIDL101	Environmental Studies and Professional Ethics / Bio System in Engineering	2	_	_	2	Audit Course	_	_	_	_	_	_	_
Total			16	3	8	27	21	90	90	270	100	100	650	14

First Year B.Tech Structure & Evaluation Scheme

Semester - II														
SN	Subject Code	Subject Name	Teaching				Credits	Evaluation Scheme (Marks)						ESE Duration (Hrs)
								Theory			Practical		Total	
			Lect.	Tut.	Pract.	Total		TAE	CAE	ESE	Cont. Assessment	Ext		
1	BEML110	Engineering Mathematics-II	3	1	–	4	4	20	20	60	–	–	100	3
2	BPHL102 BPHP102 /BCHL103 BCHP103	Engineering Physics/ Engineering Chemistry	4	1	2	7	6	20	20	60	25	25	150	3
3	BITL104 BITP104 /BECL105 BECP105	Programming in C / Basic Electronics Engineering	2	–	2	4	3	10	10	30	25	25	100	2
4	BEEL106 BEEP106 /BCEL107 BCEP107	Basic Electrical Engineering / Engineering Mechanics	3	1	2	6	5	20	20	60	25	25	150	3
5	BMEP111	Workshop	–	–	2	2	1	–	–	–	50	–	50	–
6	BFYP112	Mini Modeling	–	–	2	2	1	–	–	–	50	–	50	–
7	BMEL108 BMEP108 /BHUL113 & BMEP111	Basic Mechanical and Engineering Graphics/ Communication Skills	2	–	–	2	2	10	10	30	–	–	50	2
8	BHUP109 / BIDL101	Environmental Studies and Professional Ethics / Bio System in Engineering	2	–	–	2	Audit Course	–	–	–	–	–	–	–
Total			16	3	10	29	22	80	80	240	175	75	650	13

Department of First Year B.Tech.

Detailed Syllabus

F. Y. B. Tech
Semester I/II

BEML101: Engineering Mathematics - I

Teaching Scheme	**Examination Scheme (Theory)**	**Examination Scheme(Lab)**
Lectures: 3 Hrs/Week	**Teachers Assessment Exam:** 20 Marks	**Internal(TW):** ---
Tutorials: 1 Hr/Week	**Class Assessment Exam:** 20 Marks	**External(PR) :**Nil
	End Semester Exam: 60 Marks	**External(OR) :** Nil
Credit	**4**	**-----**

Prerequisite: 12th Science Basics

Course Objective : After completing this course student will able

1. To understand system of linear equations arising in all engineering fields using matrix methods where knowledge of Eigen values and Eigen vectors are essential.
2. To introduce Successive Differentiation and its application in the field of Engineering.
3. To understand concept of convergence of sequences and series with applications to modeling of realistic problems
4. To understand concept of sphere, Cone and Cylinder that arise in vector calculus, electro-magnetic field theory, CAD-CAM, computer graphics etc.

Course Outcome:

1. It will be possible to express the physical problems in to mathematical formulation and to find the proper solutions and apply concepts of matrices and its application for solving engineering problems.
2. Able to find solution of linear algebraic equations with consistency and inconsistency.
3. Able to find the limits and continuity of functions of multiple variables and finding nth derivative by various methods.
4. Able to find the convergence, divergence and range of convergence of various series.
5. Able to find Reduction formulae of various functions and its applications.
6. Able to calculate Cartesian, spherical, polar co-ordinate system as well as equation of sphere, cone, cylinder with guiding curve.

Course Contents	**Hrs**
Unit – I : Matrices	6

Basics of Matrix, Rank of Matrix, Reduction methods Normal form, Row Echelon form and PAQ form, System of Linear algebraic equations , homogeneous and Non-homogeneous equations with consistency and inconsistency.

Unit – II : Linear Algebra 6

Linear dependence and independence of vectors, Linear and Orthogonal Transformation, Eigen values, Eigen vectors (Symmetric and Non Symmetric Matrices), Cayley-Hamilton theorem.

Unit –III: Differential Calculus and Expansion of Functions 8

Successive Differentiation, Finding Nth Derivative by standard function, trigonometrical transformation, Partial fraction method. Leibnitz's Theorem. Indeterminate Forms, L' Hospital's Rule, Taylor's Series and Maclaurine's series with standard expansion, differentiation and Integration, use of substitution.

Unit – IV : Infinite Series 6

Infinite Sequences, Infinite Series, Alternating Series, Tests for Convergence by Cauchy's nth root test, p test, comparison test, D'Alemberts Ratio test, Raabe's test, Leibnitz test, Absolute and Conditional Convergence, Range of Convergence.

Unit – V : Integral Calculus 8

Reduction Formulae, Beta and Gamma functions, Differentiation Under Integral Sign, Error Functions.

Unit – VI : Solid Geometry 8

Cartesian, Spherical, Polar and Cylindrical Co-ordinate Systems. Sphere, Cone and Cylinder

Tutorials

1. Basics & Problem solving of rank, LD & LI, Normal form.
2. Problem solving of Eigen values, Eigen vectors, Cayley-Hamilton theorem.
3. Leibnitz Theorem, Indeterminate forms.
4. Infinite Series, Taylor's & Maclaurine's Series.
5. Examples on Reduction Formulae, Beta & Gamma functions.
6. Examples on Right Circular Cone & Cylinder.

Text Books:

1. "Higher Engineering Mathematics", B.S. Grewal, Khanna Publishers.
2. Applied Mathematics (Volumes I and II) by P. N. Wartikar & J. N. Wartikar (Pune Vidyarthi Griha Prakashan, Pune)
3. Higher Engineering Mathematics by B.V. Ramana (Tata McGraw-Hill).

Reference Books:

1. Advanced Engineering Mathematics, 7e, by Peter V. O'Neil (Thomson Learning).
2. *Advance Engineering Mathematics* Erawin Kreyszig, Wiley India Pvt. Ltd New Delhi.
3. Advanced Engineering Mathematics, 2e, by M. D. Greenberg (Pearson Education).

Web Links:

- **Matrices:**
  https://www.youtube.com/watch?v=mYVbYBZZdW0
  https://www.youtube.com/watch?v=hbk01uhgsos
- ***Eigen value & Eigen Vectors***
  https://www.youtube.com/watch?v=XM4GU8hPoZs
  https://www.youtube.com/watch?v=P2pL5VThrzQ
- **Successive differentiation**
  https://www.youtube.com/watch?v=zWURS768QrA
- ***Leibnitz thm:***
  https://www.youtube.com/watch?v=67uJGwsZz-Q
- **Indeterminate forms:**
  https://www.youtube.com/watch?v=PNTnmH6jsRI
- **Infinite Series**
  http://ocw.mit.edu/courses/mathematics/18-01-single-variable-calculus-fall-2006/video- lectures/lecture-37-infinite-series/
  https://www.youtube.com/watch?v=qNZxf0j41tw
- **Gamma function:**
  www.youtube.com/watch?v=Vc8dIykQRhy
  www.youtube.com/watch?v=SYfLj-koGJO
- **DUIS:**
  www.youtube.com/watch?v=NpXWv2jR4nC

BEML110: Engineering Mathematics – II

Teaching Scheme	**Examination Scheme (Theory)**	**Examination Scheme(Lab)**
Lectures: 3 Hrs/Week	**Teachers Assessment Exam:** 20 Marks	**Internal(TW):** Nil
Tutorials: 1 Hr/Week	**Class Assessment Exam:** 20 Marks	**External(PR) :**Nil
	End Semester Exam: 60 Marks	**External(OR) :** Nil
Credit	**4**	**-------**

Course Objective : After completing this course student will able

1. To analyze and solve first order differential equations

2. To aware of the applications of first order differential equations and modeling of various physical systems such as Newton's Law of cooling and simple electrical circuits.
3. To design and analysis of continuous and discrete system where the knowledge of Fourier series and Harmonic analysis required.
4. To understand multiple integration.
5. To understand concept of Partial Differential Equation in Engineering Applications such as Electric circuit, Heat transfer etc.
6. To understand Stationary Values of functions (Maxima and Minima), arising in optimization problems.

Course Outcome:

1. To compute solutions for first order ordinary differential equations using different analytic techniques and able to model and solve various simple real world phenomenon governed by ordinary differential equations of first order.
2. Able to understand application of differential equation.
3. Able to trace the curve and use multiple integral to formulate various engineering problems and find its area and volume.
4. Students are able to find maxima & minima, critical points, points of inflection, Errors and Approximations.
5. It will help to develop analytical skills to provide solution to the simple engineering problems.
6. Apply the fundamentals of mathematics in various branches of engineering.

Course Contents	Hrs
Unit – I :Differential Equations	6
Definition, Order and Degree of DE, Formation of DE. Solutions of Variable separable, Homogeneous DE, Exact DE (without Integrating Factor method), Linear DE and reducible to these types.	
Unit – II :Applications of Differential Equations	6
Applications of DE to orthogonal trajectories, Rate of decay of radioactive materials, Newton's Law of Cooling, Kirchhoff's Law of Electrical Circuits, Simple harmonic motion, One–Dimensional Conduction of Heat.	
Unit – III : Fourier series	8
Definition, Dirichlet's conditions, Full Range Fourier Series, Half Range Fourier Series, Harmonic Analysis and Applications to Problems in Engineering.	
Unit – IV : Multiple Integral & Applications	8

Basics of Curve Tracing, Double Integration, triple integration, Applications to Area , Volume.

Unit – V : Partial Differential Equation 8

Partial derivatives of composite function, variable to be treated as constants, Euler's theorem on homogeneous functions of two & three variables, Implicit functions, Total Derivatives.

Unit – VI : Application of Partial Differential Equation 6

Jacobians and their applications, Errors and Approximations, Maxima and Minima of Functions of two variables, Lagrange's Method of undetermined multipliers.

Tutorials

1. Basics & Problem solving of Differential Equations.
2. Problem solving of Newton's Law of Cooling, Electrical Circuits, Conduction of Heat.
3. Examples on Fourier series.
4. Examples on Multiple Integral & Applications
5. Examples on Partial differential equations.
6. Examples on Error & Approximations, Maxima & Minima.

Text Books:

1) Higher Engineering Mathematics by B. S. Grewal (Khanna Publication, Delhi).
2) Higher Engineering Mathematics by B.V. Ramana (Tata McGraw-Hill).
3) Applied Mathematics (Volumes I and II) by P. N. Wartikar & J. N. Wartikar (Pune Vidyarthi Griha Prakashan, Pune)

Reference Books:

1) Advanced Engineering Mathematics by Erwin Kreyszig, Volume I & II (Wiley Eastern Ltd)
2) Advanced Engineering Mathematics, 7e, by Peter V. O'Neil (Thomson Learning).
3) Advanced Engineering Mathematics, Wylie C.R. & Barrett L.C. (McGraw-Hill, Inc.)

Weblink:

- **Ordinary Differential Equations:**
  www.youtube.com/watch?v=P7gVp333B6M
- **Linear Differential Equations:**
  www.youtube.com/watch?v=1FnBPmEWpus
- **Fourier series:**

www.youtube.com/watch?v=3bXH7AkIV6C

www.imperial.ac.uk/worksspace/mathematics/Public

- **Multiple Integral:**

  http://freevideolectures.com/Course/2267/Mathematics-I/28#

  http://www.learnerstv.com/video/Free-video-Lecture-1823-Maths.htm

- **Partial Differential Equations:**

  http://nptel.ac.in/courses/111103021/

  https://www.youtube.com/watch?v=PTvvoVLzVCE

BPHL102: Engineering Physics

Teaching Scheme	Examination Scheme (Theory)	Examination Scheme(Lab)
Lectures: 4 Hrs/Week	**Teachers Assessment Exam:** 20 Marks	**Internal(TW):** 25 Marks
Tutorials: 1 Hr/Week	**Class Assessment Exam:** 20 Marks	**External(PR) :** 25 Marks
Practical: 2 Hrs/Week	**End Semester Exam:** 60 Marks	**External(OR) :** Nil
Credit	**5**	**1**

Prerequisite : Class XII Knowledge on the course

Course Objective:

1. To understand fundamental principles of Engineering physics specifically concern to electron optics and quantum physics and their engineering applications.
2. To use various techniques for measurement, calculation, control and analysis of engineering problems based on the principles of Electron Optics, Ultrasonic, Acoustics, Laser, Band theory of solids, Quantum Mechanics, Superconductivity, and Nanophysics
3. To provides the basic ideas and gives the solution for developing mathematical and analytical abilities with higher precision.

Course Outcome: At the end of the course student will be able to

1. Solve the problems related to the applications of uniform & non uniform electric and magnetic fields and its use related devices for engineering applications.
2. Understand the nature and characterization of acoustics and its applications.
3. Demonstrate the knowledge of semiconductors and their applications.
4. Apply the concepts of light in optical fibers, light wave communication systems, and holography and for sensing physical parameters
5. Apply knowledge of physics in mechanics, wave properties, properties of matter and to solve simple qualitative and quantitative problems

6. Apply the concepts of physics in various branches of engineering

Course Contents	Hrs
Unit – I : Electron Ballistics	
Motion of charges in uniform electric and magnetic fields; Electron optics: Bethe's law; Electrostatic and magneto static focusing; Devices: CRT, CRO and Cyclotron	8
Unit – II : Ultrasonics & Acoustics of Building	
Ultrasonics: Introduction, Production of ultrasonics waves, Magnetostriction and Piezo electric method, Detection of ultrasonics waves, Applications Acoustics of Building: Basic requirement of acoustically good hall, Reverberation, Sabine formula for reverberation, factors affecting the architectural acoustics and their remedy.	8
Unit – III : Lasers and Holography	
Introduction, Absorption and Emission of Radiation, Characteristics of Laser light, Pumping Scheme, Population Inversion, metastable state, Types of Laser i) two level – semiconductor laser, ii)three level l – Ruby laser, iii)four level – He:Ne laser Applications of Lasers – Holography, Recording and Reconstruction of Image, Applications of Holography, Optical Fiber communication system	8
Unit – IV : Band Theory of Solids	
Introduction, Distinction between Insulators, Semiconductors and Conductors, Intrinsic Semiconductor, Extrinsic Semiconductor, Hall Effect, Fermi Distribution Function, Fermi level in Intrinsic and Extrinsic Semiconductors, band structure of PN junction diode under i) zero bias, ii) forward bias, iii) reverse bias, Working of transistor (NPN only) on the basis of band diagram, photovoltaic effect, working of solar cell on the basis of band diagram and its applications.	9
Unit – V : Quantum Mechanics	
Introduction, Wave particle duality, de Broglie waves, Phase and Group velocities, Heisenberg Uncertainty Principle, Wave function and its Physical Significance, Time Independent and Time dependent Schrodinger Equation, Applications of Schrodinger Equation (infinite potential well – with derivation of energy and wave function), Tunneling through potential barrier, Applications of Tunnel Effect.	9
Unit – VI : Advanced Trends in Physics	6

BPHL102: Engineering Physics

Part A: List of Practical (Any Six)

1. Application of Velocity filter using CRT: To determine e/m by Thomson's method.
2. Study of Lissajou's Figure using CRO
3. Ultrasonic interferometer for the determination of compressibility of liquid
4. Determination of band gap of a given semiconductor
5. Characteristics of Solar cell and Calculation of fill factor
6. Determination of thickness of wire using LASER.
7. Determination wavelength of Laser using Diffraction Grating.
8. Determination of electrical resistivity of semiconductor by using four probe method.

Part B:Mini Project Modeling

Every Students has to performed mini project in a group based on curriculum courses

Instructions to Student:

1. Maximum Three Students are permissible in each group
2. Project must be based on the contents of syllabus of subject.
3. Project report has to be prepared and attach in practical file individually.

Text Books:

1. Engineering Physics, Hitendra K. Malik & A. K. Singh, Tata McGraw Hill, New Delhi, 2010
2. Engineering Physics, Avadhanulu, Kshirsagar, S. Chand Publications
3. Engineering Physics, Guar, Gupta, Dhanpat Rai and Sons Publications

Reference Books:

1. Fundamentals of Physics, Resnick and Halliday, John Wiley and Sons.
2. Lectures on Physics, Volume 1, 2 and 3 by Richard P. Feynman, Narosa Publisers /
3. Pearson Education.
4. Laser and Non-Linear Optics, B. B. Laud (Oscar publication)

Web Links:

1. https://www.youtube.com/watch?v=Lcy3f3QkTIw (Electron Ballistics)
2. http://www.nptel.ac.in/courses/122107035/6 (Acoustics)
3. https://www.youtube.com/watch?v=HFvPzXr7rxU (Nanophysics)
4. https://www.youtube.com/watch?v=knVD1AfiozA (Fermi energy & Fermi level)
5. https://www.youtube.com/watch?v=T8WCr5axQXM (Energy Bands)
6. https://www.youtube.com/watch?v=GglT1RoBPzg (Superconductivity)

BCHP103: Engineering Chemistry

Teaching Scheme:	Examination Scheme (Theory)	Examination Scheme(Lab)
Lectures: 4Hrs/Week	**Teachers Assessment Exam:** 20 Marks	**Internal(TW):** 25 Marks
Tutorials:1 Hr/Week	**Class Assessment Exam :** 20 Marks	**External(PR) :**25 Marks
Practical: 2Hrs/Week	**End Semester Exam:** 60 Marks	**External(OR) :**Nil
Credit	**5**	**1**

Prerequisite : 12th Standard Curriculum

Course Objective:

1. Technology involved in improving quality of water for its industrial use.
2. The basic concept of Electro analytical techniques that facilitate rapid and reliable measurements.
3. Chemical structure of Polymers and its effect on various properties when used as engineering materials.
4. Study of Fossil fuel and derived fuels with its properties and applications.
5. The principles of chemical and electrochemical reactions causing corrosion and methods used for minimizing.
6. An insight in to Nano materials and advance materials aspect of modern chemistry.

Course Outcome:

1. To apply the knowledge of basic science in engineering and technology and also understand the concept of applied chemistry and analyze it with experiments.
2. The broad education necessary to understand the impact of engineering solutions in global, economic and in environmental context.
3. An ability to design and conduct experiments as well as to organize, analyze and interpret data.
4. An ability to use the techniques, skills and modern engineering tools necessary for engineering practice.
5. To apply the knowledge of advance engineering materials for varied engineering applications.
6. The significance of teaching the aforementioned course is realized in both research, and development of innovative technologies by the student's successful participation in various basic level research oriented programs, and competitions, both at the national and international levels..

Course Contents	Hrs
Unit – I : Water technology and Green chemistry	8

Impurities in water. Hardness of water &its determination by EDTA method. Alkalinity of water and its determination and Numerical on alkalinity and hardness. III effects of hard water in boilers. Boiler feed water treatment -1) Internal treatment-calgon and phosphate conditioning, 2) External treatment- a) Zeolite process & its numerical b) Ion exchange method. Desalination of brackish water/Purification of water by Reverse osmosis and Electro dialysis.

Green Chemistry: Introduction, Twelve Principles of green Chemistry Major uses- traditional and green path ways of synthesis of adipic acid, indigo dye.

Unit – II : Electro analytical techniques

Type of reference electrode (calomel electrode), indicator electrode (glass electrode), Ion selective electrode, Half-cell reaction and complete cell reaction.

Conductometery: Introduction, Kohlrausch’s law, Conductivity cell, Measurement of conductance, applications-Counductometric titrations, Acid-Base Titrations, precipitation titration, Potentiometry: Introduction, Potentiometric titrations-differential plots. Applications- 8
redox titrations Fe^{2+}/Ce^{4+}titration. UV/Visible spectroscopy: Beer lambert's law, chromophore and auxochrome, types of electronic transitions. Instrumentation and principle- block diagram of single and double beam spectrophotometer. Applications of uv-visible spectroscopy.

Unit – III : Synthetic Organic Polymers

Introduction, functionality of monomer, polymerization-Free radical mechanism & step growth polymerization, Tm and Tg, Thermoplastic and Thermosetting polymers. Compounding of plastics. Preparation, properties & engineering applications of: Polyethylene (LDPE & HDPE) and Bakelite. Elastomers- Natural rubber-processing & 8
vulcanization by sulphur. Synthetic rubbers-SBR. Specialty polymers: Engineering thermoplastics- Polycarbonate, Biodegradable polymers- Poly (hydroxyl butarate-hydroxyvalanate), Conducting polymers- Polyacetylene, Liquid Crystal polymer-Kevlar.

Unit – IV : Fuel & Combustion

Fossil Fuels: Definition, Calorific values, Determination- Bomb calorimeter, Numerical Boy’s gas calorimeter, Numerical Solid fuel-coal-Proximate analysis, Ultimate analysis & Numerical. Liquid fuels-Petroleum-composition and refining. Octane number of petrol, 8
Cetane number of diesel, Power alcohol, Biodiesel. Gaseous fuel-Composition, properties and applications of NG, CNG & LPG, Combustion- Chemical reactions, Calculations for air required. Numerical.

Fuel cell: Introduction, applications.

Unit – V: Corrosion science

Introduction. Types of corrosion- Dry corrosion- mechanism, Pilling-bed worth rule. Wet corrosion- mechanism. Factors influencing corrosion- Nature of metal, Nature of environment, Catholic and anodic protection, Use of corrosion Inhibitors Protective coatings: surface preparation a) Metallic coatings:, Electroplating & Electro less plating. b) Non-metallic coatings: chemical conversion coatings	8

Unit –VI : Advances in Engineering Chemistry

Nanomaterial: Graphite, Carbon nanotube (CNT) & Fullerenes- Structure, Properties, Applications, Lubricants: Introduction, classification of lubricants, (Liquid, semi– solid (Grease). Biomaterial: classification, Properties, Examples. Biosensor- Introduction, Classification, Applications. Smart Material: Introduction, Shape Memory Alloy and its Example, Advantages, Disadvantages, Applications.	8

BCHP103: Engineering Chemistry

Part A:List of Practical(Any Six)	**Hrs.**
1.Determination of hardness of water by EDTA method.	02
2.Determination of alkalinity of water.	0 2
3.To determine maximum wavelength of absorption of $CuSO_4$ / FeSO4, verify Beer's law and find unknown concentration in given sample	02
4.Titrationofmixture of weak acidands trong acid with strong base using conductometer.	02
5. Preparation of Urea-formaldehyde resin and its characterization.	02
6.Determination of molecular weight/radius of macromolecule polystyrene/polyvinylalcohol	02
7.Proximate analysis of coal	
8. Preparation of nickel coating on copper metal using electroplating & electro less plating	02
9.TO calculate the electrochemical equivalent of copper by electrolysis of copper sulphate solution using copper electrode.	02
10.Determination of acid value of given lubricating oil.	02

Part B:Mini Project Modeling

Every Students has to performed mini project in a group based on curriculum courses 02

Instructions to Student:

1. Maximum Three Students are permissible in each group
2. Project must be based on the contents of syllabus.
3. Project report has to be prepared and attach in practical file individually.

Text Books:

1. Engineering chemistry by O.G. Palana, Tata Mcgraw Hill Eduction Pvt. Ltd.
2. Engineering chemistry by Dr. S.S. Dara Dr. S.S.Umare, S. Chand & company ltd.

Reference Books:

1. Engineering chemistry by Wiley India Pvt. Ltd. First edition
2. Inorganic chemistry, 5e, by Shriver and Atkins, Oxford university press.
3. Shashi Chawala Text book of Engineering Chemistry Sudharani (Dhanpat Rai Publishing Company)

Laboratory Manual:

1. Vogels text book of Quantitative Chemical analysis ,6e,by Mendham, R.C.denney, J.D. Barnes, M.J. K. Thomas, Pearson Education Ltd.
2. Applied Chemistry Theory and Practice ,2e, by O. P. Virmani and A.K. Narula , New age International (P) Ltd.
3. Laboratory manual Engineering Chemistry by Dr. Sudharani (Dhanpat Rai Publishing Company.)

Web Links:

1. www.nptel.ac.in/course/105/04/02-water technology
2. www.nptel.ac.in/syllabus/syllabus.php?subjectId=103/08/00 -electro analytical technique
3. www.nptel.ac.in/courses/113/05028 -polymer
4. www.nptel.ac.in/courses/103/05/10/-fuel & combustion
5. www.nptel.ac.in/courses/113108051/ corrosion science
6. http://nptel.ac.in/course.php?disciplineId=102 – advance materials

BITL104: Programming in C

Teaching Scheme	**Examination Scheme (Theory)**	**Examination Scheme(Lab)**
Lectures:	**Teachers Assessment Exam:** 10 Marks	**Internal (TW) :** 25
2Hrs/Week	**Class Assessment Exam:** 10 Marks	**External (PR) :** 25
Practical: 2Hr/Week	**End Semester Exam:** 30 Marks	**External (OR) :** Nil
Credit	**2**	**1**

Prerequisite :

1. Basic Knowledge of Computer

Course Objective:

1. To make students aware of basics about computers, hardware, software & Operating system.
2. To understand the role of constants, variables, identifiers, operators, type conversion and other building blocks of C Language.
3. To understand the Use of conditional expressions and looping statements to solve problems associated with conditions and repetitions.
4. To understand concept of array and passing array through function
5. To understand the concept of structure and union
6. To develop programming skill in a student to write programs in C language.

Course Outcome:

1. Students are able to understand basic concepts of programming.
2. Students are able to understand the basic terminology used in 'C' programming.
3. Students are able to design programs involving decision structures and loops.
4. Students are able to use different data types in a computer program.
5. Students are able to apply functions and array in program.
6. Students are able to write, compile and debug programs in C language.

Course Contents **Hrs.**

Unit – I :Basics of Programming 4

Basics of programming: approaches to Problem solving, concept of algorithm and flow charts with e.g., types of computer languages: Machine language, assembly language and high level language, concept of assembler, compiler, loader and linker.

Unit – II : C Programming fundamentals 4

Types of programming language , Introduction to C language, tokens, character set, constants, variables, data types, keywords, expressions, operators in C and its types, standard input-output statements in C, structure of C-program.

Unit –III Conditional Program Execution 4

Conditional Program Execution: Applying if and switch statements, nesting if and else, restrictions on switch values, use of break and default with switch, Uses of while, do and for loops, multiple loop variables, assignment operators, using break and continue.

Unit – IV : Introduction to function and Arrays 4

Standard library functions and user defined functions, function declaration, function definition

and function call - call by value and call by reference, return statement, recursion, **Introduction to array**, One and Two Dimensional Arrays, Initialization, Operations on one & two dimensional arrays.

Unit –V Introduction to String 4

Definition of string, Declaration of string, Reading, Writing, String handling operations using and without using library functions, Examples of stings.

Unit – VI : Structure 4

Introduction to Structure definition. Initializing, Assigning values, passing of structure as arguments, Unions, Programming Examples. **Standard C preprocessors,** defining and calling macros, Storage Classes with types.

Practical/Assignments		**Hrs.**
1.	Study of Operating Systems – Window & Linux with their Commands	2
2.	Write programs to implement simple/basic concepts of C.	2
3.	Write programs to implement decision making and control statements in C – if-else, nested if else, if-else-if and switch-case statement.	2
4.	Write programs to implement loops in C – while, do-while.	2
5.	Write programs to implement for loop in C.	2
6.	Write programs to implement string operations in C – strlen(), strcpy(), strcat(), strrev() etc.	2
7.	Write programs to implement string operations in C without using library functions.	2
8.	Write programs to implement functions in C.	2
9.	Write programs to implement of concept call by value & call by reference in C.	2
10.	Write programs to implement of Array concept (One dimensional)	2
11.	Write programs to implement of Array concept (Two dimensional)	2
12.	Write programs to implement structures in C.	2
13.	Write a programs to implement union in C.	2

Text Books:

1. E.Balagurusamy, “Programming in ANSI C” , Tata McGraw Hill
2. B.W. Kernighan, D.M. Ritchie, “The C Programming Language”, Prentice Hall of India.
3. Yeshwant Kanetkar, “Let Us C”, BPB Publication.

Reference Books:

1. R.G. Dromey, “How to Solve It By Computer”, Pearson Education
2. K. R. Venugopal, Sudeep R. Prasad, “Programming with C”, Tata McGraw Hill.
3. E.Balagurusamy,“Fundamentals of Computers”, Tata McGraw Hill

Web Links

1. www.w3schools.com
2. www.cprogromming.com
3. www.eskimo.com/~scs/cclass /notes/top.html
4. www.cprogrammingexpert.com/

BECL105: Basic Electronics Engineering

Teaching Scheme:	**Examination Scheme (Theory)**	**Examination Scheme (Laboratory)**
Lectures:2Hrs/Week	**Teachers Assessment Examination:** 10 Marks	**Internal(TW):** 25 Marks
Practical: 2 Hrs/Week	**Class Assessment Examination :** 10 Marks	**External(PR) :** 25Marks
	End Semester Examination: 30 Marks	**External(OR) :**Nil
Credit	**2**	**1**

Prerequisite : 12th Physics

Course Objective:

1. To give the basic knowledge of basic components & circuit.
2. To study logic gates and their usages in digital circuits
3. To expose the student to working of power electronic devices and transducers
4. To introduce basic aspect of electronic communication system

Course Outcome ; After completion of this course student will be able to

1. Student can acquire the basic knowledge of electronic components and circuits.
2. To gain the concepts of Semiconductor physics
3. Students will be able to effectively employ basic knowledge for new application
4. To design and analyze basic electronic circuits
5. Students will be able to effectively employ technology for their use.
6. To measure the performance parameters of electronic circuits

Course Contents	Hrs
Unit – I : Diode Circuits	
Half wave rectifier, Full wave rectifier, D.C Regulated Power supply, Diode application: clipper, Clamper. LED Diodes and Photodiode.	4
Unit – II : BJT circuits	
BJT structure and its operation with normal biasing, DC operating point, DC load line	6

analysis in various operating region of BJT. Transistor as an amplifier in CE mode and as a switch.

Unit – III : Linear Integrated Circuit

Introduction to Op-Amp, Op-amp input modes and parameters, Op-Amp with negative feedback: summing amplifier, integrator, and differentiator, IC555 as a astable multivibrator. 6

Unit – IV: Basic Digital Electronics

Introduction to logic gates with their truth table, Boolean algebra, D Morgan's Law, Simplification of logical expressions, Sum of product & product of sum, Implementation of SOP (using 3 variable)on Karnaugh map and solving technique. Implementation of expression with basic gates. 6

Unit – V : Digital Electronics Fundamental

Number system: Binary, Gray, octal, Hex, Half adder, Full Adder, Mux, Demux, Flip-flop, Registers, Mod Counter, Sequential and combinational circuits. 4

Unit – VI : Power devices and Transducers

SCR, DIAC, Triac, Transducer like Thermocouple, RTD, thermister, load cell and its application like Digital thermometer, weighing machine. 6

BECP105: Basic Electronics Engineering

Part A :List of Practical(Any Ten)

1. Study of different electronics components.
2. Study of different electronics measuring devices.
3. Study of regulated DC power supply.
4. Study of V-I characteristics of Diode.
5. Study of Clipper circuits.
6. Study of Clamper circuits.
7. Study of single stage BJT common emitter amplifier circuit.
8. Study of Op-Amp circuits as i) Adder ii) Integrator
9. Study of i) MUX ii) Demux
10. Study of IC555 as a timer
11. Study of Half Adder
12. Study of Full Adder
13. Verify the truth tables of different digital ICs like: AND, OR, NAND, NOR.
14. Study of design of AND,OR by universal gate

15. Study of synchronous counter.
16. Study of asynchronous counter.
17. Study of V-I characteristics of SCR.
18. To design electronic circuit for given application
19. Use of PCB for making circuits.
20. Study of function generator to generate various signals like sinusoidal, triangular, ramp observe the waveform on CRO.

Part B-Mini Project Modeling

Every Students has to performed mini project in a group based on curriculum courses

Instructions to Student:

1)Maximum Three Students are permissible in each group

2) Project must be based on the contents of syllabus.

3) Project report has to be prepared and attach in practical file individuallyProject report has to be prepared and attach in practical file individually.

Text Books:

1. Electronic Devices & circuits – Floyd (Pearson Education India)
2. Modern digital Electronics- R.P. Jain(TMH Publication)
3. Electronics Instrumentation- H.S. Kalsi(Tata McGraw Hill)
4. Communication Electronics principle & Application-Frenzel ((Tata McGraw Hill)
5. Electronic Devices & circuits – salivahanan Tata McGraw Hill

Reference Books:

1. Jacob Miliman, C CHalkias, Chetan Parikh- Integrated Electronics.(Tata McGraw Hill)
2. Debashish De, Kamakhya Prasad Ghatak- Basic Electronics(Pearson Education)
3. J R Cogdell- foundation of Electronics(Pearson Education)

Web Links:

Unit I : PN junction diode & Rectifier

1. http://www.electronics-tutorials.ws/diode/diode_1.html
2. http://www.allaboutcircuits.com/textbook/semiconductors/chpt-3/introduction-to-diodes-and-rectifiers/

Clipper & Clamper

http://www.daenotes.com/electronics/devices-circuits/clipper-clamper

Unit II: BJT

1. Applicationhttp://www.electronics-tutorials.ws/transistor/tran_1.html
2. BJT CE Amplifier:http://www.electronics-tutorials.ws/amplifier/amp_2.html
3. BJT as a switch:http://www.electronics-tutorials.ws/transistor/tran_4.html

Unit III: Linear Integrated Circuit

1. Op amp Application:http://www.electronics-tutorials.ws/opamp/opamp_7.html
2. http://www.electronics-tutorials.ws/opamp/opamp_4.html

IC 555:

3. https://electrosome.com/astable-multivibrator-555-timer/

Unit IV: Basic Digital Electronic

http://www.electronics-tutorials.ws/counter/count_3.html

1. **Unit V:: Digital Electronics Fundamental**
2. Half & Full adderhttp://www.circuitstoday.com/half-adder-and-full-adder
3. http://www.radio-electronics.com/info/data/semicond/thyristor/structure-fabrication.php

Unit VI: Power Devices and Transducers

http://www.radio-electronics.com/info/cellulartelecomms/cellular_concepts/mobile-basics-Transducers:http://www.electronics-tutorials.ws/io/io_1.html

BEEL106: Basic Electrical Engineering

Teaching Scheme	**Examination Scheme (Theory)**	**Examination Scheme(Lab)**
Lectures: 3 Hrs/Week	**Teachers Assessment Exam:** 20 Marks	**Continuous**
Tutorials: 1 Hr/Week	**Class Assessment Exam:** 20 Marks	**Assessment:** 25 Marks
Practical: 2 Hrs/Week	**End Semester Exam:** 60 Marks	**External(PR) :** 25 Marks
Credit	**4**	**1**

Course Objective:

1. To expose the undergraduate first-year engineering students to the fundamental laws of electricity and their applications in day-to-day life.
2. To lay a course foundation for the students who would be trained in the related core subjects like electrical, electronics, instrumentation and control, tele-communications etc.
3. Demonstrate the awareness on social issues like conservation of electrical energy, electrical safety etc.
4. Develop abilities to analyze circuits quantitatively.

Course Outcome:

1. Apply basic electric circuit laws to solve electric circuit problems and design basic D.C. electric circuit using circuit analysis techniques.
2. Apply basic A.C. electric circuit laws in solving A.C. circuit problems and able to perform A.C. power calculation.
3. Learner should understand and grasp the analytical treatment of electrical quantities with the help of phasor-algebra.
4. To understand the difference between DC and AC Systems and between Single-phase and three phase utility AC Source.
5. To understand functioning of basic electrical circuits, useful in domestic and industrial power supplies.
6. To train the learner in adequate experimentation related to high power electricity and in measurements of electrical quantities such as voltage, current and power

Course Contents	Hrs
Unit – I : D.C. Circuits	
Ohm's law, Simplification of networks using series - parallel combinations, Current and Voltage sources, Kirchhoff's laws, Superposition theorem, Thevenin's theorem, Maximum Power Transfer theorem.	07
Unit – II : Single Phase A.C. Circuits	
Concept of AC quantities, Concepts of cycle, Period, Frequency, Generation of alternating voltage and currents, RMS and Average value, Form factor, Crest factor, Phase and Phasor diagrams, AC through Pure resistance, Inductance &Capacitance, R-L , R-C and R-L-C series circuits, Power and Power factors.	07
Unit – III :Three Phase A.C. Circuits	
Three Phase Circuits:- Concept of three phase supply, Phase sequence, Concepts of line, Phase, Neutral etc., Power relations in a Three phase balanced Star and Delta connections, Three phase phasor diagrams.	06
Unit – IV : Fundamentals of Transformer	
Construction, Working Principle, EMF equation, Rating of transformer, Transformer on no load and on Full load, Transformer losses, Calculation of Efficiency and Regulation.	06
Unit – V : Work , Power and Energy	
Energy conversions from one form to another such as Electrical, Thermal and Mechanical, and Numerical problems based on different energy conversions in real life cases.	04

Unit – VI : Electrical Machines

Fundamentals of DC and AC Machines, DC Series and Shunt Motor, AC Single Phase Induction Motor, Stepper Motor, Servo Motor. 06

BEEP106: Basic Electrical Engineering

Part A:List of Practical/Assignments (Any Six)

1. Study of :
   a) Different wiring components, switches, holders, cables, tube circuit, CFL, Megger.
   b) Energy conservation and safety precautions.
2. Study of :
   a) Control of lamp from two switches.
   b) Study of staircase wiring.
3. Verification of Kirchhoff's laws.
4. Verification of Superposition theorem.
5. Verification of Thevenin's theorem.
6. Study of R. L. C. series circuits.
7. Verification of current relations in three phase balanced star and delta connected loads.
8. Single phase transformer:
   a) Voltage and Current ratio
   b) Efficiency and regulation by direct loading method.
9. Load test on DC series motor.

Part B-Mini Project Modeling

Every Student has to perform mini project in a group based on curriculum courses.

Instructions to Student:

1) Maximum Three Students are permissible in each group

2) Project must be based on the contents of syllabus of subject.

3) Project report has to be prepared and attach in practical file individually .

Text Books:

1. **Electrical Technology** Volume-I–B.L. Theraja, S.Chand and Company Ltd.,New Delhi.
2. **Basic Electrical Engineering**, V. K. Mehta , S. Chand and Company Ltd., New Delhi.
3. **Theory and problems of Basic Electrical Engineering**- I. J. Nagrath and Kothari, Prentice-Hall of India Pvt. Ltd.

Reference Books:

1. **Electrical Technology**- Edward Hughes, Seventh Edition, Pearson Education
2. **Elements of Electrical Technology**- H. Cotton, C.B.S. Publications
3. **Electric Machines** by AshfaqHussain - Dhanpatrai

Web Links:

Unit1: correlation on effect of temperature:

1. http://arxiv.org/ftp/arxiv/papers/0903/0903.1334.pdf

Unit-2: Single phase AC Circuit:

2. http://elearning.vtu.ac.in/13/ENotes/BEE/BasicElectricalNotes.pdf

Unit-3: Three Phase AC Circuit:

3. http://www.allaboutcircuits.com/textbook/alternating-current/chpt-10/three-phase-y-delta-configurations/

Unit4: Core construction of Transformer:

4. wapyoutub.com/download/video/How...**Transformer**.../vh_aCAHThTQ

Problems on Transformer:

5. https://www.youtube.com/watch?v=zg0piCo5ZTA
6. https://www.youtube.com/watch?v=9TTxUY0vNb8

Unit-5: Work , Power , Energy:

7. http://www.efm.leeds.ac.uk/CIVE/CIVE1140/
8. docs/mechanics_sec03_full_notes02.pdf

Unit-6: Electrical Machines:

9. https://www.rockwellautomation.com/resources/downloads/rockwellautomation/che/pdf/
10. Application_basics_operation_three_phase_induction_motors.pdf
11. http://www.solarbotics.net/library/pdflib/pdf/motorbas.pdf
12. http://www.baldor.com/Shared/manuals/1205-394.pdf

http://uotechnology.edu.iq/dep-ee/lectures/3rd/Communication/machine/PART%203.pdf

BCEL107: Engineering Mechanics

Teaching Scheme:	**Examination Scheme (Theory)**	**Examination Scheme(Lab)**
	Teachers Assessment Exam: 20 Marks	**Internal(TW):** 25 Marks
Lectures: 3 Hrs/Week	**Class Assessment Exam:** 20 Marks	**External(PR)** : 25 Marks
Tutorials: 1 Hrs/Week	**End Semester Exam:** 60 Marks	**External(OR)** :- Nil
Practical: 2 Hrs/Week		
Credit	**4**	**1**

Prerequisite: Knowledge of basic physics and geometry of XIIth standard

Course Objective:

1. Basic concepts of Mechanics for Static and Dynamics have to be implanted into the student.
2. To describe and be able to predict the conditions of rest or motion of the bodies under the action of forces
3. To understand the basic concepts of forces moments, couples in two dimensional force syst

Course Outcomes: After Completion of this course student will be able to

1. Understand the principle of work and energy
2. Comprehend the effect of friction on equilibrium.
3. Understand the laws of motion, the kinematics of motion and the interrelationship.

Course Content	Hrs
Unit – I : Coplanar Force System 1.1 System of Coplanar forces:- Resultant of Concurrent forces, Parallel forces, Non Concurrent Non Parallel system of forces, Moment of force about a point, Couples, Lami's Theorem, Varignon's Theorem. Distributed Forces in plane, Resultant of general force system 1.2 Center of Gravity and Centroid for plane Laminas	6
Unit – II :Equilibrium of Force System 2.1 Equilibrium of system of coplanar forces:- Condition of equilibrium for concurrent forces, parallel forces and Non concurrent Non Parallel general forces and Couples. 2.2 Analysis of plane trusses by using Method of joints and Method of sections.	6
Unit – III : Analysis of Beams, Frames & Cables 3.1 Beams: Types of beams, Types of supports, Types of loading. 3.2 Frames : Analysis of Trusses &Frames	6
Unit – IV : Friction 4.1 Friction: Dry Friction, Laws of friction, angle of friction & resultant reaction, wedge friction, ladder friction, belt friction. 4.2 Kinematics- Basic concepts, equation of motion for constant acceleration and motion under gravity. Variable acceleration and motion curves.	6
Unit – V : Dynamics **A] Kinematics of Particle**: - Velocity & acceleration in terms of rectangular co-ordinate system, Rectilinear motion, Motion along plane curved path, Tangential & Normal component of acceleration, Motion curves (a-t, v-t, s-t curves), Projectile motion.	6

B] Kinetics of a Particle: Force and Acceleration:-Introduction to basic concepts, Newton's Second law of motion. D'Alemberts Principle.

Unit – VI : Principle of Work Energy & Impulse Momentum

A] Work energy principle for particle: Work, Power, Energy, conservative forces & Potential Energy, Conservation of Energy, Work energy principle for motion of particle. 6

B] Impulse momentum principle for particle: Linear Impulse & Momentum, Conservation of momentum, Direct central impact & coefficient of restitution, Impulse momentum principle

Assignments :

Analytical solution of at least four problems / question on each unit based on above syllabus

BCEP107: Engineering Mechanics

Part A :List of Experiments (Any Six)

1. Study of law of parallelogram of forces
2. To Determine the Reaction at The Supports of Simply Supported Beam
3. To determine coefficient of Friction using Belt Friction
4. Verification of law of polygon of forces by graphical method.
5. Study of Lami's Theorem
6. To Determine the Moment of Inertia of Fly-Wheel.
7. To study kinematics of curvilinear motion of a particle
8. To find coefficient of restitution

Text Books:

1. F. L. Singer, Engineering Mechanics, Third Edition, Harper Publication, 2012
2. Engineering Mechanics – Statics and Dynamics by A Nelson, Tata McGraw Hill Education private Ltd, New Delhi 2009.

Reference Books:

1. Vector Mechanics for Engineers, Tata McGraw Hill Company Beer & Johnston, 2012, 9th Edition.
2. Engineering Mechanics, Pearson Education Asia Pvt. Ltd., Iriving K. Shames, 2009, 4th Edition.
3. Engineering Mechanics, Prentice Hall, R.C.Hibbler, 2003, Tenth Edition
4. Engineering Mechanics, DhanpatRai Publishing Company, S. Ramamrutham, 2009, 9th Edition.
5. Engineering Mechanics, DhanpatRai Publishing Company, R. K. Rajput, 2011, 3rd Edition
6. Engineering Mechanics, S. Chand Publication , R.S. Khurmi& Gupta,30july 2015.

Web Links:

Unit I : Resultant of concurrent force System

1. http://www.ae.msstate.edu/vlsm/forcesys/concurrent_force_systems/resultant.html
2. http://www.brainchamp.net/parallelogram-law-of-coplanar-concurrent-forces/
3. http://www.slideshare.net/guestb54490/concurrent-forces

Lamis theorem

1. http://me-mechanicalengineering.com/lamis-theorem/
2. http://www.tutorvista.com/content/physics/physics-iii/motion-laws/lamis-theorem.php
3. http://encyclopedia2.thefreedictionary.com/Lami's+theorem

Varignos theorem

1. nptel.ac.in/courses/Webcourse-contents/IIT-%20Guwahati/.../lec1.htm
2. me-mechanicalengineering.com/varignons-theorem
3. fsinet.fsid.cvut.cz/en/u2052/node40.htm

Moment & couple

1. www.mathalino.com/reviewer/engineering-**mechanics**/**moment**-force
2. web.mit.edu/4.441/1_lectures/1_lecture5/1_lecture5.html
3. physicsnet.co.uk/a-level-physics-as-a2/mechanics/moments/

Unit II : Analysis of structure (join method & section method)

1. www.mathalino.com › Engineering Mechanics › Analysis of Structures
2. www.thelearningpoint.net/home/...**mechanics/analysis-of-structure**
3. www.ce.memphis.edu/3121/notes/notes_03b.pd
4. https://en.wikipedia.org/wiki/**Structural_analysis**

Unit III : Beam & types of beam & FBD

1. https://en.wikipedia.org/wiki/**Beam**_(structure)
2. www.ecourses.ou.edu/cgi-bin/ebook.cgi?topic=me&chap_sec
3. https://www.quora.com/What-are-the-**types-of-beams**

Unit IV : Friction

1. study.com/academy/.../what-is-friction-definition-formula-forces.html
2. www.physicsclassroom.com › Physics Tutorial › Newton's Laws

Unit V : Dynamics

1. http://www.real-world-physics-problems.com/curvilinear-motion.html
2. http://nptel.ac.in/courses/122103010/md07_experiment/module2/lectures/lect4/slides/slide1.htm
3. www.iitg.ac.in/kd/Lecture%20Notes/ME101-Lecture27-KD.pdf
4. study.com/academy/lesson/projectile-motion-definition-and-examples.html
5. https://www.khanacademy.org/...newtons-laws/newtons-laws.../ne...
6. www.crackthehack.com/bnd/epress/2012/.../d-alemberts-principle-and-its-applications...

Unit VI : Principle of Work-Energy & Impulse

1. https://www.khanacademy.org/.../work...energy/work...energy.../...
2. www.spumone.org/courses/dynamics-notes/impulse_momentum/
3. https://www.coursera.org/.../module-12-define-coefficient-of-restitution-solve-an-imp...

BMEL108 : Basic Mechanical & Engineering Graphics

Teaching Scheme:	Examination Scheme (Theory)	Examination Scheme(Lab)
Lectures: 2 Hrs/Week	**Teachers Assessment Exam:** 20 Marks	**Internal(TW):** 25 Marks
Practical: 2 Hrs/Week	**Class Assessment Exam:**20 Marks	**External(PR) :** 25Marks
	End Semester Exam: 60 Marks	**External (OR) : Nil**
Credit	**2**	**1**

Prerequisite:

1. XIIth Physics and its principles.
2. Basic Geometry and concepts.

Course Objective:

1. To describe the scope of mechanical engineering in multidisciplinary industries.
2. To understand and identify common machine elements with their functions and power transmission devices.
3. To learn conventional machine tools , manufacturing processes and understand the design in mechanical engineering.
4. To develop imagination power of student of physical objects to be represented on paper for engineering communication in technical field.
5. To develop the manual drawing skill, drawing interpretation skill.
6. To develop the physical realization of the dimension of the objects.

Course Outcomes:

1. The students will understand the mechanical engineering in general; they will get information of power transmission shafts, keys, coupling, bush, ball bearing, friction clutches, and brakes.
2. The Students will get information of Individual & group drives, gear train, gear drive etc.
3. The Student will get information of basic Manufacturing processes as well as working principle and types of operations with block diagram of Lathe Machine, Drilling Machine, Grinding Machine.
4. The student will get idea of first & third angle method of projection, projection of lines which are inclined to both planes i.e. H.P & V.P. by first angle method of projection.

5. The student will able to draw Engineering Curves, Projection of Solids, Section of Solids and Development of Solids on sheets with their imagination power; they acquire knowledge of method of drawings adapted all over the world and able to read sheets in engineering field, their dimensioning.
6. The students will get idea of Auto-CAD software which is user friendly to draw 2D and 3D object with uniform dimensioning.

Course Contents	Hrs
Unit – I : Basic Mechanical Devices	
A] Machine Elements : Power transmission shafts, coupling, bush and ball bearing and friction clutches, brakes (Types & application only) **B] Drives :** Individual and group drives, belt drive, chain drive, rope drive, gear drive and Spur Gear Drive arrangement with gear train (Types & application only)	4
Unit – II: Manufacturing Processes & Machine Tools	
A] Manufacturing Processes Basic Manufacturing Processes overviews, Sheet metal forming processes : drawing and bending, Sheet metal Cutting processes : Blanking, Piercing ,Metal Joining Processes : Welding , Soldering , Brazing methods and application **B] Machine Tools& Operations:** Basic Elements, Working Principle, Types of Operations with Block Diagram**:** Lathe Machine, Drilling Machine.	6
Unit – III : Projection of Lines, Projection of Solids, Development of Solid & Orthographic Projection	
A] Introduction to lines and **Engineering Curves** -Ellipse, Parabola, Hyperbola by Focus Directrix and Rectangle Method **B]** Introduction to projection of solids and section of solids and Development of Solid(Prism and Pyramid Maximum with six sides) **C] Orthographic projections** of given pictorial view by First Angle Method of Projections.	8
Unit – IV : Isometric Projection & Auto-CAD	
A] Introduction to Isometric View with the example of Cube Isometric axes, scale, Isometric Projection and Isometric Views. Drawing isometric views of simple solids and objects dimensioning-only Length, width and height of Isometric views. **B] Introduction to AutoCAD**, Commands, AutoCAD drawing of simple 2D objects	6

BMEP 108: Elements of Mechanical & Engineering Graphics

Part A- List of Practical/Assignments (Any Eight Out of which 9 & 10 compulsory) Hrs.

No.	Practical/Assignment	Hrs.
1.	Study of power transmitting Elements – Gears, Couplings, Bearings	2
2.	Study of Automobile Clutches.	1
3.	Study of Mechanical Brakes.	1
4.	Study, demonstration & working of Lathe Machine	2
5.	Study ,demonstration & working of Drilling Machine	2
6.	Four problems on Projection of lines	4
7.	Two problems on Projection of Solids	4
8.	Four problems on Engineering Curves and Development of Lateral Surfaces.	4
9.	AutoCAD Drawing- 2 Problem on orthographic	4
10.	AutoCAD Drawing- 2 Problem on Isometric Projection	4

Part B-Mini Project Modeling

Every Students has to performed mini project in a group based on curriculum courses

Instructions to Student:

1. Maximum Three Students are permissible in each group
2. Project must be based on the contents of syllabus.
3. Project report has to be prepared and attach in practical file individually.

Text Books:

1. N. D. Bhatt & V. M. Panchal, Engineering Drawing, Plane and Solid Geometry, Charotor Publication House, Anand, Gujrat, India.
2. Dhananjay A. Jolhe, Engineering Drawing with an Introduction to Auto CAD, Tata Mcgraw- hill Publishing Co. Ltd., New Delhi, India.
3. G. Shanmugam S. Ravindran " Basic Mechanical Engineering",Tata McGraw- Hill Publisher Co. Ltd.
4. R. K. Purohit " Foundation of Mechanical Engineering" , Scientific Publishers.

Reference Books :

1. K. Venugopal, Engineering Drawing and Graphics, New Age Publication.
2. N. B. Shaha and B. C. Rana, Engineering Drawing, Pearson Education.
3. C. Jensen, J. D. Helsel and D. R. Short, "Engineering Drawing and Design", Tata McGraw-Hill Education Pvt. Ltd., New Delhi, 2012
4. Surinder kumar , " Basics of Mechanical Engineering". Ane Books Pvt. Ltd., New Delhi, 2011
5. T. J. Parbhu , V. Jaiganesh and S. Jebaraj, " Basic Mechanical Engineering" , Scitech Publications (India) Pvt. Ltd. Chennai, 2010.

Weblinks :

Unit – I

- https://www.google.co.in/webhp?sourceid=chrome-instant&ion=1&espv=2&ie=UTF-8#q=machine+Elements+Shaft+%2C+keys%2C+Coupling
- http://www.codecogs.com/library/engineering/theory_of_machines/belt-and-rope-drives-brakes.php

Unit – II

- https://en.wikipedia.org/wiki/List_of_manufacturing_processes
- http://www.egr.msu.edu/~pkwon/me478/operations.pdf

Unit – III

- http://nptel.ac.in/courses/112103019/20
- http://www.iitg.ernet.in/rkbc/ME111/Lecture4%20Engineering%20Curves%20and%20Theory%20of%20projections.pdf
- http://nptel.ac.in/courses/112103019/29
- http://www.iitg.ernet.in/rkbc/ME111/Lecture11%20Sections%20of%20solids.pdf
- http://www.engineeringessentials.com/ege/ortho/ortho_page2.htm

Unit – IV

- http://home.iitk.ac.in/~cvrm/TA101_L12_IsometricProjections_Basics.pdf
- http://cms.cerritos.edu/uploads/engt/autocad%20basics.pdf

BHUL109: Environmental Studies and Professional Ethics

Teaching Scheme:	**Examination Scheme (Theory)**	**Examination Scheme (Lab)**
Lectures: 2 Hrs/Week	**Teachers Assessment Exam:** Nil	**Internal(TW):** Nil
Tutorial: Nil	**Class Assessment Exam:** Nil	**External(PR) :**Nil
	End Semester Exam: Nil	**External(OR) :** Nil
Credit	**Audit Course**	

Course Objective: After completing the course students wil be able to

1. Understand fundamental concepts of Environmental systems
2. Understand fundamental concepts from the social sciences and humanities underlying environmental thought and governance.

Course Outcome: At the end of the course the student shall be able to:

1. Understand the concepts and methods and their applications in environmental problem-solving.
2. To get knowledge about impact of different types of pollutions.
3. To get knowledge about effect of water pollution on health and different energy recourses.
4. Demonstrate self confidence and self esteem.
5. Present appropriate etiquettes, style, manners and graceful personality.

Course Contents	Hrs
Unit – I : Environmental Science, Climate Change and need of public awareness	
Definition, scope importance and objectives, guiding principle of Environmental studies, climate change and Need for public awareness. Concept of ecosystem biotic & abiotic components, types of ecosystems. Explain different ecosystems- forest, grassland, desert, aquatic.	4
Unit – II : Pollution and Waste Management	
Air Pollution & Automobile Pollution: Definition, Effects – Global Warming, Acid rain & Ozone layer depletion, Animal husbandry, controlling measures. **Solid Waste Management** - E-Waste Management & Biomedical Waste Management - Sources, Characteristics & Disposal methods.	4
Unit – III : Natural Resources, Material Cycles and Energy	
Natural Resources - Water resources – Availability & Quality aspects, Water borne diseases &water induced diseases, Fluoride problem in drinking water. **Wealth Material Cycles –** Phosphorous Cycle, Carbon Cycle, Nitrogen Cycle & Sulphur Cycle. **Energy** – Different types of energy, Conventional sources & Non-Conventional sources of energy. with examples such as Solar energy and Hydro electric energy.	4
UNIT-IV: Ethics, Value System & Value Education	
Ethics: Behavioral Values, Code of Conduct in College Premises, Addiction, Patriotism – Building respect for the Country, National Anthem and National Flag, Ragging, Respect for Individuals & Environment, Peer – Pressure & Support, Moral Uprightness, Importance of Altruism, Living by the Rules. **Value System & Value Education:** Understanding how value system affects behavior and perception, Difference between Values, Moral & Ethics, Concept of Equality, Acceptance, Humility. Importance of Value education for College Student, Understanding the meaning of Vishwas : Differentiating between intention and competence, How to resolve ethical dilemma, “Right” and “Wrong” Action	4
UNIT-V: Copyrights, Corruption & Integrity and Goal Setting ,Self Improvement and Self Analysis	8
Introduction, Moral Obligations, Copyright Infringement, Patent Law, Case Study Analysis **Goal Setting:** - The importance and benefits of proper goal setting is explained to the students. The following topics are covered: S.M.A.R.T. Goals, Principles of Goal Setting, Steps for Goal	

- Setting Activity. Grooming & Body Language: The students are trained on various aspects of self-grooming and body-language.
- Attitude Development: Types of Attitude, How society affects attitude, Importance of right attitude, Activity.
- Vocabulary Building, Public Speaking & Extempore: Vocabulary Building, Crosswords, Word & Meaning, Spellings, Conversation Practice, Extempore Practice, Intonation, Speech Anxiety.

Self Analysis:

- Self Awareness& Mindfulness: Being Self Aware, Self Awareness in relationships, SWOT, Developing Self Awareness, Self Mastery, JoHari Window.

Mini Project Modeling

Every Students has to performed mini project or a survey report in a group based on following topics.

1.Air pollution

2.Noice pollution

3. water treatment

4.Sewage treatment

5.Human Rights ACTs.(right to equality, education, own a private land, other constitutional rights)

6.Recent studies on minimization of solid waste.(electronic waste, biomedical waste, plastic waste etc)

7. Latest existing status regarding rural development. (sanitary, agricultural, lifestyle, use of technical knowledge for improving different perspects of life, health awareness of both humans and animals)

8. Green building

9. Effects of Global warming

10. Impacts of climate change

Instructions to Students

1. Maximum Three Students are permissible in each group
2. Project must be based on the contents of syllabus.
3. Project report has to be prepared and attach in practical file individually.

Reference Books:

1. A textbook of Environment and Ecology – by Shashi Chawla
2. Textbook for Enviornmental Studies for Undergraduate Courses of all Branches of Higher Education by eran barucha.
3. Solid waste management- by chandrappa, Ramesh, Brown and Jeff.
4. A Textbook of Environmental Chemistry & Pollution Control: S SDara, S. Chand & Company, New

Delhi (2002).

5. "Essentials of Ecology & Environment Science" by Rana. S.V.S.; EPI Publications.
6. Gleick, H.P.1993. Water in crisis, Pacifics Institute for Studies in Dev., Environment & Security. Stockholm Env. Institute. Oxford Univ. Press.473p
7. Robert Schuller, Success Never Ends, Failure is Never Final, Revised Edition, Paperback, 1990 Page 14 of 323
8. Allen Pease, Body Language b, First Edition, Paperback, 2005

BMEP111: Workshop

Teaching Scheme:	Examination Scheme: (Theory)	Examination Scheme:(Lab)
Lectures: Nil	**Teachers Assessment Exam:** Nil	**Continuous Assessment:**
Practical: 2Hr/Week	**Class Assessment Exam:** Nil	50 Marks
Tutorial: Nil	**End Semester Exam:** Nil	
Credit	_	**1**

Course Objective:

1. To introduce to names, uses and setting of hand tools for Fitting, Carpentry and Welding used in mechanical engineering workshop.
2. To introduce students to components and PCB making so as to be able to do work related to Mini-Model making in Electronics workshop.

Course Outcome: At the end of this course student are able to

1. Understand and demonstrate workshop safety regulations.
2. Use tools and processes in fitting, carpentry and welding operations.
3. Demonstrate knowledge of component identification and PCB making.

Course Contents	Hrs
Unit – I : Utility Tools	
Carpentry – 1 Job	
Introduction to wood working, kinds of woods, hand tools and machines. Types of joints, wood turning. Pattern making, types of patterns, contraction, draft and machining allowances.	4
Term work to include one job involving joint and woodturning.	
Fitting – 1 Job	
Types of fits, concepts of interchangeability, datum selection, location layout, marking, cutting, shearing, chipping, sizing of metals, drilling and tapping.	4

Term work to include one job involving fitting to size, male-female fitting with drilling and tapping. 4

Sheet Metal Practice – 1 Job

Introduction to primary technology processes involving bending, punching and drawing various sheet metal joints, development of joints.

Term work to include a utility job in sheet metal.

Joining – 1 Job

Includes making temporary and permanent joints between similar and dissimilar material by processes of chemical bonding, mechanical fasteners and fusion technologies. 4

Term work includes one job involving various joining processes like riveting. Joining of plastics, welding, brazing etc.

Unit – II : Demonstrations (Any Four)

Assembly and Inspection

Assembly and Disassembly of some products, tools etc. Videos of advancement in manufacturing technology. Inspection of various components using different measuring instruments. Introduction to measuring equipment used in Quality Control.

Safety in Workshop

Fire hazards, electric short circuit- causes and remedies. Machine protection, Human protection, Accident prevention methods, developing ability to observe safe working habits.

Forging

Hot working, cold working processes, forging materials, hand tools and appliances, hand forging, power forging. 2

Moulding

Principles of moulding, methods, core & core boxes, preparation of foundry sand, casting, plastic moulding.

Plumbing

Types of pipe joints, threading dies, Pipe fitting.

PCB Making

Layout drawing, positive and negative film marking, PCB etching and drilling.

Machine Tools

Turing, Milling, Grinding, Planning – Machines, Tools and Accessories.

Note: All demonstrations to be engaged by teaching faculty and corresponding teaching load be shown in the time table for respective teaching faculty.

Submissions :

Two jobs as mentioned above.

Brief write-up with illustration / sketches on the demonstration (not more than 3 pages for each demonstration.)

Text Books:

Chaudhary, Hazra, "Elements of Workshop Technology,: Volume I & II Media Promoters and Publishers, Mumbai.

Course in Workshop Technology Volume-I, B. S. Raghuwanshi, Laxmi Publication-Revised Edition

BFYP112: MINI MODELING

Teaching Scheme	**Examination Scheme: (Theory)**	**Examination Scheme: (Laboratory)**
Lectures: Nil	**Teachers Assessment Examination:** Nil	**Continuous Assessment:** 50 Marks
Practicals: 2 Hrs./Week	**Class Assessment Examination:** Nil	
Tutorials: Nil	**End Semester Examination :**Nil	
Credit	**----**	**1**

Prerequisite: 12th Science Basics

Course Objective : After completing this course student will able

1. To understand different phase of model development.
2. To learn various techniques of model development.

Course Outcome: student shall be able to:

1. Developing the skills of planning and designing to develop a working Mini Model.
2. Implement knowledge of concepts learnt and workshop practices to prepare a model.
3. Use innovative ideas and convert these into physical models.

Sr. No	**Themes for Mini Modeling (value addition Venture)**
1	Mechatronics
2	Modeling a) AutoCAD/Autodesk b) Nx4/Ansys/CATIA/Uni Graphics c) Metro Rail/Automobiles

3 Transducers and sensors
  a) Simulink
  b) Lab view
4 Energy conversion and conservation
5 Renewable energy sources
6 Energy Audit
7 Alternate fuels
8 Environmental issues related projects
9 Environmental Audit
10 Designing application based projects PCB Fabrication
11 Agriculture Based Projects
12 Design of web page
13 Bio-Engineering

BHUL113 : Communication Skill

Teaching Scheme:	Examination Scheme (Theory)	Examination Scheme (Lab)
Lectures: 2Hr/Week	**Teachers Assessment Exam:**10 Marks	**Internal(TW):** Nil
Tutorials: Nil	**Class Assessment Exam:**10 Marks	**External(PR) :**Nil
	End Semester Exam: 30 Marks	**External(OR) :** Nil
Credit	**2**	_

Course Objective:

1. To develop an understanding in the students regarding communication skills
2. To develop the four essential communication skills in the students i.e. reading, writing, listening and speaking
3. To develop the vocabulary and English proficiency of the students
4. Train students to common words, phrases relevant to the immediate communication tasks
5. Enable students to comprehend the concept of communication.
6. Teach students the four basic communication skills – Listening, Speaking, Reading and Writing

Course Outcome: At the end of the course the student shall be able to:

1. The students will develop an understanding regarding communication skills.
2. Development of the four essential communication skills in i.e. –reading, writing, Listening and speaking in students.
3. Enhancement of vocabulary and English proficiency of the students.

Course Contents	Hrs
Unit – I : INTRODUCTION TO COMMUNICATION	
Importance of Communication; Importance of Communicating effectively in English; Communication Process , Channels of communication; Barriers to effective communication, Need of communication skills for Engineers.	2
Unit – II : TECHNICAL COMMUNICATION	
Introduction to Technical Communication; differences between General and Technical Communication; importance of Technical Communication; Technical Communication Skills – Listening, Speaking, Reading, Writing	2
Unit – III : LISTENING SKILLS	
Listening Process; Hearing and Listening; Poor listening habits; Traits of a good listener; Types of Listening Principles of Communication – Communication as coding and decoding – signs and symbols – verbal and non –verbal symbols – Language AND communication; language VS communication – media/channels for communication.	4
Unit – IV : SPEAKING SKILLS	
Phonetics and Diction – Theory and Practical; Body Language; Miscellaneous tips and techniques on speaking. Articles reading.	3
Unit – V : READING SKILLS	
Reading Comprehension Techniques for good comprehension, Interpreting charts and tables, Practical Exercises; Developing reading speed – Theory and Practical; Loud Reading – Practical Exercises in class	3
Unit – VI : TECHNICAL WRITING	
Characteristics of Technical Writing – introduction, characteristics, techniques; Choice of right words, phrases and sentences; Principles of paragraph writing	2
Unit – VII : WRITING BUSINESS LETTERS AND EMAILS	
Business Letters – The 7 Cs of Letter Writing, structure of business letters, writing business letters (applications, enquiry, quotations, complaints, cover letters); Writing professional emails	2
Unit – VIII: OTHER WRITTEN COMMUNICATION	
Writing reports, proposals, press release, articles, essays; drafting of Notices and Advertisements (for newspapers); note-making	2
Unit – IX: VOCABULARY DEVELOPMENT	2

Effective use of dictionary; etymology; homophones and homonyms; synonyms and antonyms; words frequently confused or miss spelt, idioms and phrases

Unit – X: BASICS OF FUNCTIONAL ENGLISH GRAMMAR 2

Parts of Speech – introduction, prepositions; articles; tenses; narration; punctuation; voice

Text Books:

1. Mason, Margaret M. Examine Your English, Hyderabad: Orient Longman, 1980
2. Sharma, R.S. Technical Writing. Delhi: Radha Publication, 1999
3. Sudarsanam, R. Understanding Technical English. Delhi: Sterling Publishers Pvt. Ltd., 1992
4. Gannon, Robert, Edt. Best Science Writing: Readings and Insights. Hyderabad: University Press (India) Limited, 1991
5. M. Ashraf Rizvi, Effective Technical Communication, First Edition, Tata McGraw Hill, 2012
6. P C Wren and H Martin, High School English Grammar and Composition, Revised First Edition, S Chand, 2005
7. Meenakshi Raman & Sangeeta Sharma, Communication – Principles & Practice, First Edition, Oxford University Press, 2011

Web Reference Links:

- http://www.youtube.com/watch?v=egeyiUpFsaw
- http://www.youtube.com/watch?v=8Oos1qoYe4o
- http://www.youtube.com/watch?v=9Y88Zw7eWZc
- http://www.youtube.com/watch?v=_pFTsGzGuOk
- http://www.youtube.com/watch?v=eB9Bq3YJGcA
- http://www.youtube.com/watch?v=UWBSlMaplT0
- http://www.youtube.com/watch?v=VFrp9ROB44c&feature=pyv&ad=4735114004&kw=success
- http://www.youtube.com/watch?v=e4g0op2P_yY
- http://www.youtube.com/watch?v=AFGNKJruxdg

BIDL101: Bio Systems in Engineering

Teaching Scheme	Examination Scheme (Theory)	Examination Scheme (Lab)
Lectures:2Hrs/Week	**Teachers Assessment Exam :**Nil	**Continuous Assessment:** Nil
Tutorials: Nil	**Class Assessment Exam:** Nil	**External(PR) :**Nil
	End Semester Exam: Nil	

Credit	**Audit Course**	**-------**

Course Objective :

This course introduces general biological concepts

1. It helps students to understand importance of biological concepts in engineering fields.
2. To understand application of engineering concepts in medical instrumentation.

Course Outcome:

Upon successful completion of the course, students will be able to

1. Use bioinstrumentation, required in cellular or molecular biology investigations.
2. Apply the concepts of engineering in different streams of biomedical field.

Course Contents	Hrs
Basics of Biology: Introduction to Human Anatomy and Physiology, The Nervous System, Cardiovascular System. **Biomedical Instrumentation:** Bioelectric Signals, Biomedical Instrumentation System, Biomedical transducers, Electrodes and Their Characteristics. Bio-imaging techniques, ECG, Computer aided ECG, X-Ray, MRI, CT Scan, Blood pressure measurement instrument. **Applications of Biomedical Engineering.**	24

Text Books:

1. "Joseph J. Carr and John M. Brown, "**Introduction to Biomedical Equipment Technology**", 4 th Edition, Prentice Hall, 2000.
2. R. Rangayan, "**Biomedical Signal Analysis**", Wiley 2002**.**

Reference Books:

1. R.S.Khandpur, "**Handbook of Biomedical Instrumentation**", Tata McGraw Hill, New Delhi, 2003, Edition-II.
2. Sörnmo, "**Bioelectrical Signal Processing in Cardiac & Neurological Applications**", Elsevier.
3. "**Biomedical Instrumentation** Arumugam,Anuradha Publishers,2002,First Edition

****

G. H. Raisoni College of Engineering and Management, Pune

An Autonomous Institute Affiliated to Savitribai Phule Pune University
(NAAC ACCREDITED)

CIVIL ENGINEERING DEPARMENT

Curriculum Structure & Detailed Syllabus (UG Program)

Second Year B. Tech.

(Effective from: Academic Year 2017-2018)

G. H. Raisoni College of Engineering and Management, Pune

College Vision and Mission

VISION:

To achieve excellent standards of quality education by keeping pace with rapidly changing technologies and to create technical manpower of global standards with capabilities of accepting new challenges.

MISSION:

Our efforts are dedicated to impart quality and value based education to raise satisfaction level of all stakeholders. Our strength is directed to create competent Professionals. Our endeavor is to provide all possible support to promote research & development activities.

G. H. Raisoni College of Engineering and Management, Pune

Vision and Mission of Civil Engineering Department

VISION:

To create globally competent technical manpower in dynamic changing world of civil engineering with self-learning & lifelong learning attributes to meet challenges by adopting changing technology

MISSION:

To impart quality education and knowledge which helps in

- Meeting the requirements of the society by developing sustainable solutions and environment friendly systems
- Carrying out research and development to meet new challenges in the field of civil engineering.

Programme Outcomes (PO):

a. Apply knowledge of mathematics, basic science and engineering skills to civil Engineering problems

b. Identify, formulate and research literature and solve analytically complex civil Engineering problems.

c. Analyze and design various structures or particular system that meets desired specifications and Requirements.

d. Design and conduct experiments, interpret and analyze data, synthesize the Information to provide conclusion.

e. Conduct investigations of problems, locate, search and select relevant data from datasheets and literature to provide valid conclusions.

f. Elect and use appropriate engineering techniques and software tools to analyze civil Engineering problems with understanding of limitations.

g. Able to understand the impact of engineering sol
h. on society and demonstrate the knowledge of, and need for sustainable development.

i. Demonstrate their professional and ethical responsibilities.

j. Communicate effectively in both verbal and written forms.

k. Understand engineering and management principles and apply to their work as a Member and/ or leader in a team to manage projects.

l. Adapt transform in industry by understanding the need of independent and lifelong Learning.

Program Specific Outcome (For Under Graduation)

On successful completion, Civil Engineering graduates will be able to:

1. Judicially interpret, analyze and apply different standards/Code used in professional civil engineering with special reference to Indian Standards, Indian Road Congress, and Environmental Standards etc.

2. Project planning techniques with special reference to Civil Engineering project from planning, costing/billing, tendering, design, execution, and completion stages.

3. To use various civil engineering computer tools/software for better productivity optimized Civil Engineering System as whole.

Department of Civil Engineering

The department of Civil Engineering provides state of the art designing, analyzing and estimating facilities to the students and also promotes active industry-institute collaboration by identifying areas of interest and taking part in sponsored research projects. Some of the major research areas, on which the faculty members and students working are Design, Consulting, Execution, Surveying, Analysis, Estimation and management of Construction site. The following facilities are provided to encourage the students into research & development:

Various UG Laboratories such as

1. Environmental Engineering Lab
2. Strength of Materials Lab
3. Geotechnical Engineering Lab
4. Concrete Technology Lab
5. Engineering Geology Lab
6. Surveying Lab
7. Fluid Mechanics Lab
8. Transportation Engineering Lab
9. UG Computer Lab
10. Engineering Mechanics Lab

Various Civil PG Laboratories Such as

1. PG Lab-1 (Civil Engg.)
2. Research Lab-1 (Civil Engg)

Structure
S.Y., B. Tech
(Effective from A.Y. 2017-2018)

Scheme of Examination for S. Y. B. Tech															
Branch- Civil Engineering															
Semester- III															
Subject code	**Subject Name**	**Teaching scheme (Weekly Load in hrs.)**				**Credits**	**Evaluation Scheme**								**ESE Duration (Hrs)**
							Theory			**Practical**			**Total**		
											Ext.				
		Lecture	**Tutorial**	**Practical**	**Total**		**TAE 20 %**	**CAE 20 %**	**ESE 60%**	**Cont Ass**	**PR**	**OR**			
BEML 203	Engg. Mathematics-III	3	1	-	4	4	20	20	60	-	-	-	100		3
BCEL201	Building Const & Materials	3	-	-	3	3	20	20	60	-	-	-	100		3
BCEL202	Strength of Materials	3	1	-	4	4	20	20	60	-	-	-	100		3
BCEP202	Strength of Materials	-	-	2	2	1	-	-	-	25	-	25	50		
BCEL203	Geotechnical Engg-I	3	1	-	4	4	20	20	60	-	-	-	100		3
BCEP203	Geotechnical Engg-I	-	-	2	2	1	-	-	-	50	-	-	50		-
BCEL204	Fluid Mechanics I	3	1	-	4	4	20	20	60	-	-	-	100		3
BCEP204	Fluid Mechanics I	-	-	2	2	1	-	-	-	25	-	25	50		-
BCEL205	Water Resources-I	3	1	-	4	4	20	20	60	-	-	-	100		3
BCEGP202	GENERAL PROFICIENCY:-II	1	-	2	3	Audit course	-	-	-	-	-	-	-		-
	Total	19	5	8	32	26	120	120	360	75	-	50	750		-

Scheme of Examination for S. Y. B. Tech

Branch- Civil Engineering

Semester- IV

Subject code	Subject Name	Teaching scheme (Weekly Load in hrs.)				Credits	Evaluation Scheme							ESE Duration (Hrs)
							Theory			Practical			Total	
											Ext.			
		Lecture	Tutorial	Practical	Total		TAE 20 %	CAE 20 %	ESE 60%	Cont Ass	PR	OR		
BCEL206	Concrete Technology	3	-	-	3	3	20	20	60	-	-	-	100	3
BCEP206	Concrete Technology	-	-	2	2	1	-	-	-	-	-	25	25	
BCEL207	Surveying-I	3	1	-	4	4	20	20	60	-	-	-	100	3
BCEP207	Surveying - I	-	-	2	2	1	-	-	-	25	-	25	50	-
BCEL208	Computer Application in Civil Engg	1	1	-	2	2	10	10	30	-	-	-	50	2
BCEP208	Computer Application in Civil Engg	-	-	2	2	1	-	-	-	25	-	-	25	-
BCEL209	Fluid Mechanics-II	3	1	-	4	4	20	20	60	-	-	-	100	3
BCEP209	Fluid Mechanics-II	-	-	2	2	1	-	-	-	25	-	-	25	-
BCEL210	Geotechnical Engg-II	3	1	-	4	4	20	20	60	-	-	-	100	3
BCEP210	Geotechnical Engg-II	-	-	2	2	1	-	-	-	-	-	25	25	-
BCEL211	Structural Analysis-I	3	1	-	4	4	20	20	60	-	-	-	100	3
BCEGP203	GENERAL PROFICIENCY:- III	1	-	2	3	Audit course	-	-	-	-	-	-	-	-
	Total	17	5	12	34	26	110	110	330	75	-	75	700	-

Semester –III

BEML203: ENGINEERING MATHEMATICS-III	
Teaching Scheme	**Examination Scheme**
Lectures : 03Hrs/Week **Tutorials** : 01Hr/Week **Credit** : 4	**TAE :** 20 Marks **CAE :** 20 Marks **ESE :** 60 Marks

Course Objective :

1. Learning Linear differential equation and their applications in civil engineering
2. Learning calculus of variation and its relevance in engineering
3. Learning partial differential equation and their applications in civil engineering
4. Introduction to optimization method.
5. Numerical solution of ordinary differential equation with various methods.

Course Outcome : Student shall be able to

1. Identify various methods in differential equations, vector calculus and Numerical Analysis that applies to the problems in civil engineering.
2. Understand the root concepts required for the analysis of civil engineering problems.
3. Solve the problems in engineering field using above concepts.
4. Analyze complex problems, categories it into parts and inter the relation between them.

Course Contents	Hrs
Unit I	10
Linear Differential Equations (LDE) and Applications: LDE of n^{th} order with constant coefficients, Method of variation of parameters, Cauchy's & Legendre's Differential Equations, Simultaneous & Symmetric simultaneous Differential Equations. Modeling of problems on bending of beams, whirling of shafts and mass springs systems	
Unit II	08
Calculus of variations: Maxima and minima of function, variation and its properties, Euler's equation, functional dependent on first and second order derivatives, The Rayleigh-Ritz method, simple application.	
Unit III	08
Partial Differential Equation: Partial Differential Equation of 1st order 1st degree i. e Langrange's form, Linear homogeneous p. d. equation of nth order with constant coefficient method of separation of variables. Application to simple problems of variation of strings and beams, elementary concept of double Fourier series and their application to simple problems of vibration of rectangular membrane.	

Unit IV	08
Introduction to Optimization Techniques: Linear programming, mathematical model formulation, Solutions by Graphical & Simplex method.	
Unit V	10
Numerical Methods (Equations): Errors of numerical calculation, Errors in series approximation, rounding of errors solutions of algebraic and transcendental equations. Iteration method, Bisection method, False position method, Newton - Raphsons method and their convergences, solution of system of linear equations, Gauss elimination method, Gauss Jordan method, Gauss Seidel method, Crouts method and relaxation method.	
Unit VI	10
Numerical Methods (Differential Equations): Numerical solution of ordinary differential equation by Taylor series method, Picard's method, Euler modified method, Runga – Kutta method, Milne's Predictor corrector method.	

Text Books:	
1.	Grewal B. S.: "*Numerical Methods in Engineering and Science*", Khanna Publishers, 6th Edition, 2002.
2.	Kreyszig: "*Advanced Engineering Mathematics* ", Wiley Publishers, 10th Edition, 2011.
Reference Books:	
1.	M. K., Iyengar S. R. K., and Jain, R. K Jain: "*Numerical methods for scientific and engineering Computations",* Wiley Eastern Ltd, 2nd Edition, 1990.
2.	S. S. Sastri: "*Introductory methods of numerical analysis* ", Prentice-Hall of India, 2nd Edition, 1984
Web Links:	
1.	http://mathworld.wolfram.com/

<table>
<tr><td colspan="2">BCEL201: BUILDING CONSTRUCTION & MATERIALS</td></tr>
<tr><td>Teaching Scheme</td><td>Examination Scheme</td></tr>
<tr><td>Lectures : 03 Hrs/Week
Tutorials : NIL
Credit : 3</td><td>TAE : 20 Marks
CAE : 20 Marks
ESE : 60 Marks</td></tr>
<tr><td colspan="2">Course Objective :</td></tr>
<tr><td colspan="2">1. To understand the concept of sub-structure and super- structure.
2. To know the different types of building, elements of building and material widely used in building construction.
3. To design and execute the infrastructure projects as per specifications.</td></tr>
<tr><td colspan="2">Course Outcome : Student shall be able to</td></tr>
<tr><td colspan="2">1. Describe types of foundation and construction materials as sustainable and alternatives materials.
2. Examine the construction and execution of brickwork, stonework, arches and lintels, flooring, damp proofing course, doors and windows and plastering and pointing.
3. Explain various methods such as manufacturing of tiles, seasoning of timbering, dressing of stones, damp Proofing.
4. Illustrate the design of staircase.</td></tr>
</table>

Course Contents :	Hrs
Unit I	07
Foundations: Necessity and types of foundation, Details of shallow foundations. Bearing capacity of soils. Presumptive bearing capacity values from codes. Loads on foundation, Causes of failures of foundation and remedial measures, Foundation on black cotton soils, Setting out foundation trenches, excavation, timbering of foundation trenches. Load bearing and framed structures. **Brickwork:** Qualities of good bricks. Terms used in brickwork, commonly used types of bonds, principles of construction. Reinforced brickwork, Parapets, coping, sills and corbels, introduction to cavity walls. Masonry construction using cement concrete blocks and clay walls, load bearing and partition walls. **Brick & Clay Products:** Introduction, Brick earth, manufacturing of clay bricks, properties of burnt bricks, new trends in brick, manufacturing of building tiles.	
Unit II	07
Building Stones : Introduction, requirement of good building stones, testing of stones, quarrying of stones, dressing of stones, artificial stones, common building stones in India **Stone Work:** Stone masonry, principles of construction, and joints in masonry. Lifting heavy stones. **Steel:** Introduction- Grades of steel - Fe 415 and Fe 500; Types of steel, Introduction to Rolled steel, Cold formed Steel, Mild Steel; Properties of Steel; Uses in construction	

Concrete: Introduction, Plain cements Concrete, Reinforced Cement Concrete, Pre stressed Concrete and Pre cast Concrete. **Building Codes:** National Building Code [(SP 7 : 2016 National Building Code of India 2016 (NBC 2016)]: Introduction	
Unit III	07
Arches and Lintels: Terminology in contraction, types of chajjas and canopies, pre cast Lintels & Arches. **Damp Proofing:** Causes and effect of dampness. Various methods of damp proofing Damp proofing in plinth protection, New Techniques of damp proofing, Epoxy etc. **Floors and Roofs:** General principle, types and method of construction upper floors, finishing quality. Flat and pitched roofs, types and their construction features. **Stairs:** Types of stairs, functional design of stairs.	
Unit IV	07
Doors and Windows: Purpose, materials of construction and types. **Plastering and Pointing:** Necessity, types and methods. **Temporary Timbering:** Formwork: Centering and Shuttering, underpinning and scaffolding. **Painting:** White washing, colour washing and distempering, new materials & Techniques.	
Unit V	07
Timber & Wood Based Product: Introduction, moisture in timber, defects in timber, decay of timber. Different type of timber used in building construction, wood base product such as plywood, particle board, veneer, sunmica and their manufacturing process. **Plastics:** Classification, advantages, properties, modern development in plastics. **Glass:** Properties, types of glass, selection of glass, glass fibre, Glass Bridge. **Asphalt and Bitumen:** IRC specification- Introduction, physical properties & its use in construction.	
Unit VI	07
Flooring and other Tiles: Types, Shahabad, Kotta, Granite, Glazed and Vitrified, tiles, IPS flooring, Mosaic tile, manufacturing process of tiles, cutting and polishing of natural stones used. **AC sheets:** Types: Corrugated & plain, Sizes. **Water Proofing Material & its Uses**, termite proofing and fire resisting materials. **Sustainable Construction Materials:** Introduction, Materials-Concrete Reinforced with Timber, Geo-textiles etc. Its uses in construction. **Alternative Construction Materials:** Introduction, Materials, Recycled Plastic, Bamboo, Ashcrete, Its uses in construction.	

Text Books:	
1.	B. C. Punmia, Ashok Kr. Jain, Arun Kr. Jain, "*Building Construction*", Laxmi Publications (p) LTD, New Delhi, 5th Edition, 1993
2.	S. V. Deodhar, "*Building Materials*" Khanna Publication, 1984
Reference Books:	
1.	Gurcharan Singh, "*Building Construction & Material*", Standard Book House, Rajsons Publication Pvt.LTD, 14th Edition, 2011.
Web-Links:	
1.	http://nptel.ac.in/courses/105102088/2
2.	https://ocw.mit.edu/courses/architecture/4-461-building-technology-i-materials-and-construction-fall-2004/lecture-notes/
3.	http://www.vssut.ac.in/lecture_notes/lecture1424085991.pdf

BCEL202: STRENGTH OF MATERIALS	
Teaching Scheme	**Examination Scheme**
**Lectures : ** 03Hr/Week **Tutorials : ** 01Hr/Week **Credit : ** 4	**TAE :** 20 Marks **CAE :** 20 Marks **ESE :** 60 Marks

Course Objective :

1. To study the various mechanical properties of materials.
2. To provide systematic methods for solving engineering problems in solid mechanics.
3. To use the fundamental concepts of stress, strain and elastic behavior of materials.

Course Outcome : Student shall be able to

1. Describe different terminologies related to mechanical properties of materials, effect of forces, types of column.
2. Apply the forces to beams and beams cross section, pressure vessels and columns.
3. Analyze for axial stresses, shear, bending, torsional and principal stresses, and stress distribution below column base.
4. Evaluate for different types of stresses.

Course Contents	**Hrs**
Unit I	08
Mechanical Properties and Uniaxial Problems: Types of force distribution, Concept of stress and strain, Stress strain behavior of ductile and brittle material in uniaxial state of stress. Elastic, Plastic and strain hardened zones stress - strain relations, Elastic constants, Relation between elastic constants. Uniaxial loading and deformation of simple cases of statically indeterminate problems under axial loading. Thin walled pressure vessel, Cylindrical and spherical subjected to internal pressure.	
Unit II: Shear Force and Bending Moment Diagram.	09
a) Concept of shear force and bending moment. Relation between shear force, bending moment and intensity of loading. Shear force and bending moment diagrams for cantilevers, simple and compound beams due to concentrated, uniformly distributed, uniformly varying loads and couples in determinate beams. b) Bending moment and loading diagram from given shear force diagram. Shear force and loading diagram from given bending moment diagram.	
Unit III: Bending and Shear Stresses.	09
a) Concept and determination of Moment of Inertia for various cross-sections. Parallel axis theorem, Polar moment of Inertia, Radius of gyration. b) Stress due to bending: theory of simple or pure bending, Assumptions, derivation of flexure formula, bending stress distribution diagrams, Moment of Resistance of cross-section. c) Shear stresses in beams: concept of shear, complimentary shear, derivation of shear stress formula, shear stress distribution for various cross sections, maximum and average shear stress for circular and rectangular sections and shear connectors.	

Unit IV: Torsion and Strain Energy	09
a) Torsion of circular shafts: theory of torsion, assumptions, derivation of torsion formula. Stresses, strains and deformations in determinate and indeterminate shafts of hollow, solid, homogeneous and composite cross-sections subjected to twisting moments. Power transmitted by shafts, twisting moment diagrams. b) Strain energy: concept of strain energy, expression of strain energy for axially loaded member under gradual, sudden and impact loads. Strain energy due to self-weight, strain energy due to shear force, bending moment and torsion.	
Unit V: Stress Transformation in Two Dimensions	08
Stress Transformation, Principal stresses, Shear stresses, Mohr's circle, Combined bending and torsion, Combined effect of Torsion and Shear. Introduction to Unsymmetrical bending.	
Unit VI: Axially and Eccentrically Loaded Columns	09
a) Axially loaded columns: concept of critical load and buckling, Euler's formula for buckling load with hinged ends, concept of equivalent length for various end conditions, Rankine's formula, safe load on column and limitations of Euler's formula. b) Direct and bending stresses for eccentrically loaded short column and other structural components such as retaining walls, dams, chimneys, etc. Effect of lateral force and self-weight. Resultant stress diagrams due to axial loads, uni-axial, and bi-axial bending. Concept of core of section for solid and hollow rectangular and circular sections.	

Text Books:	
1.	S. B. Junnarkar and H. J. Shah:" *Mechanics of Structures Vol. II",* Charotar Publishing House Pvt Ltd., 22nd Edition, 2015.
2.	D. Ghosh A. K. Datta: "*Strength of Materials*", New Age International Publishers, 5th or later Edition, 2014.
Reference Books:	
1.	Timoshenko and Young: "*Elements of Strength of Materials*", East-West Press Ltd, 7th Edition, 2017.
2.	F. L. Singer and Andrew Pyte: "*Strength of Materials*", Harper and Row Publication, 4th Edition, 1987.
3.	Egor P. Popov : "*Introduction to Mechanics of Solids*", Pearson Education, 2nd Edition, 2015.
Web-links:	
1.	http://nptel.ac.in/courses/112107147/3

BCEP202: STRENGTH OF MATERIALS LAB	
Practical Scheme	**Examination Scheme**
Practical : 02Hr/Week **Credit :** 1	**Cont. Ass.(TW) :** 25 Marks **External(OR) :** 25 Marks **External(PR) :** NIL
List of Practicals (Perform any Eight amongst the following)	
1. To determine the stress strain characteristics of Mild steel and Tor steel.	
2. To determine the Hardness of different metals.	
3. To determine Impact strength of different metals by Izod Impact Test & Charpy Impact Test.	
4. To determine the shear strengths of Mild Steel.	
5. To determine the Abrasion test on flooring tiles.	
6. To find the values of bending stress, Young's modulus, elasticity of simple supported beam of wooden beam carrying concentrated load at center.	
7. To determine the Torsional strength of steel circular shaft.	
8. To determine the transverse strength of flooring tiles.	
9. To determine the compressive strength of (Any one) (a) wet and dry of Brick (b) Wooden Block (Parallel & Perpendicular to the grains) (c) Concrete block	

BCEL203: GEOTECHNICAL ENGINEERING-I	
Teaching Scheme	**Examination Scheme**
Lectures : 03Hrs/Week **Tutorials** : 01Hrs/Week **Credit** : 4	**TAE :** 20 Marks **CAE :** 20 Marks **ESE :** 60 Marks

Course Objectives :

1. To provide basic knowledge for determining various properties of soil.
2. To understand stress characteristics and their distribution in soil.
3. To determine the various engineering properties and their impact on the design and construction of various civil engineering structure.

Course Outcomes : Student shall be able to understand

1. Identify different types of soils and various index properties required for classification of soil.
2. Compute different engineering prospering like, permeability, seepage, compaction, shear strength, which are required to understand behavior of soil under different stresses produced by structural loads.
3. Evaluate stresses within soil mass and magnitude of earth pressure.
4. Assess stability of slopes for different earth retaining structures.
5. Apply suitable compaction method to reduce compressibility and settlement and to improve shear strength and load carrying capacity.

Course Contents	Hrs
Unit I	07
Soil Formation : Formation of soil, residual & transported soils, generally used in practice such as sand, gravel, organic silt, clay, Bentonite, black cotton soil etc., major soil deposit of India, field identification of soil, soil minerology **Phases of Soil**: Various soil weight & volume inter relationship, three phase relations, Physical Properties of soil.	
Unit II	07
Physical Properties : Specific gravity, water content, shape and size, grain size distribution curves, relative density, in situ density, consistency of soils, soil classification system-IS and Unified System	
Unit III	07
Permeability: Soil water, permeability definition and necessity of its study, Darcy's law, factors affecting permeability. Laboratory measurement of permeability – Constant head method and Falling head method as per IS 2720. Permeability of stratified soil deposits. **Seepage:** Seepage and Seepage Pressure, quick sand phenomenon, critical hydraulic gradient, General flow equation for 2-D flow (Laplace equation), Flow Net, properties and application, Flow Net construction for flow under sheet pile and earthen dam.	

Unit IV	07
Compaction- Introduction, compaction tests- Standard Proctor test, Modified Proctor test, Zero air void line. Factors affecting compaction. Effect of compaction on soil properties. Field compaction methods and compaction equipment's for different types of soil, Placement water content, Proctor needle in field compaction control. Stress Distribution in Soils: Geostatic stress, Boussinesq's theory with assumptions for point load and circular load (with numerical), Pressure Distribution diagram on a horizontal and vertical plane, Pressure bulb and its significance. Westergaard's theory, equivalent point load method, Approximate stress distribution method	
Unit V	07
Shear Strength: Introduction- Shear strength an Engineering Property. Mohr's stress circle, Mohr-Coulomb failure theory. Measurement of Shear Strength- Direct Shear test, Triaxial Compression test, Unconfined Compression test, Vane Shear test. Their suitability for different types of soils, advantages and disadvantages. Different drainage conditions for shear tests. Sensitivity and thixotropy of cohesive soils.	
Unit VI	08
Earth Pressure- Introduction, Rankine's state of Plastic Equilibrium in soils- Active and Passive states due to wall movement, Earth Pressure at rest. Rankine's Theory- Earth pressure on Retaining wall due to submerged backfill, Backfill with uniform surcharge, backfill with sloping surface, layered backfill. Coulomb's Wedge theory. Rebhann's and Culmann's graphical method of determination of earth pressure. **Stability of Slopes-** Classification of slopes and their modes of failure, Taylor's stability number, Infinite Slopes in cohesive and cohesion less soil, Landslides- Causes and remedial measures.	

Text Books:	
1.	B. C. Punmia, "*Soil Mechanics and Foundation Engineering*", Laxmi Publications, 16th edition, New Delhi, 2005
2.	Shashi K. Gulati & Manoj Datta, "*Geotechnical Engineering*", Tata McGraw Hill, New Delhi, 2005.
Reference Books:	
1.	Braj M. Das, "*Principles of Geotechnical Engineering*" Cengage Learning, 8th Edition, 2014
2.	Donald. P. Coduto, "*Geotechnical Engineering–Principles & Practices"*, Pearson Education, 2nd Edition, 2010
3.	Gopal Ranjan and A. S. Rao, "*Basic and Applied Soil Mechanics*", Newage International Pvt. Ltd, New Delhi, 2nd Edition, 2000.
4.	Joseph. E. Bowles, "*Physical and Geotechnical Properties of Soils*", International Students Edition, 2nd Edition, 1984
Web links:	
1.	http://ascelibrary.org/page/books/s-gsp.

2.	http://accessengineeringlibrary.com/browse/geotechnical-engineers-portablehandbook-second-edition.
3.	http://nptel.ac.in/courses/105101084/
4.	http://nptel.ac.in/courses/105106142/

BCEP203: GEOTECHNICAL ENGINEERING-I	
Practical Scheme	**Examination Scheme**
Practical : 02Hrs/Week **Credit :** 1	**Cont. Ass. :** 50 Marks **External(OR) :** NIL **External(PR) :** NIL
I. List of Practicals (Perform any Ten amongst the following)	
1. Determination of Moisture content of given soil sample.	
2. Determination of Specific gravity of soil	
3. Grain size Analysis. (Sieve Analysis)	
4. Determination of Liquid Limits, Plastic Limit and Shrinkage Limit of given soil sample	
5. Determination of permeability by constant and falling head method	
6. Standard Proctors test/ Modified Proctors test	
7. Determination of Field Density by a) Core Cutter and b) Sand replacement method	
8. Unconfined compression test	
9. Direct shear test.	
10. Laboratory Vane Shear Test	
11. Triaxial test	
12. Open Ended Experiment	
II. Collection of soil sample from any construction project and write report about interpretation of index properties of soil.	
IS References: IS 2720(Part-3/Sec. 1) – 1987; IS 2720 (Part – 2)- 1973; IS 2720 (Part – 4) – 1985; IS 2720 (Part – 5) – 1985; IS 2720 (Part – 6) – 1972; IS 2720 (Part –7) – 1980; IS 2720 (Part – 8) – 1983; IS 2720 (Part – 17) – 1986; IS 2720 (Part - 10) – 1973; IS 2720 (Part – 13) – 1986; IS2720 (Part 11) – 1971; IS2720 (Part 15) – 1986; IS 2720 (Part 30) – 1987; IS 2720 (Part 14) – 1977; IS 2720 (Part – 14) – 1983; IS 2720 (Part – 28) – 1974; IS 2720 (Part – 29) – 1966, IS 2720 (Part-60) 1965.	

BCEL204: FLUID MECHANICS- I

Teaching Scheme:	**Examination Scheme:**
Lectures : 3 Hrs/Week **Tutorial :** 1 Hrs/Week **Credit :** 3	**TAE :** 20 Marks **CAE :** 20 Marks **ESE :** 60 Marks

Course Objective :

1. To study the basic behavior of fluids and fluid system and the laws governing this behavior
2. To understand and apply the basic concepts Mechanics to carry out professional engineering activities in the field of fluids.
3. To apply scientific strategies to analyze qualitatively and quantitatively the problems and give solutions.

Course Outcome : Student shall be able to

1. Understand basic properties of fluid flow.
2. Apply the knowledge to fluid flow problems.
3. Analyze the type of flow by using basic of mathematical principle.
4. Solve and modeling the pipe flow problems.

Course Contents	**Hrs**
Unit I	08
Properties of Fluids Introduction: Definition of Fluid, difference between fluid, Liquid and Gas. Physical properties of fluids, Rheology of fluids.	
Unit II	09
Kinematics of Fluid flow, Types of fluid flows: Velocity, acceleration of fluid and their components and different coordinate system, Steady and unsteady, uniform and non-uniform, laminar and turbulent flows, rotational and irrotational flow compressible and incompressible flows, subsonic, sonic and supersonic flows, sub-critical, critical and supercritical flows. One, two and three dimensional flows, streamlines, continuity equation for 1D and 3D flows, circulation, stream function and velocity potential, source, sink, doublet and half-body.)	
Unit III	08
Fluid Static: Hydrostatic basic equation, Pressure-density-height relationship, manometers, pressure transducers, pressure on plane and curved surfaces, centre of pressure, buoyancy, stability of immersed and floating bodies, fluid masses subjected to linear acceleration and uniform rotation about an axis.	
Unit IV	08
Dynamics of Fluid Flow : Euler's equation and its applications- Pitot tube, orifice meter, venturi meter and bend meter, Hot-wire anemometer, notches and weirs, momentum equation and its application to pipe bend.	

Unit V	09
Dimensional Analysis and Hydraulic Modelling: Buckimgum Л-theorem, Dimensionless numbers and their significance, Geometric, Kinematic and Dynamic similarity, Model studies.	
Unit VI	10
Laminar and Turbulent Flows: Equation of motion for laminar flow through pipes, Stokes law, transition from laminar to turbulent flow, types of turbulent flow, isotropic, homogenous turbulence, scale and intensity of turbulence, measurement of turbulence, eddy viscosity, mixing length concept and velocity distribution in turbulent flow. **Flow through Pipes:** Hydraulically smooth and rough pipes, Nikurade's Experiments, Moody's Chart, Darcy Weisbach Equation for Friction Head loss, minor losses in pipes, pipes in series and parallel and Hardy-Cross method of pipe networks.	

Text Books:	
1.	Modi, P. N. and S. M. Seth, "*Hydraulics and Fluid Mechanics*", Standard Book House, 14th Edition, Delhi 1998.
2.	R. K. Bansal, "*Fluid Mechanics and Hydraulic Machine*", Lakshmi Publication, 6th Edition Delhi 2000.
Reference Books:	
1.	Jain A. K., "*Fluid Mechanics*", Khanna Publisher, New Delhi, 2008
2.	Garde, R. J, "*Fluid Mechanics through Problems*", 2nd Edition, New Age International Pvt. Ltd, New Delhi, 2005.
Web Link:	
1.	www.wiley.com/college/munson/ - unit I
2.	www.princeton.edu/~gasdyn/fluids.html - unit IV
3.	www.efunda.com/formulae/fluids/index.cfm - unit V
4.	http://nptel.ac.in/courses/10510309 5/ - All units

BCEP204: FLUID MECHANICS-I	
Teaching Scheme:	**Examination Scheme:**
Practical : 2Hrs/Week **Credit :** 1	**Cont. Ass : ** 25 Marks **External(OR) :** 25 Marks **External(PR) :** NIL
List of Practicals (Perform any Seven amongst the following)	
1. To verify Bernoulli's theorem	
2. To determine co-efficient of discharge of Venturimeter & Orifice meter	
3. To determine co-efficient of discharge of Notches- a)Rectangular b) Triangular	
4. To determine co-efficient of discharge, contraction & velocity of an orifice	
5. To determine friction factor for Pipes of Different Materials	
6. To find Reynolds number for a pipe flow.	
7. To determine the Metacentric height of a floating body.	
8. To determine the Viscosity of oil by Redwood Viscometer	
9. To determine minor losses in pipes in pipes	

BCEL205: WATER RESOURCES ENGINEERING-I	
Teaching Scheme:	**Examination Scheme:**
Lectures : 3Hrs/Week **Tutorials** : 1Hr/Week **Credit** : 3	**TAE :** 20 Marks **CAE :** 20 Marks **ESE :** 60 Marks

Course Objective:

1. To study the different hydrological parameters.
2. To understand hydrological statistics and design.
3. To characterize and mitigate natural and man-made hazards

Course Outcome: Student shall be able to

1. Explain the hydrology and hydrological data.
2. To analyse the hydrological methods for runoff.
3. Evaluate the ground water hydrological problems.

Course Contents	Hrs
Unit I	07
Introduction. Introduction to Hydrology, Computation of Mean Rainfall by Different methods. Importance of temperature, wind and humidity in hydrology. Earth and its atmosphere and importance. **Precipitation:** Definition and classifications. Selection of site, density and Adequacy of rain-gauge station.	
Unit II	07
Hydrological Cycle: Definition, mechanism, factors affecting and Measurement of Infiltration, Evaporation and Transpiration.	
Unit III	08
Run Off: Source components of runoff, classification of streams, factors affecting. Estimation of discharge and Measurement methods, numerical, River Gauging – Various methods. **Hydro Graphs:** Introduction: unit hydrographs. Base flow and base flow separation, S-Curve theories Numerical.	
Unit IV	07
Statistical Methods: Statistics in hydrological analysis. Probability and probability distribution. Analysis of time series, frequency analysis, numerical. **Floods:** Causes and effects, factors affecting Flood routing and flood forecasting, numerical.	
Unit V	08
Ground Water Hydrology: Introduction: occurrence and distribution, Ground water exploration techniques, Introduction to hydraulics of well, Numerical. Ground water quality, geomorphic and geologic control, Ground water province of India.	

Unit VI	07
Ground Water Recharge: Introduction. Recharging methods, spreading methods.Recharge through rain water harvesting. **Project Planning for Water Resources** Introduction: Water resource planning	

Text Books:	
1.	P. Jaya and Rami Reddy, "*Text book of hydrology*", Laxmi Publication, 3rd Edition, 2007.
2.	P. N. Modi, "*Irrigation, Water Resources and water power engineering*", Standard Book House, 1998.
3.	K. Subramanyam, "*Engineering hydrology*", Tata McGraw Hill, 4th Edition, 2017
Reference Books:	
1.	K. Subramanya ,"*Engineering hydrology*", McGraw Hill, 3rd Edition, 2008
2.	R. K. Sharma and T. K. Sharma, "*Text book of hydrology and water resource engineering*", Dhanpat Rai Publications, 5th Edition, 2007
Web Link:	
1.	http://nptel.ac.in/courses/10510511 0/
2.	http://nptel.ac.in/courses/10510808 1/

BCEGP202: GENERAL PROFICIENCY-II (FOREIGN LANGUAGE: FRENCH/ GERMAN/ JAPANESE/ SPANISH)		
Teaching Scheme:	**Examination Scheme (Th)**	**Examination Scheme (Lab)**
Lectures : 01Hr/Week **Tutorials :** NIL **Practical :** 02 Hr/Week	**ESE :** 80 Marks	**Cont. Ass.(TW) :** 20 Marks **External(OR) :** NIL
Credit: Audit Course		
Course Objectives :		
1. To learn foreign languages to improve inter personal skills. 2. To enable improving business communications and having access to literature in globally recognized languages. 3. To help communicate at international forums and explore opportunities for employment.		
Course Outcomes : students will be able to		
1. Communicate effectively in one of the globally recognized language like French, Spanish, German, and Japanese. 2. Interact with technical and business communities at international forums.		
FOREIGN LANGUAGE: FRENCH		
Session 01: Basic Introduction, Alphabets, Salutations, Days **Session 02:** Months And Numbers, Colors, Profession, Articles, Prepositions **Session 03:** Revision And Reinforcement Work **Session 04:** Vocabulary: Fruits, Vegetables, Sentence Construction **Session 05:** Vegetables, Numbers, Grammar [Verbs] **Session 06:** Phonetics And Pronunciation, Audio Visual Session **Session 07:** Articles, Conjugations, Verbs, Sentence Construction **Session 08:** Vocabulary And Spoken Practice, Audio Example And Sentence Reformation. **Session 09:** Worksheets/Practice **Session 10:** Revision Test 1 [Spoken] **Session 11:** Revision Test 2 [Written] **Session 12:** Final Evaluations		
FOREIGN LANGUAGE: GERMAN		
Session 01: Introduction Session: Greetings, Alphabets, Numbers **Session 02:** Numbers, Division, Writing, Colors, Profession, Days, Subjects, Conjugations And Greetings Reinforcement., Months, Uhrzeil, Staclte-Lander- Sprache, Wei Gelits, Gegenteil, Farge, Wonnung, Wortschatz, Greetings And Wishes **Session 03:** Revision Work, Verben- Spielen, Jogen, Arbeiten, Spazieren, Gehen, Ins Kino Gehen, Kochen, Lessen, Schwimer, Singen, Malen,Familie Essay, Wortschatz. **Session 04:** Revision Test, German History Flim, Konjugation Excercises, Tagesablauf **Session 05:** Framing And Asking Questions [Emails, Phone Number, 'Please Say That Again', Yes/No] Wiederholung:Artikel [Der, Die, Das, Die], Vocabulary [Klassenzimmer], Exercise [Verben] Ubersetzung **Session 06:** Listening Skills, Hobbies, Days Of A Week, Artikel Notes, Exercise, Texts-		

Translations, Die Stadt- Wortschatz, W-Frage- Aussagesatz, Ja/Nein Frage.

Session 07: Worksheet, Revision, Diktat, Wiederholung, Verben

Session 08: Tagesablauf, Test, Negation, Directions, Stadt, Beruf- Zukunft Meines Berwfs, Possessive Artikel, Modal Verbena

Session 09: Worksheets/Practice

Session 10: Revision Test 1 [Spoken]

Session 11: Revision Test 2 [Written]

Session 12: Final Evaluations

FOREIGN LANGUAGE: JAPANESE

Session 01: Introduction Session , Greetings, Reading And Writing

Session 02: Basic Scripts [Hiragana], Worksheets

Session 03: Orientation For New Students, Basic Grammar, Revision Work

Session 04: Modified Kana , Double Consonants ,Days, Number

Session 05: Numbers: 1 To 1 Billion, Reading And Writing Numbers

Session 06: Days In A Week, Months, Time Reading And Speaking

Session 07: Names And Places, Timings

Session 08: Timings- Write And Speak

Session 09: Worksheets/Practice

Session 10: Revision Test 1 [Spoken]

Session 11: Revision Test 2 [Written]

Session 12: Final Evaluations

FOREIGN LANGUAGE: SPANISH

Session 01: Basic Introduction And Ice Breaking Session**,** Alphabets

Session 02: Numbers- Read, Write And Speak , Greetings And Introduction

Session 03: Numbers [1 To 1000], Days, Months And Years, Colors And Names, Basic Grammar.

Session 04: Revision Test, Solution Discussion And Reinforcement Work

Session 05: Numbers And Time, Family And Names

Session 06: Names Of Fruits And Vegetables And Other Food Items, Name Of Animals Audio Visual Activity: Spanish Movies

Session 07: Work, Professions, Self-Introduction- Read And Write

Session 08: Self-Introduction- Speak, Places And History [Audio Activity]

Session 09: Worksheets/Practice

Session 10: Revision Test 1 [Spoken]

Session 11: Revision Test 2 [Written]

Session 12: Final Evaluations

****

<u>Semester-IV</u>

BCEL206: CONCRETE TECHNOLOGY	
Teaching Scheme	**Examination Scheme**
Lectures : 03Hr/Week **Tutorials :** NIL **Credit :** 3	**TAE :** 20 Marks **CAE :** 20 Marks **ESE :** 60 Marks

Course Objective :

1. To understand the properties of concrete ingredients.
2. To study the compressive, flexural, split strengths etc. and other non-destructive tests.

Course Outcome : Student shall be able to

1. Understand properties of constituent of cement concrete, fresh concrete and hardened concrete and mix design.
2. Apply the knowledge to manufacturing of concrete.
3. Analyze different properties of concrete and mix proportion of concrete.
4. Evaluate properties of concrete and mix proportions.

Course Contents	**Hrs**
Unit I	07
Cement: Main constituents of cements, Hydration process of cement, Physical properties and testing of cement. Effect of fineness, Initial & final setting time of cement, Various tests on cement: Soundness test, Hardening and compressive strength of cement, grades of cement, different types of cement (: Blast furnace slag cement, Low heat Portland cement, Portland flyash cement, Sulphate resisting cement, Ferro cement), IS 650:1991 Specification for standard sand for testing of cement **Aggregates:** Sources of aggregates, classification and nomenclature, Coarse and fine aggregate, normal weight (light and heavy weight aggregates). Aggregate characteristics and their significance in strength, workability, placement and compaction of concrete. Sampling, Particle shape and texture, Bond of aggregate, size & grading of aggregate strength of aggregate. Mechanical properties and tests – Specific gravity, bulk density, porosity, absorption of aggregate, moisture content of aggregate, bulking of sand abrasion test, impact value. Deleterious substances in aggregate, organic impurities clay and other fine soundness of aggregate, Crushed sand. Alkali aggregate reaction. Introduction of IS: 383, water quality for mixing and curing, Acceptable water, pH value, Seawater chlorides content. Provisions in IS: 456-2000 material etc.	
Unit II	07
Fresh Concrete: Batching, Mechanical mixers, automatic batching and mixing plants. Efficiency of mixing, Workability Measurement - Slump cone test, compacting factor test, flow table, Vee-Bee consistometer. Factor affecting workability, setting time, Significance of w/c ratio, Segregation, bleeding, voids, and permeability. Hot weather concreting, Conveyance of concrete, placing of concrete, compaction, vibrators, curing of concrete, significance, methods of curing, temperature effects on curing and strength gain. IS code on curing, Maturity of concrete, Framework for concrete- IS code.	

Unit III	07
Strength of Concrete- Gain of strength, w/c ratio. Factors affecting compressive strength, w/c ratio, type of cement, air entrainment, aggregate, mixing water, admixtures, curing conditions. Tensile and flexural strengths, relation between compressive and tensile strength. Failure modes in concrete, cracking in compression. Impact strength, fatigue strength, shear, elasticity, poisson's ratio. Testing of hardened concrete. Compression test cubes, strength and cylinder strength and their relation, effect of aspect ratio on strength. Flexural strength of concrete, determination of tensile strength, indirect tension test, splitting test, abrasion resistance, accelerated curing test. **Non Destructive Test**- significance, rebound hammer, ultra-sonic pulse velocity test.	
Unit IV	07
Additives, **Admixtures & Replacers**: Types of additives- antifoam agents & fibers, natural products, Admixtures, Types of admixtures- air entraining, water reducing, accelerators, retarders, plasticizers and superplasticizer, grouting agents, surface hardeners. Replacers: blast furnace slag, flay ash, rice husk ash.IS 9103(1999)	
Unit V	07
Shrinkage & Durability of Concrete: Shrinkage- early volume changes, drying shrinkage, mechanism of shrinkage, factors affecting shrinkage, influence of curing and strong conditions, differential shrinkage, carbonation, creep- factors influencing, relation between creep and time, nature of creep, effect of creep **Durability of Concrete**- Definition, Significance, Factors affecting the durability of concrete. water as an agent of deterioration, permeability of concrete, air sulphate attack and control, sea water attack, acid attack, efflorescence, resistance of corrosion, abrasion and cavitation.	
Unit VI	07
Mix Design- Process, statistical relation between main and characteristic strength, variance, standard deviation, factors affecting mix properties, grading of aggregates, aggregate/cement ratio etc. Degree of quality control, design of mix by IS 10262:2009 & ACI method.	

Text Books:	
1.	A. M. Neville, "*Properties of concrete*", Pearson Education Limited, 5th Edition, Mar 2018
2.	M. S. Shetty ,"*Concrete Technology*", published by S. Chand, Faridabad, 1st Edition, 2005
Reference Books:	
1.	M. L. Gambhir, "*Concrete Technology (Theory and practice)*", McGraw Hill publications, 5th edition, Nov 2010.
2.	Santha kumar, "*Concrete Technology* ", Oxford publication New Delhi, 1st Edition, 2006
3.	Pillai and Menon Reinforce, "*concrete design*", McGraw Hill, 2nd Edition, 2003
Web Links:	
1.	https://en.wikipedia.org/wiki/Cement
2.	https://www.engineeringcivil.com/list-of-is-codes-for-cement-and-concrete.html
3.	http://civil.emu.edu.tr/courses/civl284/5%20Fresh%20Concrete.pdf
4.	https://courses.washington.edu/cm425/strength.pdf
5.	https://www.slideshare.net/achaldadhania/concrete-additives-admixtures
6.	http://www.civil.northwestern.edu/people/bazant/PDFs/Papers/P207.pdf
7.	https://theconstructor.org/concrete/concrete-mix-design-calculation-procedure-example-m20-m25-m30/13020/

BCEP206 : CONCRETE TECHNOLOGY	
Practical Scheme:	**Examination Scheme:**
Practical : 02 Hr/Week **Credit :** 1	**Cont. Ass.(TW) :** NIL **External(OR) :** 25 Marks **External(PR) :** NIL
List of Practicals (Perform any Ten amongst the following)	
1. To determine Fineness Modulus (FM) of Coarse Aggregate	
2. To determine the Specific Gravity of aggregate by pycnometer method	
3. To determine Impact value of Aggregate	
4. To determine Crushing Strength of Aggregate	
5. To determine flakiness Index and elongation Index of Aggregate	
6. To determine Abrasion Value of Aggregate	
7. To determine Bulking of Sand and Silt content in sand	
8. To determine fineness of cement and Soundness cement	
9. To determine the Consistency of Cement and Initial and Final Setting time of Cement by Vicat's Apparatus	
10. To determine the Workability of Concrete by (a) Slump Test (b) Compaction Factor Test	
11. To determine Compressive Strength of (a) Concrete (b) Cement	
12. To determine compressive strength by rebound hammer test	
13. To determine modulus of rigidity by ultrasonic pulse velocity test	
14. Concrete Mix Design (Any one of the method)	

BCEL207: SURVEYING-I	
Teaching Scheme:	**Examination Scheme:**
**Lectures : ** 03Hr/Week **Tutorials : ** 01Hr/Week **Credit : ** 4	**TAE :** 20 Marks **CAE :** 20 Marks **ESE :** 60 Marks

Course Objective :

1. To understand the basic principles of surveying.
2. To study the coordinate systems and measuring techniques.
3. To study different types of survey and instruments used.

Course Outcome : Student shall be able to

1. Identify difference between plain surveying and geodetic surveying.
2. Understand information related to instrument such as dumpy level, theodolite and plane table.
3. Calculate reduced levels of different points on grounds, slope or gradient, horizontal and vertical angle measurements.
4. Illustrate adjustments of traversing, contour maps, area computation and distance by Electronic Distance Meter and Traverse Survey.

Course Contents	Hrs
Unit I	10
Introduction to Surveying: Necessity & purpose, Geodetic & Plane Surveying, Classification of survey, Principles of Surveying, Division of Survey. Instruments and Measurement: -Linear measurements, Corrections to field measurements, ranging out, Direct & Indirect ranging. Use of Distomat, Error in Instruments and Calibration of Instruments. **Chain surveying**: -Introduction, Principle of Chain Surveying.	
Unit II	09
Instruments for Measurement of Angles: -Prismatic compass, Surveyor's compass, their use & adjustment. **Compass Traversing**: Reference meridians, Bearings & azimuths. Local attraction, magnetic declination & its variation. Open & closed traverses. Adjustment of closed traverse. Bowditch's Graphical method.	
Unit III	08
Instruments for Measurement of Elevation: Dumpy level, Tilting level & Automatic level. Details of their construction. **Adjustments of Levels:** Temporary & Permanent adjustments of Dumpy & Tilting levels. Principle axes of Dumpy level, Relationship, Testing and adjustment of bubble axis and line of collimation.	
Unit IV	10
Leveling: Definition of terms, Principle of leveling, Reduction of levels, Classification of leveling, Profile leveling, Longitudinal sectioning, Cross Sectioning, Reciprocal leveling, Distance to vertical horizon, leveling methods, Leveling staves, Booking &	

reduction of field notes, curvature & refraction. Sensitivity of bubble tube. Errors in leveling. **Contouring:** Definition, Characteristics & uses of contour maps, methods of contouring. Interpolation of Contours, Computation of area and volume – Trapezoidal and Simpson's Rule, Plan meter.	
Unit V	09
Theodolite: Introduction, Type of Theodolite, Temporary & Permanent adjustment, Measurement of Horizontal & Vertical angles, Magnetic Bearing, Prolonging a line, Lining in. Other uses of Theodolite **Theodolite Traverse:** Consecutive & Independent Coordinates, Adjustment of Closed traverse, latitude & departure, Gale's traverse table, area calculation by coordinates.	
Unit VI	08
Plane Table Surveying: Equipment's, methods of Plane Tabling, Advantages & disadvantages of plane tabling. Lehman's rules. **Major & Minor Instruments**: Construction & use of Electronic Distance Metre (EDM), Total Station.	

Text Books:	
1	Ashok K. Jain, Arun K. Jain, "*Surveying Vol. I & II",* B. C. Punmia, Laxmi Publications, 7th Edition, 2016
2	T. P. Kanetkar and S.V.Kulkarni, "*Surveying and Levelling Vol. I and Vol. II*", Pune Vidyarthi Griha Prakashan, 2014
Reference Books:	
1	N. Basak, "*Surveying & Leveling*", Mc- Graw Hills Publication, 2nd Edition, 2014
Web Links:	
1	http://nptel.ac.in/courses/105107122/
2	http://nptel.ac.in/courses/105104100/

<table>
<tr><td colspan="2">BCEP207: SURVEYING –I</td></tr>
<tr><td>Teaching Scheme:</td><td>Examination Scheme:</td></tr>
<tr><td>Practical : 02 Hr/Week
Credit : 1</td><td>Cont Ass.(TW) : 25 Marks
External(OR) : 25 Marks
External(PR) : NIL</td></tr>
<tr><td colspan="2">List of Practicals</td></tr>
<tr><td colspan="2">1 Measurement of bearings of sides of traverse with Prismatic Compass and computation of correct included angle.</td></tr>
<tr><td colspan="2">2 Determination of elevation of various points with dumpy level by Collimation Plane Method and Rise & Fall Method.</td></tr>
<tr><td colspan="2">3 Theodolite Traverse.
i. Measurement of horizontal angles with Theodolite by means of Repetition Method.
ii. Measurement of vertical angles using Theodolite.
iii. One full size drawing sheet locating given building (traverse) by Theodolite traversing.</td></tr>
<tr><td colspan="2">4 Plane Table Survey.
i. One full size drawing sheet locating given building (traverse) by Radiation Method
ii. One full size drawing sheet locating given building (traverse) by Intersection Method by Plane Table Traversing.</td></tr>
<tr><td colspan="2">5 Measurement of area of irregular figure by using Plan meter.</td></tr>
<tr><td colspan="2">6 Survey Project involving field work
i. Road Project(L – section and C/S – section of Road)
ii. Contour Project</td></tr>
</table>

BCEL208: COMPUTER APPLICATION IN CIVIL ENGINEERING	
Teaching Scheme:	**Examination Scheme:**
Lectures : 01Hr/Week **Tutorials :** 01Hr/Week **Credit :** 2	**TAE :** 10 Marks **CAE :** 10 Marks **ESE :** 30 Marks

Course Objective :

1. To understand the concept and terminologies used in computer programming
2. To use programming language for solving Civil Engineering problems.
3. To determine optimistic solution to design

Course Outcome : Students shall able to

1. To be done by Comp. Faculty.

Course Contents	Hrs
Unit I	05
C-Fundamentals: CHARACTER SET data type constant and variables, Declaration of constants & variables, Expression, Statements, Symbolic constants. Operator and Expression, Arithmetic operator, Unary operator, Relation and Logical operator, Assignment operators, the conditional operator, Library functions. Data input & output Interactive programming preparing & running a complete simple program.	
Unit II	05
Control Statement: the WHILE statements, do-while, for nested loop, if-else, switch break, continue, go-to statement, comma operator.	
Unit III	05
Functions: Storage class, Arrays, Pointers, structures and Unions, Data files, File Handling, Link list.	
Unit IV	05
Fundamental of Numerical Methods: Interpolation & extrapolation. Numerical Integration (Simpsons method , Trapezoidal method , Newton's Gauss Quadrature method) , Interactive Computer Program Development	
Unit V	05
Solution of Linear Algebraic Equations: Gauss quadrature (method), solution errors. Interactive Computer Program Development	
Unit VI	05
Solution of Non Linear Equations: (Newton Raphson Schemes) , Initial & Two point boundary value problem, Euler's Runge-kutta Milnes etc., Interactive Computer Program Development	

Text Books:	
1.	Yashwant Kanetkar, "*LET US C*", 3rd Edition, BPB Publications, 2010
Reference Books:	
1.	Ward Cheney and David Kincaid, "*Numerical Mathematics and Computing*", 7th Edition, Thomson Publications, 2013.
2.	Rajiv Khanna, "*Computer Application for Engineering*", New Age International (P) Limited, 1st Edition, 2007.
3.	E. Balaguruswamy, "*Programming in Using C*", Tata Mc Graw Hill, 5th Edition, 2010.

BCEP208 : COMPUTER APPLICATION IN CIVIL ENGINEERING	
Practical Scheme:	**Examination Scheme:**
Practical : 02Hr/Week **Credit :** 1	**Cont. Ass.(TW) :** 25 Marks **External(OR) :** NIL **External(PR) :** NIL
List of Practicals	
1. Program for Shear Force & Bending Moment for beam carrying UDL	
2. Program for Shear Force & Bending Moment for beam carrying Point Load	
3. Program for Bisection Method	
4. Program to find the Root of an equation using Newton Rapson Method.	
5. Program to Find Integral of given function by using Simpson's 1/3rd Rule.	
6. Program to Find Integral of given function by using Simpson's 3/8th Rule.	
7. Program to solve equation by using Euler's Method.	
8. Program to solve the system of Linear Equation Using Gauss Elimination Method.	
9. Program to solve equation by using Second Order Runga-kutta Method.	
10. Program to solve equation by using Fourth Order Runga-kutta Method.	

BCEL209: FLUID MECHANICS-II	
Teaching Scheme:	**Examination Scheme:**
Lectures : 03Hr/Week **Tutorials :** 01Hr/Week **Credit :** 4	**TAE :** 20 Marks **CAE :** 20 Marks **ESE :** 60 Marks

Course Objective :

1. To understand the flow pattern in the open channels and immersed body.
2. To understand varied flow in open Channel.
3. Study different types of pumps and turbines to know their characteristics.

Course Outcome : Student shall be able to

1. Understand the concept of steady and unsteady flow.
2. Apply the knowledge of channel flow for irrigation system.
3. Assess the problems related to hydraulic structure.
4. Analyze the unsteady flow.

Course Contents	**Hrs**
Unit I	10
a) Fluid Flow Around Submerged Objects: Practical problems involving fluid flow around submerged objects, Definitions and expressions for drag, lift, drag coefficient, lift coefficient, types of drag. Drag on sphere, cylinder, flat plate and Aero foil, Karman's vortex street, Effects of free surface and compressibility on drag, Development of lifts, Lift on cylinder and Aero foil, Magnus effect, Polar diagram. **B) Unsteady Flow:** Types of unsteady flow; Flow through openings under varying head, Fluid compressibility, Celerity of elastic pressure wave through fluid medium; Water hammer phenomenon; Rise of pressure due to water hammer, Surge Tanks and their functions and curved surfaces.	
Unit II	09
a) Introduction to Open Channel Flow: Classification of channels and Channel flows. Basic governing equations of Channel flow viz. continuity equation, energy equation and momentum equation, One dimensional approach, Geometric elements of channel, Velocity distribution in open channel flow, Introduction to notches and weirs (Rectangular, Triangular, Trapezoidal). **b) Depth-Energy Relationships in Open Channel Flow:** Specific energy, Specific force Specific energy diagram, Specific force diagram, Depth discharge Diagram, Critical depth, Conditions for occurrence of critical flow; Froude's number, flow classification based on it, Important terms pertaining to critical flow viz. section factor, concept of first hydraulic exponent; Critical flow computations; channel transitions	
Unit III	07
Flow Through Open Channel: General types of channel and their geometrical properties; Types of flow in open channel. **Uniform Flow** : Chezy's and Manning's equations ; Hydraulically most efficient	

rectangular , triangular and trapezoidal sections ; Computations of normal depyh of flow , conveyance of channel , section factor for uniform flow , normal slope and normal discharge. **Hydraulic Jump:** Phenomenon of hydraulic jump; Location and examples of occurrence of hydraulic jump; Assumptions in the theory of hydraulic jump; Application of momentum equation to hydraulic jump in rectangular channel: Conjugate depths and relations between conjugate depths. Energy dissipation in hydraulic jump; Graphical method of determination of energy dissipation, Classification of hydraulic jump; Practical uses of hydraulic jump, venture flume, standing wave flume.	
Unit IV	10
A) Gradually Varied Flow In Open Channels : Definition and types of non-uniform flow; Gradually Varied Flow (GVF) and Rapidly Varied Flow (RVF); Basic Assumptions of GVF; Differential equation of GVF - Alternative forms; Classification of channel bed slopes, Various GVF profiles, their general characteristics and examples of their occurrence; Control section **B) Gradually Varied Flow Computations:** Methods of GVF computations. Direct Step method, Graphical Integration method, Standard Step method, Ven-Te Chow method.	
Unit V	08
A) Impact Of Jet: Force and work done due to impact of jet on stationary and moving, flat and curved surfaces using linear momentum principle. **B) Centrifugal Pumps:** General classification of pumps, Centrifugal pumps- Classification, theory working, Selection of pumps, Centrifugal head, Work done by impeller, Heads and efficiencies, minimum starting speed, Cavitation in centrifugal pumps, multistage pumping, Introduction to submersible pumps and reciprocating pumps.	
Unit VI	09
A) Hydropower Generation: Elements of hydropower plant; hydraulic turbines- Classification, heads and efficiencies, Design and governing of Pelton Wheel, Francis turbine-parts and working. Cavitation in hydraulic turbines- Site visit is recommended to learn this topic. **B) Performance Of Hydraulic Turbines:** Prediction of performance in terms of unit quantities and specific quantities, Specific speed, Characteristic curves, Dimensional analysis as applied to hydraulic turbines, selection of turbines	

Text Books:	
1.	K. Subramanya, "*Flow In Open Channels*", Tata Mc Graw Hill, 3rd Edition, 2009
2.	P. N. Modi & S. N. Seth, "*Hydraulics and Fluid Mechanics*", Standard book house, 5th Edition 1998.
Reference Books:	
1.	P. N. Chatterjee, "*Fluid Mechanics for Engineers*", Macmillan Publishers India Limited, 3rd Edition, 2000.
2.	R. K. Bansal, "*Fluid Mechanics and Hydraulic Machine*", Lakshmi Publication, 6th Edition, Delhi 1999.
3.	Cengel and Cimbala, "*Fluid Mechanics, Fundamental and Applications*", McGraw Hill, 2nd Edition, 2002.
Web Link:	
1.	http://nptel.ac.in/courses/10510309 5/ - All units

BCEP209: FLUID MECHANICS-II	
Teaching Scheme:	**Examination Scheme:**
Practical : 02 Hr/Week **Credit :** 1	**Cont Ass.(TW) :** 25 Marks **External(OR) :** NIL **External(PR) :** NIL
List of Practicals (Perform any Seven amongst the following)	
1. Study of Uniform Flow Formulae of Open channel.	
2. Velocity Distribution in Open Channel Flow.	
3. To determine performance characteristics of Centrifugal Pump.	
4. Impact of Jet on flat plate and curved vane	
5. Study of Hydraulic Jump as Energy Dissipater.	
6. To determine performance characteristics of Pelton Turbine.	
7. Flow around a Circular Cylinder/Aero foil	
8. To determine co-efficient of discharge of venturiflume.	
9. To study Gradually Varied Flow profiles.	

BCEL210: GEOTECHNICAL ENGINEERING–II		
Teaching Scheme:	**Examination Scheme:**	
Lectures : 03Hr/Week **Tutorials** : 01Hr/Week **Credit** : 4	**TAE :** 20 Marks **CAE :** 20 Marks **ESE :** 60 Marks	
Course Objectives :		
1. To learn soil exploration, planning and methods of exploration 2. To determine the bearing capacity of foundation 3. To learn ground improvement methods and soil stabilization techniques		
Course Outcomes : Student shall be able to		
1. Describe purpose of soil exploration field testing and their planning and execution. 2. Identify type of foundation as per requirements. 3. Determine settlement and consolidation of foundation. 4. Design raft, pile, and well foundation.		
Course Contents		**Hrs**
Unit I :		07
Purpose and Planning of Subsurface Exploration: Methods of Investigation: Trial pits, borings, depth & number of exploration holes, core recovery, RQD, Core Log. **Geophysical methods:** Seismic refraction and Electrical resistivity method. Disturbed and undisturbed sampling, types of samplers, degree of disturbance of a sampler. Field tests--SPT, DCPT, SCPT and Pressure meter test, California Bearing Ratio		
Unit II:		08
Types of Foundation: A basic definition, Modes of shear failure, Bearing capacity analysis by Terzaghi's equations, IS code method - Rectangular and Circular Footings. Bearing Capacity evaluation- Plate Load Test and SPT, Housel's perimeter shear concept. Bearing capacity of layered soil. Effect of water table on bearing capacity.		
Unit: III		08
Settlement: Introduction, Causes of settlement. Pressure bulb, Contact pressure. Allowable settlement, Differential settlement - I.S. criteria, Types - Elastic settlement, consolidation settlement. Use of Plate load test and SPT in settlement analysis. Allowable soil pressure. **Consolidation** : Introduction, spring analogy, Terzaghi's consolidation theory, Laboratory consolidation test, Determination of coefficient of consolidation- Square root of time fitting method and logarithm of time fitting method. Time factor. Rate of settlement and its applications in shallow foundation. Introduction of Normal consolidation, Over consolidation and Preconsolidation pressure.		
Unit IV:		07
Well Foundation: Component and their function, sinking of well, types of force system, and their computation, design criteria for various components of wells, tilting and shifting of wells, methods of correcting tilting and shifting. Bearing capacity of well foundation as per IS method. Cofferdam: Its purpose, various types, their suitability. **Raft Foundation:** Its purpose, advantages, situation, classification of raft, criteria for rigid		

and flexible raft, design of raft foundation, and concepts of floating foundation.	
Unit V:	07
Foundation in Black Cotton Soils: Characteristics of black cotton soil, swelling potential and its evaluation methods, Engineering problems, Swelling pressure measurement, Foundations on black cotton soil: design principles, Soil improvement techniques in B.C soils, Stone columns, prefabricated vertical drains, preloading technique, and vibroflotation technique, Soil Reinforcement: Basic components and Mechanism of reinforced soil, Geosynthetics: type's, functional properties and requirements. Geosynthetic applications in Civil Engineering.	
Unit VI:	08
Pile Foundation: Classification of piles and their uses, static analysis, formula for determination of pile capacity for driven and bored pile in sand and in clay, dynamic pile formula, Negative skin friction, factor affecting it, piles in groups and their capacity, group efficiency, factors affecting group efficiency, behavior of group of pile in sandy and in clayey solids, pile load test, effect of pile cap. Criteria for spacing and depth of piles.	

Text Books:	
1.	K. R. Arora, "*Soil Mechanics and Foundation Engineering*", Standard Publishers Distributors, 7th Edition
2.	B. J. Kasmalkar, " *Foundation Engineering*", Pune Vidyarthi Griha Prakashan, Pune, 2012
Reference Books:	
1.	V. N. S. Murthy , "*Principles of Soil Mechanics and Foundation Engineering*", UBS Publishers, 4th edition, 1996
2.	Das B. M, "*Principal of Foundation Engineering*", Thomson Brooks/Cole, 5th Edition 2004
3.	Bowles J. E., "*Foundation Analysis and Design*" , McGraw Hill International, 5th Edition, 1996
4.	Gopal Ranjan and A. S. Rao, "*Basic and Applied Soil Mechanics*", New Age International Publishers, 2nd Edition, 2000
5.	N. V. Nayak, "*Foundation Design Manual*" , Dhanpat Rai Publication, 7th edition, 2015
Web links:	
1.	http://ascelibrary.org/page/books/s-gsp.
2.	http://accessengineeringlibrary.com/browse/geotechnical-engineers-portable handbook- second-edition.
3.	http://nptel.ac.in/courses/105101084/
4.	http://nptel.ac.in/courses/105106142/

BCEP210: GEOTECHNICAL ENGINEERING–II	
Practical Scheme:	**Examination Scheme:**
Practical : 02 Hr/Week **Credit : ** 1	**Cont. Ass.(TW) :** NIL **External(OR) :** 25 Marks **External(PR) :** NIL
A. Report based on following shall be submitted by each student.	
1. Auger Boring and soil sampling	
2. Standard Penetration Test	
3. Static Cone Penetration Test	
4. Dynamic Cone Penetration Test	
5. Pressure meter Test	
6. California Bearing Ratio Test	
7. Plate Load Test	
8. Pile Load Test	
9. Consolidation Test	
10. Swelling Pressure of given soil sample	
B. Planning and preparation of report on soil investigations for a real life problem (Case Study).	
C. Assignment on Each Unit	
Is References : IS 2720(Part-3/Sec. 1) – 1987; IS 2720 (Part – 2)- 1973; IS 2720 (Part – 4) – 1985; IS 2720 (Part – 5) – 1985; IS 2720 (Part – 6) – 1972; IS 2720 (Part –7) – 1980; IS 2720 (Part – 8) – 1983; IS 2720 (Part – 17) – 1986; IS 2720 (Part - 10) – 1973; IS 2720 (Part – 13) – 1986; IS2720 (Part 11) – 1971; IS2720 (Part 15) – 1986; IS 2720 (Part 30) – 1987; IS 2720 (Part 14) – 1977; IS 2720 (Part – 14) – 1983; IS 2720 (Part – 28) – 1974; IS 2720 (Part – 29) – 1966, IS 2720 (Part-60) 1965.	
Note:	
External examination shall consist of oral examination based on Geotechnical Engineering I and II Lab File.	

BCEL211: STRUCTURAL ANALYSIS-I	
Teaching Scheme:	**Examination Scheme:**
Lectures : 3 Hrs/Week **Tutorials :** 1 Hr/Week **Credit :** 4	**TAE :** 20 Marks **CAE :** 20 Marks **ESE :** 60 Marks

Course Objective :

1. To study basic concepts of analysis of structural components.
2. To study the behavior of structural components under the various combination of loads.
3. To study various methods for the analysis of in determinant structure.

Course Outcome : Student shall be able to

1. Understand and describe concept like indeterminacy, methods of slope deflection, Castilians theorem strain energy, arches, Moment distribution method, Influence Line Diagram.
2. Analyse the structure by using various methods and its application.
3. Get deflection, Bending Moment Diagram, Shear Force Diagram of beams, Arches Influence Line Diagram.

Course Contents	Hrs
Unit I	08
a) Indeterminacy of Structures: Static and kinematic indeterminacy. **b) Slope and Deflection of Determinate Beams:** by Macaulay's Method, Introduction to Conjugate Beam Method and Moment Area Methods	
Unit II	08
a) Strain Energy: Concept of Strain Energy due to Axial Force, Shear Force, Bending Moments, and Torsional Moments. **b) Castigliano's First Theorem:** Slope and deflection of determinate beams, Application to joint displacement of determinate trusses.	
Unit III	
a) Castigliano's Second Theorem: Analysis of beams and redundant trusses, lack of fit, sinking of supports, temperature changes (indeterminacy up to two). **b) Clapeyron's Theorem of Three Moment:** Analysis of indeterminate beams. Effects of sinking of support.	08
Unit IV	08
a) Arches: Types of Arches. Equation of Parabolic and Circular Arch b) **Three Hinge Arches:** Concept, analysis of parabolic arch with supports at same and different levels, semicircular arches with support at same level. c) **Two Hinged Arches:** analysis of parabolic and semicircular arches with supports at same level.	
Unit V	08
Moment Distribution Methods: Analysis of continuous beam and simple portals (Single bat and single story). Effects of sinking of support and portals including Sway analysis.	

Unit VI	08
Influence Line Diagrams: a) Basic concept of Muller- Braslau's principal, influence line diagram for reaction, shear and moment to simply supported and overhanging beams, applications of ILD to determined reactions, shear and moment in beams. b) Influence Line Diagram for axial force and trusses, application of ILD to determine of axial forces in the member of plane determinate trusses under dead loads and live loads.	

Books:	
1	S. S. Bhavikatti, Vikas," *Structural Analysis Vol-1*", Vikas publishing House, PVT. LTD, 4th Edition, 2015
2	T. S. Thandavamoorthy," *Analysis Structures: Strength and behavior*", Oxford University Press, 2015
3	Wilbur J. B. & Norris C. H., "*Elementary Structural Analysis*", McGraw Hill, 3rd Edition, 2009
4	S. B. Junnarkar and H. J. Shah," *Mechanics of Structures Vol. II*", Charotar Publishing House Pvt. Ltd., 32nd Edition, 2016
5	R. C. Hibbler, " *Structural Analysis* ", Pearson Education, 9th Edition, 2017
6	Devdas Menon, " *Structural Analysis*", Narosa Publishing House, 2nd Edition ,2017
7	G. S. Pandit and S. P. Gupta, " *Structural Analysis: A matrix approach*", Tata Mc Graw Hill, 2nd Edition, 2005
8	R. Vaidynathan, P. Perumal and S. Lingedwari, " *Mechanics of solids and Structures Volume I",* Scitech Publication (India) Pvt Ltd., 2010
9	C. S. Reddy, " *Basic Structural Analysis*", Tata Mc Graw Hill, 3rd Edition, 2011
10	C. K. Wang, " *Intermediate Structural Analysis*", Tata McGraw Hill, 3rd Edition, 2010

<table>
<tr><td colspan="3">BCEGP203: GENERAL PROFICIENCY-III
(Hobby module)</td></tr>
<tr><td>Teaching Scheme:</td><td>Examination Scheme(Th):</td><td>Examination Scheme(Lab):</td></tr>
<tr><td>Lectures : 01Hr/Week
Tutorials : NIL
Practical : 02 Hr/Week</td><td>ESE : NIL</td><td>Cont. Ass.(TW) : NIL
External(OR) : NIL</td></tr>
<tr><td colspan="3">Credit: Audit Course</td></tr>
<tr><td colspan="3">Course Objectives :</td></tr>
<tr><td colspan="3">1. To enhance the inherent qualities of oneself and provide a platform to show hidden talent.
2. To nurture ones special capability and interest in hobby activities.
3. To help express oneself and be more compatible with outer world in the hobby domain.</td></tr>
<tr><td colspan="3">Course Outcomes : Student shall be able to</td></tr>
<tr><td colspan="3">1. Explore and demonstrate the inherent talents within.
2. Fruitfully engage themselves in creative activities during spare time.
3. Provide logical solution as a result of hobby activity exhibited.</td></tr>
<tr><td colspan="3">Course Contents :</td></tr>
<tr><td colspan="3">Hobby module offered</td></tr>
</table>

1. Cricket,	6. Table Tennis,
2. Volleyball,	7. Yoga Parana yam,
3. Basketball,	8. Puzzle Solving,
4. Chess,	9. Horse Ridding,
5. Carom,	10. Dancing

Savitribai Phule University of Pune

Third Year Civil Engineering

(2015 Course)

Semester I

Course Code	Course	Teaching Scheme hour/week			Semester Examination Scheme of marks						Credit	
		Theory	Tutorial	Practical	In-Sem	End-Sem	T W	OR	PR	Total	TH/TUT	PR/OR/TW
301001	Hydrology and water resource engineering.	03	--	02	30	70	--	50	--	**150**	03	01
301002	Infrastructure Engineering and Construction Techniques	03	--	--	30	70	--	--	--	**100**	04	--
301003	Structural Design-I	04	--	04	30	70	50	50	--	**200**	04	02
301004	Structural Analysis-II	04	--	--	30	70	--	--	--	**100**	03	--
301005	Fluid Mechanics-II	04	--	02	30	70	--	50	--	**150**	04	01
301006	Employability Skills development	--	--	02	--	--	50	--	--	**50**	--	01
	Total	18	--	10	**150**	**350**	**100**	**150**		**750**	**18**	**05**

Semester II

Course Code	Course	Teaching Scheme hour/week			Semester Examination Scheme of marks						Credit	
		Theory	Tutorial	Practical	In-Sem	End-Sem	T W	OR	PR	Total	TH/TUT	PR/OR/TW
301007	Advanced Surveying	03	--	02	30	70	50	--	--	**150**	03	01
301008	Project Management and Engineering Economics	04	--	--	30	70	--	--	--	**100**	04	--
301009	Foundation Engineering	03	--	--	30	70	--	--	--	**100**	03	--
301010	Structural Design-II	04	--	04	30	70	50	50	--	**200**	04	02
301011	Environmental Engineering-I	04	--	02	30	70	--	--	50	**150**	04	01
301012	Seminar	--	--	01	--	--	--	50	--	**50**	--	01
	Total	18	--	09	**150**	**350**	**100**	**100**	**50**	**750**	**18**	**05**

Savitribai Phule Pune University

TE Civil (2015 Course) w.e.f. June 2017

301001 Hydrology and Water Resource Engineering

Teaching scheme	Examination scheme
Lectures: 3 hours/week	In semester exam: 30 marks---1 hour Paper
Practical: 2 hours/week	End semester exam: 70 marks—2.5 hours Paper
	Oral: 50 Marks

Unit – I **(06 hours)**

Introduction to Hydrology:
Hydrological cycle, Application of hydrology

Precipitation:
Types of precipitation, measurement, Rain gauge network, Preparation of data-estimation of missing data, Consistency test, Presentation of rainfall data-mass rainfall curves, Hyetograph, Point rainfall, Moving average, Mean precipitation over an area- arithmetic mean method, Thiessen's polygon, isohyetel method, Concepts of depth-area-duration analysis, Frequency analysis - frequency of point rainfall and plotting position, Intensity-duration curves, Maximum Intensity-duration- frequency analysis

Abstractions of Precipitation: Intersection, Depression storage, Evaporation**-** Elementary concepts, factors affecting, Measurement of evaporation, Transpiration, Evapotranspiration- process and measurement, Infiltration –introduction, Infiltration capacity, Infiltrometer, Horton's method and infiltration indices

Stream Gauging:
Selection of site, various methods of discharge measurement (velocity-area method, dilution method, slope-area method), Advance techniques/equipments used in gauge discharge measurements such as Radar, Current meter, ADCP (Acoustic Doppler Current Profiler)

Unit – II **(06 hours)**

Introduction to Irrigation:
Definition, Functions, Advantages and Necessity, Methods of Irrigation, Surface Irrigation, Subsurface Irrigation, Micro-Irrigation

Water Requirements of Crops:
Soil moisture and Crop water relationship, Factors governing Consumptive use of water, Principal Indian crops, their season and water requirement, Crop planning, Agricultural practices, Calculations of canal and reservoir capacities – duty, delta, irrigation efficiency

Assessment of Canal Revenue:
Various methods (Area basis or crop rate basis, volumetric basis, seasonal basis, composite rate basis, permanent basis or betterment levy basis)

Unit III **(06 hours)**

Ground Water Hydrology:

Occurrences and distribution of ground water, Specific yield of aquifers, Movement of ground water, Darcy's law, Permeability, Safe yield of basin, Hydraulics of wells under steady flow condition in confined and unconfined aquifers, Specific capacity of well, Well Irrigation: Tube wells, Open wells and their construction

Unit – IV **(06 hours)**

Runoff:

Introduction, Factors affecting runoff, Rainfall-Runoff relationships, Empirical Techniques to determine runoff, Runoff hydrograph- Introduction, Factors affecting Flood Hydrograph, Components of Hydrograph, Base flow separation, Effective rainfall,

Unit hydrograph theory, S-curve hydrograph, uses and limitations of Unit Hydrograph

Floods:

Estimation of peak flow, Rational formula and other methods, Flood frequency analysis, Gumbel's method, Design floods

Unit – V **(06 hours)**

Reservoir Planning: Introduction, Term related to reservoir planning (Yield, Reservoir planning and operation curves, Reservoir storage, Reservoir clearance), Investigation for reservoir planning, Significance of mass curve and demand curves, Applications of mass curve and demand curves, Fixation of reservoir capacity from annual inflow and outflow, Fixation of reservoir capacity using elevation capacity curve and dependable yield, Reservoir regulation, Flood routing- Graphical or I.S.D method, Trial and error method, Reservoir losses, Reservoir sedimentation- Phenomenon, Measures to control reservoir sedimentation, Density currents Significance of trap efficiency, Useful life of reservoir, Costs of reservoir, Apportionment of total cost, Use of facilities method, Equal apportionment method, Alternative justifiable expenditure method

Unit VI **(06 hours)**

Water Management:

Distribution, Warabandi, Rotational water supply system, Participatory Irrigation Management, Cooperative water distribution systems, Introduction to auto weather station

Water Logging and Drainage:

The process of water logging**,** Causes of water logging, Effects of water logging, preventive and curative measures, Land drainage, Reclamation of water logged areas, Alkaline and saline lands.

Reference Books

1. Irrigation Engineering - S. K. Garg, Khanna Publishers
2. Irrigation, Water Resources and water power engineering- P. N. Modi, Standard Book House.
3. Irrigation and water power Engineering- Dr. Punmia and Dr. Pande, Standard Publisher
4. Elementary Engineering Hydrology- M.J.Deodhar-Pearson Education

5. Engineering Hydrology. –Ojha—Oxford University Press
6. Engineering hydrology – K. Subramanyam Tata McGraw Hill.
7. Hydrology- Principles, Analysis and Desin, Raghunath, New Age International
8. Irrigation Engineering-Raghunath--Wiley
9. Groundwater Hydrology, 3ed—Todd--Wiley
10. Applied Hydrology – Chow, Maidment, Mays, McGraw-Hill
11. Principles of Hydrology- Ward and Robinson, Tata McGraw Hill
12. Irrigation Engineering - Bharat Singh

Term Work

Assignments (Hydrology and Water Resources Engineering)

Term work will consist of a journal giving the detailed report on assignments performed and visit report. **(any 8)**

1. Analysis of rainfall data (Double mass curve technique/Missing rainfall data).
2. Marking catchment area on a topo-sheet and working out average annual precipitation and determining yield by various methods.
3. Analytical method of measurement of infiltration
4. Flood frequency studies assuming Gumbel's extreme value distribution.
5. Determination of peak flood discharge in a basin using unit hydrograph technique.
6. Determination of storage capacity of a reservoir using mass curve of inflow and outflow.
7. Application of HEC-RAS for Hydrologic routing.
8. Site visit to Meteorological station
9. Measurement of / video demonstration of evaporation by Pan Evaporimeter
10. Measurement of / video demonstration of infiltration by Infiltrometer

Savitribai Phule Pune University TE Civil (2015 Course) w.e.f. June 2017 301002
Infrastructure Engineering and Construction Techniques

Teaching scheme	Examination scheme
Lectures: 3 hours/week	In semester exam: 30 marks---1 hour Paper
	End semester exam: 70 marks—2.5 hours Paper

Unit I - Infrastructure Engineering (06 hours)

a) Meaning and scope of Infrastructure Engineering: Scope of infrastructure engineering in national and global development, Forthcoming infrastructure projects at national and global level, Necessity, advantages and disadvantages of PPP (Public Private Partnership), Salient features of smart city , Bus rapid transit system.

b) Railways: Permanent way, Track structure of BG, Functions of rail, Standard rail, Tilting of rail, Coning of wheels, Types of sleepers, Fastenings, Ballast, Modern development in railways- metro rails, mono rails, bullet train.

Unit II- Railways (06 hours)

Rail joints, types, evil effects, remedial measures, Welding of rails, Short and long welded rails, Types of gradients, Curves, Grade compensation on curves, Alignment, Super elevation, Equilibrium cant, Equilibrium speed, Maximum permissible limits for cant, Cant deficiency, Cant excess, Speed on curves, Safe speed on curves using Indian railways formula only for fully transition curves, Concept of negative cant, Points, crossings and turnouts- functions, Components, elements of points, Types of crossings and turnouts, Track maintenance: Regular and Periodic. **(Site visit is recommended to learn this topic)**

Unit III - Construction Techniques (06 hours)

Necessity of mechanization, Dredging techniques, Use of barges, Dewatering techniques- Well Point system, Vacuum dewatering, Electro osmosis, Underwater drilling and blasting, Grouting methods in soft and hard soil, Diaphragm walls- purpose and construction methods, Prefabrication – applications, advantages and disadvantages.

Unit IV – Tunneling (06 hours)

Tunneling, functions & types of tunnel, Criteria for selection of size & shape of tunnels. Pilot tunnel, shaft, addit and portal, Needle beam, NATM, TBM & earth pressure balance method of tunneling in soft soil, Drilling & blasting method of tunneling including various operations like mucking, Drainage in tunneling- Pre drainage and permanent drainage, Ventilation in tunneling-temporary and permanent, Micro tunneling and trenchless tunneling.

Unit V- Docks & Harbors (06 hours)

Introduction, Requirements of harbors and ports, Classification of harbors with examples, Selection of site for harbor, Various components of ports, Break waters- types, comparison, design criteria , methods of construction, Tetra pod, Tri bar, Hexapod, Quay wall, Wet & dry dock, Floating dock, Wharves, Jetties, Types of fenders, Dolphins, Marin railway.

Unit VI - Construction Equipments **(06 hours)**

Dozers, Power shovels, Excavators, Loaders, Scrapers, Dumpers, Drag line, Clamp shell, Compactors, Pavers, Factors affecting performance, selection of equipment, Various types of hoists and cranes and selection, Boom placers, Simple numerical problems on cycle time and production rate, Economic maintenance & repair of construction equipment.

Reference books

1. Construction Planning Methods & Equipment:Puerifoy –Tata MC Graw Hill
2. Construction Equipments & its Management: S.C Sharma,Khanna Publication
3. Railway Engineering, 2/E by Chandra—Oxford University Press
4. Railway Track Engineering: J.S.Mundrey,Tata McGraw Hill
5. Harbour,Dock & Tunnel Engineering:R. Srinivasan
6. Dock & Harbour Engineering:Hasmukh P.Oza & Gautam H.Oza-Charoter Book Stall
7. Construction Project Scheduling & Control, 2ed—Mubarak--Wiley

University of Pune---TE Civil (2015 Course)---w.e.f. June 2017
301003 Structural Design I

Teaching scheme	Examination scheme
Lectures: 4 hours/week	In semester exam: 30 marks---1.5 hour Paper
Practical: 4 hours/week	End semester exam: 70 marks—3 hours Paper
	Oral based on T.W. : 50 Marks Term Work: 50 Marks

Design shall be based on IS: 800-2007

Unit I **(08 hours)**

a) Types of steel structures, grades of structural steel, various rolled steel sections, relevant IS specifications such as IS:800-2007, IS:808-1989, IS:875 part I to III, SP: 6(1), SP: 6(6), SP38. IS:4000- 1992, codes for welded connections (mention code) . Philosophy of limit state design for strength and serviceability, partial safety factor for load and resistance, various design load combinations, classification of cross section such as plastic, compact, semi-compact and slender.
b) Tension member: various cross sections such as solid threaded rod, cable and angle sections. Limit strength due to yielding, rupture and block shear. Design of tension member: using single and double angle sections, connections of member with gusset plate by bolts and welds.

Unit II **(08 hours)**

a) Buckling classification as per geometry of cross section, buckling curves, design of struts in trusses using single and double angle section, connections of members with gusset plate by bolts and welds.
b) Design of axially loaded column using rolled steel section. Design of built-up column, lacing and battening, connection of lacing/battening with main components by bolts and welds.

Unit III **(08 hours)**

a) Design of eccentrically loaded column providing uniaxial and biaxial bending (check for section strength only).
b) Design of column bases: Design of slab base, gusseted base, and moment resistant base. (axial load and uni-axial bending)

Unit IV **(08 hours)**

a) Design of laterally supported beams using single rolled steel section with and without flange plate, curtailment of flange plates, strength in flexure, low and high shear, check for web buckling, web crippling and deflection.
b) Design of laterally unsupported beams using single rolled steel section with and without flange plate, curtailment of flange plates, strength in flexure and shear, check for deflection.

Unit V **(08 hours)**

a) Secondary and main beam arrangement for floor of a building, design of beam to beam and beam to column connections using bolt / weld.
b) Design of welded plate girder: design of cross section, curtailment of flange plates, stiffeners and connections.

Unit VI **(08 hours)**

a) Design of gantry girder: Selection of gantry girder, design of cross section, check for moment capacity, buckling resistance, bi-axial bending, deflection at working load and fatigue strength.
b) Roof truss: assessment of dead load, live load and wind load, design of purlin, design of members of a truss, detailing of typical joints and supports

Term work

Term work will consists of the following.

A) Four full imperial size drawing sheet showing structural detailing of 16 sketches based on syllabus. (Hand drawn)
B) Design of industrial building including roof truss, purlin, bracings, gantry girder, column, column base and connections.
Three full imperial size drawing sheets. (Hand drawn)
C) Design of welded plate girder, design of cross section, curtailment of flange plates, stiffeners and connections. One full imperial size drawing sheets.
Site visit is recommended to learn this topic.
OR
C) Design of building including primary and secondary beams, column, column base and connections. One full imperial size drawing sheets. (Using suitable software)
D) Two site visits: Report should contain structural details with sketches.

Oral Examination shall be based on the above term work.

Note: 1. Maximum number of students in a group, if any, should not be more than three to five for the term work design assignments.
2. Draw any one sheet from (B) and (C) Using suitable software.

Reference Books

1. Design of Steel Structure by N Subramanian, Oxford University Press, New Delhi.
2. Limit state design of Steel Structure by V L Shah & Gore, Structures Publication, Pune
3. Limit state design in Structural Steel by M.R. Shiyekar, PHI, Delhi
4. Structural Design in Steel—Sarwar Alam ,Raz—New Age International Publishers
5. Analysis and Design: Practice of Steel Structures—Karuna Ghosh-- PHI Learning Pvt. Ltd .Delhi
6. Limit state design of steel structures by S K Duggal, Tata McGraw Hill Education, New Delhi.
7. Design of Steel Structures by K. S. Sai Ram, Pearson, New Delhi.
8 Fundamentals of structural steel design M L Gambhir, Tata McGraw Hill Education Private limited, New Delhi.
9. Limit state design of Steel Structure by Ramchandra & Gehlot, Scientific Publishers, Pune.
10. Design of steel structure by Limit State Method as per IS: 800- 2007 by Bhavikatti S S, I.K. International Publishing House, New Delhi

Savitribai Phule Pune University
TE Civil (2015 Course) w.e.f. June 2017
301004 Structural Analysis II

Teaching scheme	Examination scheme
Lectures:4 hours/week	In semester exam: 30 marks---1 hour Paper
	End semester exam: 70 marks—2.5 hours Paper

Unit I **(08 hours)**

a) Slope-deflection method of analysis: Slope-deflection equations, equilibrium equation of Slope-deflection method, application to beams with and without joint translation and rotation, yielding of support, application to non-sway rigid jointed rectangular portal frames, shear force and bending moment diagram.
b) Sway analysis of rigid jointed rectangular portal frames using slope-deflection method (Involving not more than three unknowns)

Unit II **(08 hours)**

a) Moment distribution method of analysis: Stiffness factor, carry over factor, distribution factor, application to beams with and without joint translation and yielding of support, application to non-sway rigid jointed rectangular portal frames, shear force and bending moment diagram.
b) Sway analysis of rigid jointed rectangular single bay single storey portal frames using moment distribution method (Involving not more than three unknowns).

Unit III **(08 hours)**

a) Fundamental concepts of flexibility method of analysis, formulation of flexibility matrix, application to pin jointed plane trusses (Involving not more than three unknowns).
b) Application of flexibility method to beams and rigid jointed rectangular portal frames (Involving not more than three unknowns).

Unit IV **(08 hours)**

a) Fundamental concepts of stiffness method of analysis, formulation of stiffness matrix, application to trusses by member approach. Application to beams by structure approach only, (Involving not more than three unknowns).
b) Application to rigid jointed rectangular portal frames by structure approach only (Involving not more than three unknowns).

Unit V **(08 hours)**

a) Finite Difference Method – Introduction, application to deflection problems of determinate beams by central difference method
b) Approximate methods of analysis of multi-storied multi-bay 2 - D rigid jointed fames by substitute frame method, cantilever method and portal method.

Unit VI **(08 hours)**

a) Finite element method: Introduction, discretization, types of elements-1D, 2D, 3D, isoparametric and axisymmetric, convergence criteria, Pascals triangle, direct stiffness method, principal of minimum potential energy, principal of virtual work. (No numerical)
b) Shape functions: CST elements by using polynomials, 1D, 2D elements by using Lagrange's method

Reference Books

1. Structural Analysis: Deodas Menon---Narosa Publishing House.
2. Structural Analysis: Thandavamoorthy---Oxford University Press.
3. Structural Analysis: A Matrix Approach by Pundit and Gupta, McGraw Hills.
4. Structural Analysis by Hibbler, Pearson Education.
5. Structural Analysis: M. M. Das, B. M. Das---PHI Learning Pvt Ltd. Delhi.
6. Fundamentals of Structural Analysis: 2nd ed---West---Wiley.
7. Theory of Structures: Vol. I & II by B. C. Punmia, Laxmi Publication.
8. Theory of Structures: Vol. I & II by Perumull & Vaidyanathan, Laxmi Publication.
9. Fundamentals of Structural Analysis: K. M. Leet, Vang, Gilbert—McGraw Hills
10. Matrix Methods for structural engineering.by Gere, Weaver.
11. Introduction to Finite element method, Dr. P.N. Godbole, New Age Publication, Delhi.
12. Finite element Analysis, S.S. Bhavikatti, New Age Publication, Delhi.
13. Basic Structural Analysis: Wilbur and Norris.

Savitribai Phule Pune University
TE Civil (2015 Course) w.e.f. June 2017

301005 Fluid Mechanics-II

Teaching scheme	Examination scheme
Lectures: 4 hours/week	In semester exam: 30 marks---1 hour Paper
Practical: 2 hours/week	End semester exam: 70 marks—2.5 hours Paper
	Oral: 50 Marks

Unit I **(8 hours)**

a) Fluid Flow around Submerged Objects: Practical problems involving fluid flow around submerged objects, Definitions and expressions for drag, lift, drag coefficient, lift coefficient, types of drag. Drag on sphere, cylinder, flat plate and Aerofoil, Karman's vortex street, Effects of free surface and compressibility on drag, Development of lifts, Lift on cylinder and Aerofoil, Magnus effect, Polar diagram.

B)Unsteady Flow: Types of unsteady flow; Flow through openings under varying head, Fluid compressibility, Celerity of elastic pressure wave through fluid medium; Water hammer phenomenon; Rise of pressure due to water hammer, Surge Tanks and their functions.

Unit -II **(08 hours)**

a) Introduction to Open channel flow: Classification of channels, and Channel flows. Basic governing equations of Channel flow viz. continuity equation, energy equation and momentum equation, One dimensional approach, Geometric elements of channel, Velocity distribution in open channel flow, Introduction to notches and weirs ((Rectangular, Triangular, Trapezoidal).

b) Depth-Energy Relationships in Open Channel Flow:

Specific energy, Specific force Specific energy diagram, Specific force diagram, Depth discharge Diagram, Critical depth, Conditions for occurrence of critical flow; Froude's number, flow classification based on it, Important terms pertaining to critical flow viz. section factor, concept of first hydraulic exponent; Critical flow computations; channel transitions

Unit –III **(08 hours)**

a) Uniform flow in open channels : Characteristics and establishment of uniform flow, uniform flow formulae :Chezy's and Manning's formulae; Factors affecting Manning's roughness coefficient; Important terms pertaining to uniform flow, viz. normal depth, conveyance, section factor, concept of second hydraulic exponent, Uniform flow computations. Most efficient channel sections (rectangular, triangular, trapezoidal and circular).

b) Hydraulic Jump-Phenomenon of hydraulic jump; Location and examples of occurrence of hydraulic jump; Assumptions in the theory of hydraulic jump; Application of momentum equation to hydraulic jump in rectangular channel: Conjugate depths and relations between conjugate depths. Energy dissipation in hydraulic jump; Graphical method of determination of energy dissipation, Classification of hydraulic jump; Practical uses of hydraulic jump, venture flume, standing wave flume

Unit -IV **(08 hours)**

a) Impact of Jet: Force and work done due to impact of jet on stationary and moving, flat and curved surfaces using linear momentum principle.

b) **Centrifugal Pumps**: General classification of pumps, Centrifugal pumps- Classification, theory working, Selection of pumps, Centrifugal head, Work done by impeller, Heads and efficiencies, minimum starting speed, Cavitation in centrifugal pumps, multistage pumping, Introduction to submersible pumps and reciprocating pumps,

Unit -V **(08 hours)**

a) Hydropower generation: Elements of hydropower plant; hydraulic turbines- Classification, heads and efficiencies, Design and governing of Pelton Wheel, Francis turbine-parts and working. Cavitation in hydraulic turbines- **Site visit is recommended to learn this topic.**

b) Performance of hydraulic turbines: Prediction of performance in terms of unit quantities and specific quantities, Specific speed, Characteristic curves, Dimensional analysis as applied to hydraulic turbines, selection of turbines

Unit-VI **(08 hours)**

a) Gradually Varied Flow in Open Channels-Definition and types of non-uniform flow; Gradually Varied Flow (GVF) and Rapidly Varied Flow (RVF); Basic Assumptions of GVF; Differential equation of GVF - Alternative forms; Classification of channel bed slopes, Various GVF profiles, their general characteristics and examples of their occurrence; Control section

b) **Gradually varied flow computations:** Methods of GVF computations. Direct Step method, Graphical Integration method, Standard Step method, VenTe Chow method.

Oral

The Oral is based on the term work which consists of a journal giving the detailed report on experiments and assignments performed and visit report.

List of Experiments

Following experiments and assignments shall be performed.

A) Experiments (All compulsory, Fluid Mechanics II)

1. Flow around a Circular Cylinder/Aerofoil
2. Study of Uniform Flow Formulae of Open channel.
3. Velocity Distribution in Open Channel Flow.
4. Calibration of Standing Wave Flume/Venturi flume
5. Study of Hydraulic Jump as Energy Dissipater. 6.
Impact of Jet on flat plate and curved vane
7. Characteristics of a Pelton Wheel
8. Characteristics of a Centrifugal Pump
9. Calibration of Notch

B) Assignments (All compulsory, Fluid Mechanics II):

(a) Graphical determination of energy loss in Hydraulic Jump.
(b) Assignment on GVF computation using Direct Step and VenTe Chow method.

C) Report on Site visit to Hydropower generation plant/Research Institute.

Reference Books

1. Engineering Fluid Mechanics by Garde, Mirajgaonkar, Scitech
2. Hydraulics and Fluid Mechanics by P. N. Modi & S. N. Seth Standard book house
3. Open Channel Flow by K Subranmanya, TMH, Third Ed.
4. Open Channel Hydraulics: Vente Chow - Tata McGraw Hill.
5. Open Channel Flow: K. G. RangaRaju - Tata McGraw Hill.
6. Fluid Mechanics- Fundamental and Applications by Cengel and Cimbala- McGraw Hill
7. Flow through Open Channels—Srivastava-- Oxford University Press
8. A test book of Fluid mechanics and Machinary by Bansal
9. Fluid Mechanics by Streeter, Wylie and Bedford – Tata McGraw Hill
10. Fluid Mechanics by White – Mc-Graw Hill
11. Fluid Mechanics-A.K.Mohanty- PHI Learning PvtLtd.Delhi
12. Open Channel Flow by M. M. Das - PHI Learning PvtLtd.Delhi

Savitribai Phule Pune University

TE Civil (2015 Course) w.e.f. June 2017

301006 Employability Skills Development

Teaching scheme	Examination scheme
Practical: 2 hours/week	Term Work: 50 Marks

How to handle this course? (02 hours)

This course has been introduced with the objective of enhancing the employability of the students through development of their skills. Following topics and their contents are expected to be explored through following 10 activities.

1. Expert lectures 2.Group discussions 3.Case study analysis 4.Group presentations 5.Company and corporate visits 6.Mock interviews and exercises 7.Demo presentations 8. Audio-video shows 9. Use of e-resources 10.Games.

The term work will consist of detailed report of any 8 out of above 10 activities. The activities which need to be performed in a group will have a group of not more than 6 students. However, the report for the term work will be prepared at individual level.

Unit I (02 hours)

a) What is Employability? What are Employability Skills? Focus on what skills do employers expect from graduates? Career planning with action plan.

Unit –II (02 hours)

b) Interpersonal Skills-Critical Thinking, Assertiveness, Decision Making, Problem Solving, Negotiation, Building Confidence, Time Management, Personal Presentation, Assertiveness, Negotiation, Avoiding Stress.

Unit –III (02 hours)

c) Presentation Skills-Presentation Skills What is a Presentation? Writing Your Presentation Coping with Nerves

Unit –IV (02 hours)

d) Communication Skills-Verbal Communication, Written Communication, Difference between C.V. Bio data and Resume

Unit –V (02 hours)

e) Commercial Awareness-Professional etiquettes and manners, Global negotiating and Persuading, Integrity. Global trends and statistics about civil engineering businesses.

Unit-VI **(02 hours)**

f) Personal skills-Leadership, Ability to work in a team, Conceptual ability, Subject Knowledge and competence, Analysing and investigating, Planning, Flexibility, Self, Lifelong Learning, ,Stress Tolerance, Creativity

Reference Reading

1.Cambridge English for Job Hunting—Colm Downes---Cambridge University Press(ISBN-978-0- 521-14470-4)

2.Polyskills--Foundation books-- Cambridge University Press—(ISBN 978-81-7596-916-2)

3.Global Business Foundation Skills-- Foundation books-- Cambridge University Press—(ISBN 978-81-7596-783-0)

E-Resources

www.skillsyouneed.com/general/employability-skills.html-
*www.kent.ac.uk/careers/sk/top-ten-skills.htm*www.skillsyouneed.com/general/employability-
www.fremont.k12.ca.us/cms/lib04/.../Domain/.../employability-skills.pdf

Savitribai Phule Pune University

TE Civil (2015 Course)---w.e.f. June 2017

301007 Advanced Surveying

Teaching scheme	**Examination scheme**
Lectures: 3 hours/week	**In semester exam: 30 marks---1 hour Paper**
Practical: 2 hours/week	**End semester exam: 70 marks—2.5 hours Paper**
	TW: 50 Marks

Unit-I Geodetic Surveying & SBPS (06 hours)

a) Objects, Methods of Geodetic Surveying, Introduction to triangulation, Classification of triangulation systems, Triangulation figures, Concept of well-conditioned triangle, selection of stations, Intervisibility and height of stations.

b) Introduction to SBPS; Positioning with SBPS - Absolute & Differential methods, Use of SBPS in Surveying, SBPS Co-ordinates & heights, Factors governing accuracy in SBPS positioning, Different types of errors in SBPS positioning. Earth ellipsoid, Geodetic datum and Co-ordinate systems, Applications of GPS in civil engineering.

Unit-II Hydrographic Surveying (06 hours)

Objects, Applications, Establishing controls, Shore line survey, Sounding, Sounding equipment, Methods of locating soundings – conventional and using GPS, Reduction of soundings, Plotting of soundings, Nautical sextant and its use, Three point problem and its use, solution of three point problem by all methods, Tides and tide gauges, determination of MSL

Unit-III Remote Sensing and Geographical Information System (06 hours)

a) Remote Sensing introduction, Definition, Necessity, Importance and use; Basic concepts in Remote Sensing , Basic Laws of electromagnetic radiation, Atmospheric effects on radiation, Interaction of EM energy with matter, Resolution in remote sensing, Satellite remote sensing, Problems confronting remote sensing system. Ideal and Real remote sensing systems. Space platforms for remote sensing: Imaging sensors and techniques. Image interpretation:- Visual image processing & Digital image processing. Applications of remote sensing. Introduction to LIDAR & Underground utility survey. Comparison between aerial photograph and satellite image.

b) Geographical Information System -Introduction, Definition, Objectives, Components (people, procedure, hardware, software & data) & functions (input, manipulation, management, querry & analysis and visualization) of GIS. Coordinate systems and projections, Georeferencing, GIS data – spatial (Raster & vector) & aspatial data. Introduction to vector and raster data analysis such as network analysis, overlay analysis etc. for vector, DEM, Management of aspatial data. Applications of GIS such as visibility analysis, Slope analysis, Watershed analysis & Preparation of thematic maps. Limitations of GIS,

Unit -IV Triangulation Adjustment (06 hours)

Kinds of errors, Laws of weights, Determination of most probable values (MPV) of conditioned and independent quantities, Method of least squares, Indirect observations, Probable error and its determination, Distribution of error to the field measurements, Normal equation, Method of correlates. Station and figure adjustment of geodetic quadrilateral without central station.

Spherical triangle, Calculations of spherical excess and sides of spherical triangle.

Unit – V Aerial Photogrammetry (06 hours)

Objects, Classification- qualitative & quantitative photogrammetry, Applications, comparison of Map and aerial photograph, Vertical, Tilted and Oblique photographs, Scale of vertical photograph, Relief displacement in vertical photograph, Flight planning, Stereoscopic parallax & its measurement by parallax bar.

Mirror stereoscope, Differential height from differential parallax, Ground control points (GCPs), Introduction to digital photogrammetry, different stereo viewing techniques in digital photogrammetry, Method of creation of elevation data, Different products of digital photogrammetry.

Unit –VI Trigonometric Levelling and Setting out works (06 hours)

a) Trigonometric Levelling :- Terrestrial refraction, Angular corrections for curvature and refraction, Axis signal correction, Determination of difference in elevation by single observation and reciprocal observations.

b) Setting out of Construction works:- Setting out of a bridge, Determination of the length of the central line and the location of piers. Setting out of a tunnel – Surface setting out and transferring the alignment underground.

Term work

Term work shall consist of the following practicals and project.

Geodetic Surveying and Trigonometrical levelling (any three)

1. Measurement of horizontal and vertical angles with 1” theodolite.
2. Determination of elevation of inaccessible objects by trigonometrical levelling.
3. Practical based on various special functions available in a total station such as remote elevation measurements, remote distance measurements and co-ordinate stakeout .
4. Establishing control station using single or dual frequency GPS receiver

1. Study and use of nautical sextant and measurement of horizontal angles
2. Plotting of river cross-section by hydrographic surveying
3. Solution to three point problem by analytical method

1. Study of aerial photograph and finding out the scale of the photograph.
2. Determination of air base distance using mirror stereoscope.
3. Determination of difference in elevation by parallax bar.

1. Study and applications of different RS data products available with National Remote Sensing Centre (NRSC)
2. Use of RS images and visual interpretation
3. Use of interface and tools in GIS software such as GRAM++ or QGIS or equivalent software.

Project: (Any one)

1. Adjustment of geodetic quadrilateral without central station by method of correlates.
2. Field survey (500 sq.m.) using Differential GPS (Control as well as mapping).

Reference Books

1. Surveying & Levelling, 2/E—Subramanian—Oxford University Press
2. Surveying: Vol. II. and III by Dr. B. C. Punmia : Laxmi Publication - New Delhi.
3. Surveying and Levelling Vol. II by T. P. Kanetkar and S. V. Kulkarni Pune Vidyarthi Publication.
4. GPS Sattelite Surveying—Alfred Leick—Wiley
5. Remote sensing and Geographical Information System, By A. M. Chandra and S. K. Ghosh, Narosa Publishing House.
6. Remote Sensing & GIS,2/E—Bhatta-- Oxford University Press
7. Principles of Geographical Information System—Burrough-- Oxford University Press
8. Surveying—M.D.Saikia—PHI Learning Pvt .Ltd.Delhi
9. Advanced Surveying -Total Station, GIS and Remote Sensing by SatheeshGopi, R.Sathikumar and N. Madhu , Pearson publication
10. Surveying Vol. 2 by S. K. Duggal, McGraw Hill Publication
11. Remote sensing & image interpretation, Lillesand& Kiefer, John wiley Pub.
12. Surveying &levelling by R. Subramanian, Oxford Publication.

Suggested Reading

Bureau Gravimetrique International (BGI)
International GPS Service for Geodynamics (IGS)
International Association of Geodesy (IAG)
International Federation of Surveyors (FIG)
Permanent Service for Mean Sea Level (PSMSL)
Commission X Global and Regional Geodetic Networks
www.nrsa.gov.in
www.iirs-nrsa.gov.in
www.surveyofindia.gov.in

Savitribai Phule Pune University

TE Civil (2015 Course) w.e.f. June 2017

301008 Project Management and Engineering Economics

Teaching scheme	Examination scheme
Lectures: 4 hours/week	In semester exam: 30 marks---1 hour Paper
	End semester exam: 70 marks—2.5 hours Paper

Unit I **(8 hours)**

Introduction to project management

Importance, Objectives & Functions of Management , Principles of Management, Categories of Project, Project Failure, Project--- Life Cycle Concept and Cost Components, Project Management Book of Knowledge {PMBOK} – Different Domain Areas, Project management Institute and Certified Project Management Professionals (PMP). Importance of organizational Structure in Management- Authority / Responsibility Relation, Management by objectives (MBO)

Unit –II **(08 hours)**

Project planning and scheduling

WBS – Work Breakdown Structure, Gantt/Bar chart & its Limitations, Network Planning, Network analysis, C. P. M.- . Activity on Arrow (A.O.A.), Critical path and type of Floats, Precedence network analysis (A.O.N.), Types of precedence relationship, P. E. R.T. Analysis

Unit –III **(08 hours)**

Project Resources and Site Planning

Objectives of Materials Management – Primary and Secondary Material Procurement Procedures - Material requirement - raising of Indents, Receipts, Inspection, Storage, Delivery, Record keeping – Use of Excel Sheets, ERP Software, Inventory Control - ABC analysis, EOQ, Introduction to Equipment Management – Fleet Management, Productivity Studies, Equipment Down Time, Sizing - Matching , Site Layout and Planning, Safety Norms – Measures and Precautions on Site, Implementation of Safety Programs

Unit –IV **(08 hours)**

Project Monitoring and Control

Resource Allocation – Resource Smoothening and Levelling, Network Crashing – Time- Cost – Resource optimization, Project Monitoring - Methods, Updating and Earned Value Analysis, Introduction to use of Project Management Softwares – MS Project / Primavera, Case study on housing project scheduling for a small project with minimum 25 activities.

Unit –V (08 hours) Project Economics

Introduction to Project Economics - Definition, Principles, Importance in Construction Industry, Difference between Cost, Value, Price, Rent, Simple and Compound Interest, Profit, Annuities, Demand, Demand Schedule, Law of Demand, Demand Curve, Elasticity of Demand, Supply, Supply Schedule, Supply Curve, Elasticity of Supply Equilibrium, Equilibrium Price, Equilibrium Amount, Factors affecting Price Determination, Law of Diminishing Marginal Utility, Law of Substitution, Concept of Cost of Capital, Time Value of Money, Sources of Project Finances –

Concepts of Debt Capital and Equity Capital. Types of Capital – Fixed and Working, Equity Shares and Debenture Capital, FDI in Infrastructure

Unit-VI **(08 hours)**

Project appraisal

Types of Appraisals such as Political, Social, Environmental, Techno-Legal, Financial and Economical, Criteria for Project Selection - Benefit - Cost Analysis, NPV, IRR, Pay-Back Period, Break Even Analysis [Fundamental and Application Component], Study of Project Feasibility report and Detailed Project Report (DPR), Role of Project Management Consultants in Pre-tender and Post-tender.

Reference Books

1. Project Management—Khatua—Oxford University
2. Construction Project Management-Planning, Scheduling and Controlling by K. K. Chitkara, Tata McGraw Hill Publishing Company, New Delhi.
3. Construction Management and Planning by B. Sengupta and H. Guha, Tata McGraw Hill Publishing Company, New Delhi.
4. The Essentials of Project Management by Dennis Lock, Gower Publishing Ltd. UK.
5. Essentials for Decision Makers by Asok Mukherjee, Scitech Publication, New Delhi.
6. Total Quality Management - Dr. S.Rajaram and Dr. M. Sivakumar-- Biztantra
7. Total Engineering Quality Management – Sunil Sharma – Macmillan India Ltd.

Savitribai Phule Pune University
TE Civil (2015 Course) w.e.f. June 2017
301009 Foundation Engineering

Teaching scheme	**Examination scheme**
Lectures: 3 hours/week	**In semester exam: 30 marks---1 hour Paper**
	End semester exam: 70 marks—2.5 hours Paper

Unit-I

Subsurface Investigations for Foundations (06 hours) Purpose and planning of subsurface exploration. Methods of Investigation: Trial pits, borings, depth & number of exploration holes, core recovery, RQD, Core Log. Geophysical methods– Seismic refraction and Electrical resistivity method. Disturbed and undisturbed sampling, types of samplers, degree of disturbance of a sampler. Field tests- SPT, N value correction and significance, DCPT, SCPT and introduction of advanced testing techniques like Pressure meter test. **Site visit is recommended to learn this topic.**

Unit-II

Bearing capacity and Shallow Foundation (06 hours) Basic definitions, Modes of shear failure, bearing capacity analysis- Terzaghi's, Hanson's, Meyerhof's, Skempton's, Vesics equations and IS code method - Rectangular and Circular footings. Bearing Capacity evaluation: - Plate Load Test and SPT. Housel's perimeter shear concept. Bearing capacity of layered soil. Effect of water table on bearing capacity. Effect of eccentricity. Shallow foundation- Types and Applications. Floating foundation. Presumptive bearing capacity.

Unit-III **(06 hours)**

a) Settlement and Consolidation Settlement: - Introduction, Causes of settlement. Pressure bulb, Contact pressure, Significant Depth of foundation, Allowable settlement, Differential settlement - I.S. criteria, Types - Elastic settlement, Consolidation settlement. Use of Plate Load test and SPT in settlement analysis. Allowable soil pressure.

b) Consolidation - Introduction, spring analogy, Terzaghi's consolidation theory, Laboratory consolidation test, Determination of coefficient of consolidation- Square root of time fitting method and logarithm of time fitting method. Time factor. Rate of settlement and its applications in shallow foundation. Introduction of Normal consolidation, over consolidation and Preconsolidation pressure.

Unit-IV **(06 hours)**

Deep Foundations

Introduction, Pile classification, Pile installation-Cast in-situ, driven and bored pile, Load carrying capacity of pile by static method, Dynamic methods-Engineering news formula and Modified ENR formula. Pile load test and Cyclic Pile load test. Group action- Feld rule. Rigid Blocks method. Negative skin friction. Settlement of pile group in cohesive soil by approximate method. Piers and Caissons- Definition, Types and uses. Well foundation: components, sand Island method.

Unit V **(06 hours)**

Cofferdams and Foundation on Black Cotton Soils

a) Cofferdams: Types and concepts of Steel Sheet Piles and Precast Concrete Piles, Interlocking Circular Piles, RC Diaphragm wall method.

b) Foundation on Black Cotton Soils: Characteristics of black cotton soil, swelling potential and its evaluation methods, Engineering problems, Swelling pressure measurement, Foundations on black cotton soil: design principles, Construction techniques in B.C soils, under reamed piles-Design principles and its construction Techniques. Stone Columns prefabricated vertical Drains, Preloading technique, and vibro flotation technique.

Unit VI **(06 hours)**

Soil Reinforcement and Earthquake Geo-techniques

a) Soil Reinforcement: Basic components and Mechanism of reinforced soil. Geosynthetics: type's, functional properties and requirements. Geosynthetic Applications in Civil Engineering.

b) Earthquake Geo-techniques Introduction, Earthquake Terminology, Sources of earthquake, Seismic zones of India, Magnitude of an earthquake, Intensity of earthquakes, Effect of ground motion on structures, General principles of earthquake resistant design. Liquefaction Phenomenon.

Reference Books

1. Dr. B. J. Kasmalkar, "Foundation Engineering", Pune Vidyarthi Griha Prakashan, Pune
2. Gopal Ranjan and A. S. Rao, "Basic and Applied Soil Mechanics", New Age International Publishers, (2010)
3. Dr. B. C. Punmia, "Soil Mechanics and Foundation Engineering", Laxmi Publications.
4. Soil Mechanics- T.William Lambe--Wiley
5. J. E. Bowels, "Foundation Analysis and Design", McGraw-Hill
6. Foudation Enginnering- P. C. Varghese-- PHI Learning Pvt. Ltd.
7. Soil Mechanics and Foundation Engineering- V. N. S Murthy, Marcel Dekker, Inc. Newyork.
8. Soil Mechanics & Foundation Engineering - Rao --Wiley
9. A. K. Arora, "Soil Mechanics and Foundation Engineering", Standard Publishers, 2009.
10. Engineering in Rocks for Slopes. Foundations and Tunnels - T Ramamurthy - PHI Learning
11. Geotechnical Engineering by Conduto, PHI, New Delhi.
12. Foundation Design Manual: N V Nayak, Dhanpat Rai Publications.
13. International Steven Kramer, "Geotechnical Earthquake Engineering", Prentice Hall Publications.
14. Practical Handbook of Grouting: Soil-Rock and Structures---James Warner-- Wiley
    15. IS 1892, 1893, 2911, 6403, SP36 (PART-II)

Savitribai Phule Pune University
TE Civil (2015 Course) w.e.f. June 2017

301010 Structural Design –II

Teaching scheme	Examination scheme
Lectures: 4 hours/week	In semester exam: 30 marks---1.5 hours Paper
Practical: 4 hours/week	End semester exam: 70 marks—2.5 hours Paper
	Term Work: 50 Marks, Oral Based on T.W.: 50 Marks

Unit I **(8 hours)**

Introduction to various design philosophies R.C structures: Historical development, Working stress method, Ultimate load method and Limit state method.

a) Working stress method: Moment of resistance of singly reinforced rectangular R.C. sections, Under reinforced, Balanced and Over reinforced sections. Moment of resistance of doubly reinforced rectangular sections.

b) Limit state method: Limit state of collapse, Limit state of serviceability and Limit state of durability. Characteristic strength, Characteristic load, concept of Safety - Probabilistic approach, Semi probabilistic approach. Partial safety factors for material strengths and loads. Study of Structural Properties of Concrete.

Unit II **(8 hours)**

a) Assumptions of Limit State Method, Strain variation diagram, Stress variation diagram, Design parameters for singly reinforced rectangular R.C. section, Moment of resistance of under reinforced and balanced section, M.R. of doubly reinforced rectangular section and flanged section.

b) Design of slab: One way, Simply supported, Cantilever and Continuous slabs by using IS code coefficients.

Unit III **(8 hours)**

a) Design of slab: Two way slabs: Simply supported, Continuous and Restrained.

b) Design of staircase: Dog legged and Open well.

Unit IV **(8 hours)**

Design of flexural members: Simply supported, Continuous, Cantilever beams (singly reinforced, doubly reinforced and flanged) for flexure.

Unit V **(08 hours)**

Design of flexural members:

a) Design of flexural members: For Shear, Bond and Torsion.

b) Design of flexural members: Redistribution of moments in continuous reinforced concrete beam.

Unit VI **(08 hours)**

a) Column: Introduction, Strain and Stress variation diagrams, axially loaded Short Column with minimum eccentricity requirements. Design of Short Column for axial load, Uni-axial, Biaxial bending using interaction curves.
b) Design of Isolated Column footing for axial load and uni-axial bending .

Term work

Design Assignments

a) Design of G + 2 (Residential/Commercial/Public) building covering all types of Slabs, Beams, Columns, Footings and Staircase (first and intermediate flights).

i. Minimum plan area of each floor shall be more than 150 m^2.
ii. Design of all plinth and ground beams.
iii. Design of all slabs, beams of first floor.
iv. Design of three types columns for, (a) axial load, (b)axial load + uniaxial BM, (c)axial load + biaxial BM), from terrace level to footing along with detailed load calculations and footing for columns with (a) axial load (b)axial load + uniaxial BM
v. Design any one element by using spread sheet.
vi. Detailing of reinforcement should be as per SP-34 & IS 13920
vii. Full imperial drawing sheets in four numbers. Out of which only structural plan drawing sheet shall be drawn by using any drafting software.

b) Reports of two site visits. (Building under construction)

Oral Examination shall be based on the above term work.

Note: Maximum number of students for projects not more than Four

Reference Books

1. "Illustrated Reinforced Concrete Design" by Dr. V.L.Shah and Dr. S.R. Karve, 'Structures Publications' , Pune 411009
2. "Illustrated Design of Reinforced Concrete Buildings (G+3)" by Dr. V.L.Shah and Dr. S.R. Karve, 'Structures Publications', Pune 411009.
3. "Design of Reinforced Concrete Structures" by Subramanian, 'Oxford University Press'.
4. "Limit State Analysis and Design" by P. Dayaratnram, 'Wheeler Publishing company', Delhi.
5. "Comprehensive Design of R.C. Structures" by Punmia, Jain and Jain, 'Standard Book House', New Delhi.
6. "RCC Analysis and Design" by Sinha, S, Chand and Co. New Delhi.
7. "Reinforced Concrete Design" by Varghese, PHI, New Delhi.
8. "Reinforced Concrete Design" by Pillai Menon, 'Tata McGraw Hill', New Delhi.
9. "Design of Concrete Structure" by J N Bandyopadhyay, PHI, New Delhi.

Savitribai Phule Pune University

TE Civil (2015 Course) w.e.f. June 2017

301011 Environmental Engineering-I

Teaching scheme	**Examination scheme**
Lectures: 4 hours/week	**In semester exam: 30 marks--1 hour Paper**
Practical: 2 hours/week	**End semester exam: 70 marks—2.5 hours Paper**
	Practical Exam: 50 Marks

Unit-I **(08 hours)**

A) Noise Pollution: Sound measurements – Sound pressure, Intensity, Sound pressure level, Loudness, Equivalent noise level and Cumulative noise level.

B) Air Pollution: Atmospheric stability, Mixing heights, Meteorological parameters.

Air pollution control mechanism. Equipment for particulate contaminants. Principle and working of Settling chamber, Cyclone, Fabric filter, ESP. Gaseous contaminants control by adsorption and absorption technique.

C) Municipal Solid Waste: Concept of Municipal Solid waste management, Sources, Classifications, Treatment (composting &anaerobic digestion) Disposal (sanitary land fill)

Unit -II **(08 hours)**

A) Introduction to water supply scheme: Data collection for water supply scheme, Components and layout. Design period, Factors affecting design period.

B) Quantity: Rate of water consumption for various purposes like domestic, Industrial, Institutional, Commercial, Fire demand and Water system losses, Factors affecting rate of demand, Population forecasting.

C) Quality: Physical, Chemical, Radioactivity and Bacteriological Characteristics, Heavy metals. Standards as per IS: 10500 (2012)

Unit –III **(08 hours)**

A) Water treatment: Principles of water treatment operations and processes, Water treatment flow sheets.

B) Aeration: Principle and Concept, Necessity, Methods, Removal of taste and odour. Design of aeration fountain.

C) Sedimentation: Plain and chemical assisted - principle, efficiency of an ideal settling basin, Settling velocity, Types of sedimentation tanks, Design of sedimentation tank. Introduction & design of tube settlers.

Unit -IV **(08 hours)**

A) Coagulation and flocculation: Principle of coagulation, Common coagulants alum & ferric salts, Introduction to other coagulant aids like bentonite clay, Lime stone, Silicates and Polyelectrolytes, Introduction of natural coagulants, Mean velocity gradient "G" and Power consumption, Design of Flocculation chamber, Design of Clari-flocculator.

B) Filtration: Theory of filtration, Mechanism of filtration, Filter materials, Types: Rapid, Gravity, Pressure filter, Multimedia and dual media filters, Components, Under drainage system, Working and cleaning of filters, Operational troubles, Design of Rapid sand Gravity filters.

Unit -V **(08 hours)**

A) Disinfection: Mechanism, Factors affecting disinfection, Types of disinfectants, Types and methods of chlorination, Break point chlorination, Bleaching powder estimation.
B) Water softening methods and Demineralization : lime-soda, Ion-Exchange, R.O. and Electrodialysis
C) Fluoridation and defluoridation.

Unit-VI **(08 hours)**

A) Water distribution system: System of water supply- Continuous and intermittent system. Different distribution systems and their components. ESR- Design of ESR capacity. Wastage and leakage of Water- Detection and Prevention.
B) Rainwater harvesting: Introduction, need, methods and components of domestic rainwater harvesting system. Design of roof top rainwater harvesting system.
C) Introduction to Packaged WTP in townships, big commercial plants, necessity (On-site water treatment)

Term Work

Note- Any 8 out of 10 Practicals. (a ,b & c are compulsory.)

a) Practicals.

1. pH and Alkalinity of raw water, soft drinks & tea.
2. Total hardness and components of raw water.
3. Chlorides in water.
4. Chlorine demand and residual chlorine.
5. Sodium or Potassium or Calcium using flame photometer.
6. Turbidity and optimum dose of alum.
7. Fluorides or Iron contents in water.
8. Most Probable Number (MPN)
9. Ambient air quality monitoring for PM10/PM2.5,SO2 & NOx.
10. Measurement of noise levels at various locations using sound level meter, Calculate cumulative noise level at any one location.

b) Site visit to water treatment plant and Detailed Report.

c) Assignment 1. Study of Water intake structures.
2. Complete Design of WTP using appropriate software.

Text / Reference Books

Reference Books:

1. Environmental Engineering: Peavy and Rowe, McGraw Hill Publications.
2. Optimal Design of Water Distribution Networks: P. R. Bhave, Narosa Publishing House.
3. Rain Water Harvesting: Making water every body's business by CSE (Centre for Science and Environment) www.cse.org
4. Harvesting Faith: Linda K. Hubalek. Published by Butterfield books.
5. CPHEEO Manual on Water Supply & Treatment.
6. Standard Methods for the examination of water and waste water, 20th Edition (American Public health Association).

Text Books:

1.Water Supply Engineering: S. K. Garg, Khanna Publishers, New Delhi.
2.Water Supply and Sanitary Engineering: G. S. Birdie and J. S. Birdie, DhanpatRai Publishing Company, New Delhi.
3 Environmental Engineering 1: Water Supply Engineering: B. C. Punmia, Ashok Jain and Arun Jain. Laxmi Publications (P) Ltd.
4 Air Pollution: H. V. N. Rao and M. N. Rao, TMH Publications.
5**.** Theory and practice of water and waste water treatment--Wiley
6. Water Supply and Treatment Manual: Govt. of India Publication.
7. Waste Water Treatment-Concept Design and Approach---C.L.Karia,R.A.Christian--PHI
8. Environmental Remote Sensing from Regional to Global Scales—Ed.Giles Foody—Wiley
9. Water Supply and Sanitary Engineering: G. S. Birdie and J. S. Birdie, Dhanpat Rai Publishing Company, New Delhi.

Suggested Reading:

- Environmental Engineering by N. N. Barak , MGH
- Environmental Engineering by Venugopal Rao, PHI
- Environmental Engineering by Steel,McGhee , MGH
- Water Supply & Engineering by Pande andCarne , Tata McGraw Hill
- Water Supply Engineering by Harold Eaton Babbit & James Joseph Doland , MGH
- Principles of Water Treatment by Keny J. Howe, MWH.
- Water treatment : principles & Design 3rd edition by John C Crittenden R. Rhodes
- Water quality &Treatment : Handbook on Drinking Water 6th Edition by James K. Edzwald.
- Standard Methods, APHA,AWWA.
- Environmental Engineering Laboratory Manual by B. Kotain & Dr. N. Kumarswamy
- NEERJ Laboratory Manual

Savitribai Phule Pune University
TE Civil (2015 Course) w.e.f. June 2017

301012 Seminar

Teaching scheme	Examination scheme
Practical: 1 hour/week	**Oral Exam: 50 Marks**

Oral examination shall be conducted based on a Seminar report to be prepared by each individual. The seminar report should contain the following.

1. Introduction of the topic, its relevance to the construction industry, need for the study, aims and subjunctives, limitations.
2. Literature review from books, journals, conference proceedings, published reports / articles / documents from minimum 8 references.
3. Theoretical chapter on the topic of study, advantages and limitations.
4. Photographs from web search / experiments done / projects visited / organizations visited for studying documents / procedures/ systems / materials/ equipment/ technologies used.
5. Ongoing research areas, information, about commercial vendors, information on benefit – cost aspects.
6. Concluding remarks with respect to commercial/ practical and social applications.
7. References in standard format.

Note:- In order to arouse the interest of students and engage them in active learning, mini-projects/ complex problems may be given in groups of maximum 4students, covering different aspects involved in Civil engineering so as to also enable the students to submit separate individual reports as required above.

Internal guides may prepare a continuous evaluation sheet of each individual and refer it to the external examiner for consideration.

The oral examination of each individual may then be conducted as per the practice adopted for other subjects.

Board of Studies in Civil Engineering

Structure and Syllabus for B.E. Civil 2012 Course (w.e.f.June, 2015)

Savitribai Phule Pune University

Savitribai Phule Pune University

Board of Studies in Civil Engineering

Structure for B.E. Civil 2012 Course (w.e.f.June 2015)

Subject code	Semester – I								
	Subject	Teaching Scheme Hrs/Week			Examination Scheme				
		Lect	Tu	Pr	In-Semester Assessment	TW	Or	End - Semester Exam	Total
401 001	Environmental Engineering II	3		2	30	--	50	70	150
401 002	Transportation Engineering	3		2	30	50	--	70	150
401 003	Structural Design and Drawing III	4		2	30	--	50	70	150
401 004	Elective I	3		2	30	50		70	150
401 005	Elective II	3			30			70	100
401 006	Project	--	2			50			50
	Total →	16	2	8	150	150	100	350	750

Subject code	Semester – II								
	Subject	Teaching Scheme Hrs/Week			Examination Scheme				
		Lect	Tu	Pr	In-Semester Assessment	TW	Or	End - Semester Exam	Total
401 007	Dams and Hydraulic Structures	3	--	2	30	---	50	70	150
401 008	Quantity Surveying,Cotracts and Tenders	3	--	2	30	--	50	70	150
401 009	Elective III	3	--	2	30	50	--	70	150
401 010	Elective IV	3	--	2	30	50	--	70	150
401 006	Project	--	6		--	50	100	--	150
	Total →	12	6	8	120	150	200	280	750

Following will be the list of electives..

Semester I

Elective-I 401 004	**Elective-II 401 005**
1.Structural Design of Bridges 2. Systems Approach in Civil Engineering 3.. Advanced Concrete Technology 4. Architecture and Town Planning 5. Advanced Engineering Geology with Rock Mechanics	1. Matrix Methods of Structural Analysis 2. Integrated Water Resources and Planning 3. TQM & MIS in Civil Engineering 4. Earthquake Engineering 5. Advanced Geotechnical Engineering

Semester II

Elective-III 401 009	**Elective-IV 401 010**
1. Advanced Structural Design 2.Advanced Foundation Engineering 3. Hydropower Engineering 4. Air Pollution and control 5. Finite Element Method in Civil Engineering	1 Construction Management 2. Advanced Transportation Engineering 3. Statistical Analysis and Computational Methods in Civil Engineering **4.Open Elective** a). Plumbing Engineering b) Green Building Technology c) Ferrocement Technology d) Sub sea Engineering e)Wave Mechanics

401 001 Environmental Engineering – II

Teaching Scheme: Lectures: 3 Hrs / week
Practical: 2 Hrs/week

Examination Scheme:
Paper In-sem. 30 Marks (1 hr),
Paper End-sem : 70 Marks (2.5 hr)
Oral : 50 Marks

Unit I (6Hrs)

Sewage quantity: Collection and conveyance of sewage, sources of sewage, variations in sewage flow, Flow quantity estimation, Design of circular sanitary sewers. Pumping of sewage, necessity, location. Effect of change of life style on sewage quality.
Characteristics of sewage: Physical, chemical and biological characteristics, effluent discharge standards as per CPCB norms, interpretation and practical significance of test results.
Stream sanitation: Self purification of natural streams, river classification as per MoEF & CC, Govt. of India; Oxygen Sag Curve, Streeter - Phelps equation and terminology (without derivation and numerical).

Unit II (6Hrs)

Sewage treatment: Introduction to sewage treatment, preliminary, primary, secondary and tertiary treatment, Process flow diagram for sewage treatment, Theory and design of screen chamber, Grit Chamber and Primary sedimentation tank as per the Manual of CPHEEO.

Unit III (6Hrs)

Theory & design of secondary treatment units: Introduction to unit operations and processes for secondary treatment. Principles of biological treatments, important microorganisms in waste water & their importance in waste water treatment systems, bacterial growth, general growth pattern, growth in terms of bacterial numbers and bacterial mass. Kinetics of biological growth, cell growth, substrate limited growth, cell growth and substrate utilization, effect of endogenous metabolism.
Activated sludge process: Theory and design of ASP, sludge volume index, sludge bulking & control, modifications in ASP.
Trickling filter: Biological principle, different T.F media & their characteristics, design of standard rate and high rate filters using NRC formula, single stage & two stage filters, recirculation, ventilation, operational problems, control measures, theory of rotating biological contractors.

Unit IV (6Hrs)

Low cost treatment methods:
Oxidation pond: Bacteria – algae symbiosis, design of oxidation pond as per the manual of CPHEEO, advantages & disadvantages of oxidation ponds.

Aerated lagoons: Principle, aeration method, advantages & disadvantages of aerated Lagoons, design of aerated lagoon.
Introduction and theory of Phytoremediation technology for wastewater treatment. Introduction and theory of root zone cleaning system

Unit V **(6Hrs)**

Onsite Sanitation and Introduction to Package Sewage Treatment Plant: Working principle, advantages and disadvantages

Anaerobic digester: Principle of anaerobic digestion, stages of digestion, bio – gas production its characteristics & application, factors governing anaerobic digestion,. Dewatering of sludge by gravity thickener, sludge drying bed, decanters. Methods of sludge treatment and disposal, advantages & disadvantages. Up-flow Anaerobic Sludge Blanket (UASB) Reactor– Principle, advantages & disadvantages.

Unit VI **(6 Hrs)**

Industrial waste water treatment: Methods of sampling. Equalization and neutralization. Application of preliminary, primary and secondary treatment for industrial wastewater as per the CPCB norms.
Sources of waste water generation from manufacturing process, characteristics of effluent, different methods of treatment & disposal of effluent for the following industries: Sugar, dairy and distillery. Discharge standards as per CPCB norms.

Term Work

A. Compulsory Assignment

1. Brief report on Sewer materials, choice of materials, testing of sewer pipes, sewer appurtenances.
2. Design of septic tank

B. Experiments

The term work shall consist of a journal giving details of at least 8 out of 12 of the following experiments conducted in Environmental Engineering laboratory, of which, **Sr.No.12 is compulsory**.

1. Solids -Total solids, suspended solids, volatile solids, settleable solids & non settleable solids.
2. Sludge Volume Index.
3. Dissolved oxygen.
4. Bio-Chemical Oxygen Demand.
5. Chemical Oxygen Demand.
6. Electrical Conductivity.
7. Determination of Phosphates by spectrophotometer.
8. Determination of Nitrates by spectrophotometer.
9. Determination of heavy metals like Cr^{6+} or Zn or Ni or Cd.
10. Determination of total nitrogen by kjeldal method
11. Visit to domestic / Industrial wastewater treatment plant & its detailed reports.

12. Computer aided design of Sewage Treatment Plant (STP) OR Effluent Treatment Plant (ETP) of Sugar or Dairy Industry using suitable software (C programming or any other suitable software).

Note: - Term Work should include a detailed analysis of practical interpretation, significance and application of test results.

Text Books

1. Environmental studies by Rajgopalan- Oxford University Press.
2. Waste Water Treatment & Disposal – Metcalf & Eddy - TMH publication.
3. Environmental Engg. - Peavy, Rowe - McGraw Hill Publication.
4. Waste Water Treatment – Rao & Dutta.

Reference Books

5. Waste Water Engg. – B.C. Punmia & Ashok Jain - Arihant Publications.
6. Water Supply & Waste Water Engg.- B.S.N. Raju – TMH publication.
7. Sewage Disposal & Air Pollution Engg. – S. K. Garg – Khanna Publication.
8. Environmental Engg. – Davis - McGraw Hill Publication
9. Manual on sewerage and sewage treatment – Public Health Dept., Govt. of India.
10. Standard Methods by APHA.

I.S. Codes

I.S. 3025 (all parts)

e - Resources

i) http://nptel.iitm.ac.in/courses-contents/IIT Kanpur and IIT Madras.
ii) http://cpcb.nic .in
iii) http://moef.nic .in

@@@

401 002 Transportation Engineering

Teaching scheme
Lectures: 3 hours/week
Practical: 2 hrs

Examination scheme
In semester exam: 30 marks---1 hour
End semester exam: 70 marks—2.5 hours
Term Work: 50 marks

Highway Engineering

Unit I (6 hrs)

Introduction:
Role of transportation, scope of road transportation, highway development in India, necessity of highway planning and development plans e.g. Bombay plan, Lucknow plan.
Classification of road:
Classification of roads, road patterns, planning surveys and preparation of master plan based on saturation system, determination of road length by 3rd road development plan.
Traffic engineering:
Traffic characteristics-road user characteristics, vehicular characteristics (only name and significance) Traffic studies –name of various studies and their uses, accident studies-objectives, causes of accident, condition and collision diagram, and measures for the reduction in accidents. Traffic regulation and control devices-traffic signs, traffic signals (types merits and demerits) road markings. Traffic islands, types of road intersections (sketch merits and demerits). Parking facilities.

Unit II (6 hrs)

Highway alignment:
Basic requirements of an ideal alignment and factors controlling it, engineering survey for highway location, special requirements for hill roads,
Geometric design and traffic engineering:
Design controls and criteria for geometric design, cross sectional elements, sight distance requirements, stopping distance, overtaking sight distance, overtaking zones with IRC recommendations, attainment of super elevation, radius of curves, methods of introduction of extra widening, widening of pavement on horizontal curves, horizontal transition curves- objects, necessity, types of transition curves, length and shift of transition curves. Design of vertical alignment, gradient and its type, IRC recommendations, grade compensation on horizontal curve, vertical curves: - crest and sag curves, types of summit curves, length of summit curve for SSD and OSD. Requirements, types of valley curves, length of valley curve for comfort and head light sight distance criteria.
Highway drainage:
Importance of highway drainage, subsurface and surface drainage systems, scope of arboriculture for highway.

Unit III (6 hrs)

Highway materials:
Importance and properties of sub-grade, pavement component materials. Tests on aggregates. Bitumen: Types--cut back, tar, emulsion and tests, modified binders, bitumen mix design by Marshall Stability test, viscosity based gradation of bitumen

Pavement design:

Objects and requirements, types of pavements structures, functions of pavement components factors affecting pavement design, Design of flexible pavement by C.B.R. Method, IRC 37- guidelines design of rigid pavements, actors affecting design & analysis of stress- wheel load stress & temp. Stress, critical combination of stress, IRC 58- design guidelines, types of joints, requirements of joints.

Construction:

Construction process of WBM, WMM, GSB (Mix design). Introduction to bituminous works such as prime coat, tack coat, seal coat, MPM, AC or BC, BM, DBM and premix carpet.

Section II Airport Engineering:

Unit IV **(6 hrs)**

Introduction:

Advantages and limitations of air transportation. Aeroplane component parts and important technical terms.

Airport planning:

Aircraft characteristics, which influence judicious and scientific planning of airports, Selection of sites, survey and drawings to be prepared for airport planning.

Airport layout:

Characteristics of good layout, runway configuration, airport obstruction, location of terminal buildings, aprons and hangers. Zoning requirements regarding permissible heights of constructions and landing within the airport boundary.

Runways and taxiways:

Runway orientation, wind coverage, use of wind rose diagram, basic runway length, corrections for elevation, temperature and gradient as per ICAO and FAA recommendation. Airport classification by ICAO.

Unit V **(6 hrs)**

Bridge engineering:

Introduction:

Classification of bridges, components of bridges, preliminary data to be collected during investigation of site for bridges, determination of discharge – empirical formula, direct methods, economical span, afflux, HFL, scour depth and clearance, locations of piers and abutments, factors influencing the choice of bridge super structure, approach roads.

Loads on bridges:

Brief specifications of different loads, forces, stresses coming on bridges, IRC load specification, requirements of traffic in the design of highway bridges

Substructure:

Abutment, Piers, and wing walls with their types based on requirement and suitability.

Unit VI **(6 hrs)**

Types of bridges

Various types of bridges:

a. Culvert: Definition, waterway of culvert and types.
b. Temporary bridges: Definition, materials used brief general ideas about timber, floating and pantoon bridges.
c. Movable Bridges: Bascule, cut boat, flying, swing, lift, transporter and transverse bridges, their requirement and suitability.
d. Fixed span bridges:
   Simple, continuous, cantilever, arch, suspension, bowstring girder type and rigid frame and cable stayed bridges, materials for super structure.

Bearing:

Definition, purpose and importance. Types of bearings with their suitability.

Erection of bridge super structure and maintenance:

Introduction to different techniques of erection of bridge super structure and maintenance of bridges.

Term work:

Term work shall consist of the following:

A. Practicals:

I. Tests on Aggregate (Any Six) :

1. Aggregate Impact Value Test
2. Aggregate Crushing Strength Test
3. Los Angeles Abrasion Test
4. Shape Test (Flakiness Index and Elongation Index)
5. Specific Gravity and Water Absorption Test by basket method
6. Stripping Value Test
7. Soundness Test

II. Tests on Bitumen (Any Five + No. 8 compulsory):

1. Penetration Test
2. Ductility Test
3. Viscosity Test
4. Softening Point Test
5. Flash Point & Fire Point Test
6. Specific Gravity Test
7. Bitumen Extraction Test
8. Marshall Stability Test

B. Technical visits to 1) Bridge site/Airport and 2) Hot mix Plant with detailed report

Text Books

1. Principles of Highway Engineering and Traffic Analysis (4th edition)
   - F. L. Mannering, Scott S. Washburn, Wiley India
2. Highway engineering – S.K. Khanna and C.E.G. Justo, Nem Chand and Brothers, Roorkee

3. Principles and practices of Highway engineering –Dr. L.R. Kadiyali, Khanna Publishers Delhi.
4 .Essentials of Bridge Engineering – D. Johnson and Victor, Oxford and IBH publishing co . Pvt. Ltd. , New Delhi.
5.Bridge engineering – S. Ponnuswamy, Tata Mc Graw – Hill publishing co. Ltd. New Delhi.
6.Airport planning and design – S.K. Khanna , M.G. Arora , S.S. Jain, Nem Chand and Brothers, Roorkee.
7.Airport Engineering - Rangawala, Charotar publishing House, Anand 388001 (Gujrat)

Reference Books:

1. A Course in Highway Engineering – S.P. Bindra, Dhanpat Rai and Sons, Delhi.
   Principles of Transportation Engineering – G.V. Rao Tata MacGraw Hill Publication
2. Highway Engineering – Rangawala, Charotar publishing House, Anand 388001 (Gujrat)
3. Principles of Transportation Engineering – Partha Chakraborty ,Animesh Das, Prentice Hall of India Pvt. Ltd., New Delhi.
4. Highway and Bridge Engineering – B.L. Gupta, Amit Gupta Standard publishers Distributors, Delhi. 8) Principles and practice of Bridge Engineering – S.P. Bindra, Dhanpatrai and Sons, Delhi.
5. Bridge engineering – Rangawala, Charotar Publishing House, Anand –388 001.

Codes:

1. I.S. 1201 TO 1220-1978, IS 73, IS 2386 PART I toV
2. I.R.C. 58, IRC37
3. Specifications for Road and Bridge works (MORTH)-IRC, New Delhi.

Hand Books:

1. Handbook of Road Technology_Lay M.G., Gorden Breach Science Pub.Newyork
2. Civil Engineering Handbook-Khanna S.K.

e – Resources:

1. www.nptel.iitm.ac.in/courses/iitkanpur
2. www.cdeep.iitb.ac.in/nptel

@@@

401 003 Structural Design III

Teaching Scheme:
Lectures: 4 Hrs / week
Practical: 2 Hrs/week

Examination Scheme:
In sem :30 + End sem : 70Marks
Oral : 50 Marks
Duration : Insem : 1.5 Hr
End sem : 3 Hrs

Unit 1
Prestressed concrete - Analysis
Introduction, Basic concepts, materials-various Pretensioning and post tensioning systems, concept of losses, Stress calculations, and concept of cable profile.

Unit 2
Prestressed concrete - Design
Design of post tensioned prestressed concrete simply supported rectangular and flanged sections for flexure and shear including end block.
Design of one way and two way post tensioned slabs (Single panel only)

Unit 3
Earthquake force calculation and analysis and design of frames
Review of methods of analysis for frames subjected to gravity and lateral loads. Earthquake loads by seismic coefficient method. Estimation of combined effect of lateral forces and vertical loading on multi storeyed frames. Design any intermediate continuous beam of the frames for combined effect of loadings

Unit 4
Earth retaining structures
Introduction, Functions and types of retaining walls. Analysis and design of RCC cantilever type of retaining wall for various types of backfill conditions.

Unit 5
Combined footings
Introduction, necessity and types of combined footings, design of slab type and slab-beam type of combined footing.

Unit 6
Liquid retaining structures
Introduction, types, function, codal provisions, methods of analysis and design of circular, square, and rectangular water tanks resting on ground.
Note: Design based on above unit shall conform to latest versions of IS 456, IS 875, IS 1343, IS 3370, IS 1893, IS 13920.

Term Work
Term work shall be based on the above syllabus. It consists of

1) Assignment on Loss calculation unit 1
2) Assignment on stress calculation unit 1

3) Design and detailing of design of prestressed girder from Unit 2
4) Assignment on Earthquake force calculation from unit 3
5) Design and detailing of frame(beam only) from Unit 3
6) Design and detailing of retaining wall for any type of loading from Unit 4
7) Design and detailing combined footing from Unit 5
8) Design and detailing of ground resting water tank from Unit 6
9) Minimum five full imperial sheets based on four projects of RCC and one project of pre-stressed concrete.
10) **Report on analysis of assignment on unit 3 by software or computer program**
11) Two site visit reports one each of R.C.C. and another P.S.C. Oral Examination: Oral based on above term work
12) **There should separate design data for a group size of maximum four students.**

Text Books

1. Limit state theory and design of reinforced - Dr. V. L. Shah and Dr S. R. Karve - Structures Publications,Pune
2. Fundamentals of Reinforced Concrete- N.C. Sinha, S.K. Roy – S. Chand & Co. Ltd
3. Advanced design of structures- Krishnaraju - Mc Graw Hill
4. Design of Prestressed concrete structures- T. Y. Lin.
5. Prestressed Concrete- N. Krishna Raju – Tata Mc Graw Hill Publication Co.

Reference Books

6. Comprehensive RCC Design - Punmia, Jain & Jain - Laxmi Publications.
7. Design of design of reinforced Concrete structures- M. L. Gambhir -PHI
8. Reinforced Concrete, Vol I- Dr.H J. Shah Charotar Publishing House
9. Prestressed Concrete – A Fundamental Approach- Edward Nawy – PHI.
10. Reinforced concrete design- Pillai and Menon TMH

I.S. Codes

1. IS: 456: Indian Standard code of practice for plain and reinforced concrete, BIS, New Delhi.
2. IS: 1343: Indian Standard code of practice for Prestressed concrete, BIS, New Delhi.
3. IS: 1893: Indian Standard Code of practice for criteria for Earthquake resistant design of structures, BIS, New Delhi.
4. IS: 3370-Indian Standard code of practice for concrete structures for storage of liquids, BIS, New Delhi.

@@@

401 004 Elective I: (1) Structural Design of Bridges

Teaching Scheme:
Lecture: 3 hours per week
Practical : 2 hours per week

Examination scheme:
Term work: 50 marks
In-sem. Exam.: 30 marks (1 hrs)
End Sem. Exam.: 70 marks (2.5 hrs)

Unit 1

Introduction to RC highway bridges and steel railway bridges: Types of bridges, classification, IRC codal provisions for RC highway bridges, IRS codal provisions for railway steel bridges, loading standards.

Unit 2

RC highway bridges: T-beam deck slab bridges – Deck slab: Structural configuration, Piegaud's method, analysis and design of deck slab.

Unit 3

RC highway bridges: T-beam deck slab bridges – Post tensioned girders: Load distribution on longitudinal and cross girders, methods of analysis, analysis and design of longitudinal and cross girders.

Unit 4

Railway steel bridges – Truss bridges: Structural configurations, loads and load combinations, analysis and design of truss elements, longitudinal and cross-girders, bracing systems.

Unit 5

Bearings: Function of bearings, types of bearings, design of steel bearings and elastomeric bearings.

Unit 6

Sub-structure: Function, loads, analysis and design of RC abutments and piers.

Note: The designs should conform to the latest codal provisions.

Term Work

a) One project on RC highway bridges which shall include - the design of deck slab, longitudinal girder, cross-girder, bearings and abutment and pier.

The detailing shall be shown in at least three full imperial sheets.

b) One project on railway steel bridges which shall include – the design of truss elements, longitudinal girder, cross-girder, and bearings.

The detailing shall be shown in at least two full imperial sheets.

c) The term work can be prepared in a group of not more than four students in a group.

d) Report of at least two site visits covering the contents of the syllabus.

e) One of the above projects can be done using any drafting software.

Reference Books

Design of Bridges, N. Krishna Raju, Oxford and IBH Publishing Company Pvt. Ltd.

Design of Bridge Structures, M.A. JayaramPrentice-Hall Of India Pvt. Limited

Prestressed Concrete, N. Krishna Raju, Tata-McGraw Hill

Design of Steel Structures, Ramachandra, Standard Publications New-Delhi

@@

401 004 Elective I (2)- Systems Approach in Civil Engineering

Teaching scheme
Lectures: 3 hours/week
Practical: 2 hrs/week

Examination scheme
In semester exam: 30 marks---1 hour
End semester exam: 70 marks—2.5 hours
Term Work: 50 marks

Unit 1: Introduction of systems approach (6 Hrs)

Introduction to System approach, Operations Research and Optimization Techniques, Use of systems approach in Civil Engineering, Methods, Introduction to Linear and Non linear programming methods (with reference to objective function, constraints), Local & Global optima, unimodal function, convex and concave function

Unit 2: Non linear programming (6 Hrs)

Single variable unconstrained optimization: Sequential Search Techniques-Dichotomous, Fibonacci, Golden section

Multivariable optimization without constraints-The gradient vector and Hessian Matrix, Gradient techniques, steepest ascent/decent technique, Newton's Method

Multivariable optimization with equality constraints - Lagrange Multiplier Technique

Unit 3: Stochastic Programming (6 Hrs)

Sequencing– n jobs through 2, 3 and M machines

Queuing Theory : elements of Queuing system and it's operating characteristics, waiting time and ideal time costs, Kendall's notation, classification of Queuing models, single chanel Queuing theory : Model I (Single channel Poisson Arrival with exponential services times, Infinite population (M/M/1) : (FCFS/∞/∞)

Simulation : Monte Carlo Simulation

Unit 4: Dynamic programming: (6 Hrs)

Multi stage decision processes, Principle of optimality, recursive equation, Applications of D.P.

Unit 5: Linear programming (A) (6 Hrs)

Formulation of Linear optimization models for Civil engineering applications. The simplex method, Method of Big M, Two phase method, duality

Unit6: Linear programming (B) (6 Hrs)

The Transportation Model and its variants, Assignment Model, and its variants

Term Work

1. One exercise/assignment on each unit. Out of these any one exercise/assignment to be solved using Computer

2. One exercise on formulation of a problem applicable to any field of Civil Engineering, requiring use of LP/ NLP/ DP. Formulation of objective function and constraints (No solution)

Text Books

1. Engineering Optimization: Methods and Application-- A. Ravindran, K. M. Ragsdell— Wiley India

2. Engineering Optimization by S.S.Rao

3. Operations Research by Hamdy A. Taha

4. Quantitative Techniques in Management by N.D. Vohra (Mc Graw Hill)

5 Operations Research by Premkumar Gupta and D.S.Hira, S. Chand Publications (2014).

Reference Books

6.Topics in Management Science by Robert E. Markland(Wiley Publication)

7. An Approach to Teaching Civil Engineering System by Paul J. Ossenbruggen

8 A System Approach to Civil Engineering Planning & Design by Thomas K. Jewell (Harper Row Publishers)

e - Resources

1. Mathematical Model for Optimization (MMO Software)

2. nptel.iitm.ac.in/courses/webcourse-contents/IISc-Bang/OPTIMISATION METHODS/New-index1.html

@@

401 004 Elective I (3)- Advanced Concrete Technology

Teaching scheme
Lectures: 3 hours/week
Practical: 2 hrs/week

Examination scheme
In semester exam: 30 marks---1 hour
End semester exam: 70 marks—2.5 hours
Term Work: 50 marks

Unit I

Cement and its types: general, hydration of cement, alkali aggregate reaction. Grading curves of aggregates, Manufactured sand as fine aggregate, copper slag as fine aggregate
Concrete: properties of concrete, w/b ratio, gel space ratio, Problems on maturity concept, aggregate cement bond strength, Green concrete ,Guidelines for Quality control & Quality assurance of concrete ,Effect of admixtures.

Unit II

Structural Light weight concrete, ultra light weight concrete, vacuum concrete, mass concrete, waste material based concrete, sulphur concrete and sulphur infiltrated concrete, Jet cement concrete (ultra rapid hardening), gap graded concrete, high strength concrete, high performance concrete ,Self curing concrete, Pervious concrete.

Unit III

Design of high strength concrete mixes, design of light weight aggregate concrete mixes, design of flyash cement concrete mixes, design of high density concrete mixes, Design of pumpable concrete mixes, Design of self compacting concrete.
Advanced non-destructive testing methods: ground penetration radar, probe penetration, break off maturity method, stress wave propagation method, electrical/magnetic methods, nuclear methods and infrared thermographs.

Unit IV

Historical development of fibre reinforced concrete, properties of metallic fibre, polymeric fibres, carbon fibres, glass fibres and naturally occurring fibres. Interaction between fibres and matrix (uncracked and cracked matrix), basic concepts and mechanical properties: tension and bending.

Unit V

Properties of hardened frc, behavious under compression, tension and flexure of steel fibres and polymeric fibres,GFRC, SFRC, SIFCON,-development, constituent materials, casting, quality control tests and physical properties.

Unit VI

Ferrocement: Properties & specifications of ferrocement materials ,analysis and design of prefabricated concrete structural elements,manufacturing process of indusrrial concrete elements, precast construction, errection and assembly techniques.

Termwork / Labwork:

The Termwork / Labwork will be based on completion of assignments / practicals / reports of site visits, confined to the course in that semester.

1. Concrete mix design and production in lab of any one – Self compacting concrete, Fiber reinforced concrete, light-weight concrete, high strength or ultra-high strength concrete . Comparison with traditional concrete mix is to be clearly stated in the report.

2. Cost analysis (material, labour, equipment, others) of any type of concrete for lab, in-situ and RMC production.
3. Perform any two Fresh (workability tests – Slump Flow Test, T-50, J-Ring, Visual Stability Index, Column Segression, L-Box, U-box) and Hardened (Compressive, tensile, flexural) properties tests on any high performance concrete.
4. Any one experiment on any one of the topics – NDTs; Microscopic examination of cement/concrete; Performance study of any one admixture (Mineral/Chemical) in concrete.
5. Write a review on any recent research article from standard peer-reviewed journal.
6. Visit reports on minimum two site visits - exploring the field and practical aspects of concrete technology.
7. Report on at least one patent (national/international)– on any topic related to concrete technology.

Note: - Term Work should include a detailed analysis of practical interpretation, significance and application of test results including above contents and site visit report in form of journal.

Text books

1. Concrete Technology --M.S. Shetty, S. Chand Publications.
2. Concrete Technology -- A R Santhakumar, Oxford University Press.
3. Concrete technology -- M. L. Gambhir, Tata Mcgraw Hill Publications.
4. Fiber Reinforced Cement Composite- P.N.Balguru & P.N.Shah.
5. Concrete: Microstructure, Properties and Materials-- P. Kumar Mehta and P. S. M. Monteiro-- Tata Mc-Graw Hill Education Pvt. Ltd.

Reference Books

1.Handbook on Advanced concrete Technology Edited by N V Nayak,A .K.Jain, Narosa Publishing House .
2. Properties of concrete by A. M. Neville, Longman Publishers.
3. Concrete Technology by R.S. Varshney, Oxford and IBH.
4. Concrete technology by A M. Neville, J.J. Brooks, Pearson
5. Ferrocement Construction Mannual-Dr. D.B.Divekar-1030,Shivaji Nagar,Model Colony, Pune
6. Concrete Mix Design-A.P.Remideos--Himalaya Publishing House (ISBN-978-81-8318-996-5
7. Concrete, by P. Kumar Metha, Gujrat Ambuja.
8. Learning from failures ---- R.N.Raikar
9. Structural Diagnosis ---- R.N.Raikar
10. Concrete Mix Design---Prof. Gajanan Sabnis

General Reading suggested: 1) Codes : i)IS 456 ii)IS 383 iii)IS 10262-2009 iv)IS 9103
2) Ambuja cement booklets on concrete Vol .1 to 158
3) ACC booklets on concrete
@@

401 004 Elective I (4)- Architecture and Town Planning

Teaching scheme
Lectures: 3 hours/week
Practical: 2 hrs/week

Examination scheme
In semester exam: 30 marks---1 hour
End semester exam: 70 marks—2.5 hours
Term Work: 50 marks

Unit I:

- Principles and elements of Architectural Composition,
- Qualities of Architecture: user friendly, contextual , ecofriendly, utility of spaces, future growth etc.
- Role of "Urban Planner and Architect"in planning and designing in relation with spatial organization, utility, demand of the area and supply

Unit II:

- Landscaping : importance , objectives, principles, elements, material (soft and hard),
- Urban renewal for quality of life and livability.
- Importance of sustainable architecture with case study

Unit III:

- Goals and Objectives of planning; components of planning; benefits of planning
- Levels of planning: Regional plan , Development Plan, Town Planning Scheme,
- Neighbourhood plan ; Types of Development plans: Master Plan, City Development Plan, Structure Plan

Unit IV:

- Various types of civic surveys for DP : demographic, housing, land use, Water Supply & sanitation, etc.,
- Planning agencies for various levels of planning. Their organization and purpose (CIDCO-MHADA-MIDC, MMRDA/ PMRDA etc).,
- Traffic transportation systems: urban road, hierarchy, traffic management, Intelligent Transport Systems.

Unit V:

- Legislative mechanism for preparation of DP: MRTP Act 1966
- UDPFI guidelines (for land use, infrastructure etc),SEZ, CRZ, Smart City Guidelines

Unit VI :

- Special townships, Land Acquisition Rehabilitation and Resettlement Act 2013.
- Application of GIS, GPS, remote sensing in planning.

Term Work: - 50 Marks

Sr. no. 1 and 2 are compulsory and any four from remaining.

1 Study and analysis of Development Plan with respect to landuse , services, infrastructure, street furniture, housing etc. (group work)

2. Neighborhood- planning (group work)

3 Report on contribution of Engineers, Planners and Architects in post independence India (individual work)

4 Report on any existing new towns and planned towns like new Mumbai, Gandhinagar, PCNTDA etc.(infrastructure, disaster management etc), (individual work)

5 Study of salient features of urban renewal schemes (group work)
6 Study of any existing town planning scheme (group work)
7 Smart City approaches (individual work)
8 Study of Special Townships: (site visit) (group work)
9 Study of urban housing and housing change (group work)

Text Books:

--Town Planning By G K Hiraskar
--Town Planning By S Rangwala
---Building Drawing and Built Environment- 5 Th Edition – Shah , Kale , Patki
---Planning Legislation By Koperdekar And Diwan.
---G. K. Bandopadhyaya , “Text Book of Town Planning”.
---Climate Responsive Architecture – Arvind Krishnan.
---Introduction To Landscape Architecture By Michael Laurie

Reference Books

MRTP Act 1966

- Manual Of Tropical Housing And Building By Koenigsbeger
- Sustainable Building Design Manual
- UDPFI Guidelines
- “The Urban Pattern: City planning and design” by Gallion and Eisner.
- Design of cities by Edmond bacon
- LARR Act 2013
- MoUD By GoI
- NRSA
- CIDCO, MHADA, MIDC, MMRDA, PMRDA

@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@

401 004 Elective I-(5) Advanced Engineering Geology with Rock Mechanics

Teaching scheme
Lectures: 3 hours/week
Practical: 2 hrs/week

Examination scheme
In semester exam: 30 marks---1 hour
End semester exam: 70 marks—2.5 hours
Term Work: 50 marks

Unit I : Indian Stratigraphy, Geology applied to Civil Engineering Practices

1	***Indian Stratigraphy:*** Distribution and Geological characters of Major rock formations of India, Geological Map of India with special reference to Maharashtra, Seismic Zones of India, Engineering characters of major rock formations of India.	**4**
2	***Geology applied to Civil Engineering Practices:*** Importance of geological studies in engineering investigations, precautions necessary to avoid misleading conclusions likely to be drawn while interpreting drilling data, dependence of design on geological features of project site.	**2**

Unit II: Subsurface Explorations for Water Retaining Structures; Geological Foundation Treatments for various Civil Engineering Projects, Tail Channel Erosion.

3	***Subsurface Explorations for Water Retaining Structures:*** Various Physical and Mechanical properties of rocks affecting strength & water tightness of them from foundation point of view. Effect of weathering, deterioration of rock masses on exposure to atmosphere & hydrothermal alteration of rocks on water retaining structures & suitable treatment for such rocks. Case studies illustrating economics made possible by proper geological studies & wasteful expenditure or difficulties resulting from their negligence.	**2**
4	***Geological Foundation Treatments for various Civil Engineering Projects:*** Foundation investigations during construction for determining the foundation treatment for adverse geological features. Determination of foundation levels. Correction of adverse features by means of various techniques such as grouting etc. for improving strength of weak & fragmented rocks. Curtain grouting for preventing leakage through foundation rocks. Determining depths & zones of consolidation & curtain grouting. Foundation treatment for fractures having different manifestation, jointed rocks.	**2**
5	***Erosion of Tail Channels:*** Erosion of tail channel as factor in selecting site for spillway. Causes of rapid erosion of tail channels of side spillways. Geological conditions leading to tail channel erosion. Case studies	**2**

Unit III: Geohydrological characters of major rock formations of India; Geological process of Soil formations

6	***Geohydrological characters of major rock formations of India:***	**4**

Geohydrological characters and factors affecting the water bearing structures of various rocks in India. Introduction to morphometric analysis of river system. Various methods of water conservation techniques, adverse aspects of tube wells, bore wells and dug wells. Geological aspects of conservation of water, artificial recharge, rainwater harvesting and watershed development & necessity of geological studies for such schemes. Illustrative case studies.

7	***Geological Process of Soil formations:*** Rock weathering conditions favorable for decomposition & disintegration, Residual & transported soils. Effect of climate on formation of soil. Soil profile of various states in India.	**2**

UNIT IV Rock Mechanics and Geophysical techniques.

8	***Rock Mechanics:*** General principles of rock mechanics. Dependence of physical and mechanical properties of rocks on geological characters. Various laboratory testing methods. Calculation of R.Q.D. Joint Frequency Index, Various Methods of Geomechanical classifications of rocks such as Terzahagi, U.S.B.M, R.M.R., R.S.R., Q. system, Deer and Miller, Bieniawaski's Geomechanical classification etc. and computation of representative rock formation such as DTB.	**4**
9	***Geophysical techniques :*** Various methods of Geophysical Exploration like Electrical Resistivity methods, Seismic method of exploration as applied to engineering investigations such as determination of thickness of overburden, locating ground water potential zones	**2**

Unit V: Engineering Geological investigation for Tunnels and Bridges

10	***Engineering Geological investigation for Tunnels:*** Variations in methodology of investigation for different types of tunnels for different purposes, location, spacing, angles & depths of drill holes suitable for different types of tunnels. Difficulties introduced in various geological formation and their unfavourable field characters. Standup time of rock masses and limitations of it. Dependence of protective measures such as guniting, rock bolting, shotcreting, steel fiber shotcreting, permanent steel supports, lagging concreting & contact grouting above permanent steel supports on geological conditions. Illustrative case studies.	**4**
11	***Bridges:*** Investigation for bridge foundation, difference in objectives of investigation of bridge foundation. Computing safe bearing capacity for bridge foundation based on nature & structure of rock. Foundation settlements. Case studies.	**2**

UNIT VI : Resource Engineering ,Role of Geology in planning and development

12	***Resource Engineering:*** Deccan Trap basalts as construction material. Use of compact basalt & amygdaloidal basalts as rubble for masonry & metal for concrete & pavement quality concrete. Use of Basalt fibre during construction.	**2**

Illustrative case studies.

13 ***Role of Geology in planning and development:*** **2**

Influence of geological factors upon urban development & planning ,locating non-renewable resources and geothermal energy.

14 ***Earthquakes and tectonics:*** **2**

Seismicity of Indian sub continent. Earthquakes occurring in the areas of some dams & RIS theories.

Practical Work / Term Work

I) Study of Geological map and seismic zonation map of India **(2 Practical)**

II) Interpretation of drill hole data

Logging of drill core, preparation of Litho logs & interpretation of drill data. Preparing geological cross sections from drill hole data & using them for designing of civil engineering structures representing following case studies.

1. Dipping sedimentary formation
2. Faulted region
3. Folded region
4 Locating spillway on Igneous rocks
5. Tunnels in Tectonic areas
6. Tunnels and open cuts in non-tectonic areas **(6 Practical)**

III) Study of some parameters of Morphometric Analysis of some tributaries of river, (Toposheet will be made available by the college) **(1 Practical)**

IV) Study of Soil Profile of any region. **(1 Practical)**

V) Use of electrical resistivity method for determining depth of bedrock. **(1 Practical)**

VI) Computation of RQD & Joint Frequency Index **(1 Practical)**

VII) A compulsory guided tour to study geological aspects of an engineering projects & writing a report based on studies carried out during visits to civil engineering projects.

Note:

**** Class test will be held in the last week of every month**

**** Field visits will be made to different places around study area and one long study tour to important geological place.**

The practical journal will be examined as term work.

Reference Books and Text Books:

1. Jaeger – Rock Mechanics in Engineering, Cambridge Univ Press London, 1990.
2. Goodmann – Principles of Rock Mechanics.
3. Bieniawski Z. T. - Engineering Classification of jointed Rock Masses.
4. Dr. Dobbrin - Introduction to Geophysics.
5. Goodmann – Engg. Geology.
6. Megaw T. M.& Tunnels: Planning, Design, Construction
7. J. V. Bartlett - Int. ED, Ellis Horwood ltd. John Willey & Sons .
8. Skinner B. J: The Dynamic Earth, An Introduction to Phy & Porter S. C Geology John Willey & Sons. NY 1989
9. Introduction to Rock Mechanics by B. P. Verma-Khanna Pub New Delhi

10. Environmental Geology by Waldiya
11. Environmental Geology – Keller, Prentice – Hall Publication.

Handbooks

a. Gupte R. B. (1980) – P. W. D. Handbook Chapter –6, Part-II ‘Engineering Geology Government of Maharashtra.
b. Tunneling India '94, “Central Board of Irrigation and Power”, New Delhi
c. Manual on Rock Mechanics, Central Board of Irrigation and Power, New Delhi, 1988.
d. Handbook of Geological terms, geology and Physical Geology, David page, University of Michigan. USA.
e. Handbook of Geology in Civil engineering, Robert Fergussion , Legget, Mc-Graw hill.
f. Geotechnical Engineering handbook, Robert day, Mc- Graw hill, ISBN 0-07-137782-4

I. S. Codes

i) IRC code of practice for Road Tunnels. IRC-78-2000; IS-12070; IS-1336 Part I and II.
ii) I. S. 4453-1967 Code of practice for Exploration, pits, trenches, drifts & shaft.
iii) I. S. 6926-1973 Code of practice for diamond drilling for site investigation river valley project.
iv) I. S. 4078-1967 Code of practice for Logging and Storage of Drilling Core.
v) I. S. 5313-1969 Guide for core drilling observation.

e- Resources

1. www.ebd.co.in/undergraduate/eng.
2. www.library.iisc.ernet.in
3. www.iitb.ac.in
4. www.nptel.iitm.ac.in

@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@

401 005 Elective II (1)- Matrix Methods of Structural Analysis

Teaching scheme — **Examination scheme**

Lectures: 3 hours/week — **In semester exam: 30 marks---1 hour**

End semester exam: 70 marks—2.5 hours

Unit I: Computational Techniques **6 Hrs**

Review of matrix algebra, computer oriented numerical methods-Gauss elimination, Gauss Jordon and Gauss Seidel. Computer algorithm and flowcharts of above methods

Unit II: Flexibility matrix method for trusses, beams and frame **6 Hrs**

Degree of static indeterminacy, flexibility, selection of redundant, flexibility matrix, analysis of pin jointed indeterminate trusses, continuous beams and simple portal frames involving not more than three unknowns.

Unit III: Stiffness matrix method for bars and trusses **6 Hrs**

a) Degree of kinematic indeterminacy (degrees of freedom), local and global coordinate systems, stiffness matrices of a axially loaded bar members, global stiffness matrix, structure approach, member approach, analysis of determinate/indeterminate bars involving not more than three unknowns

b) Stiffness matrices of a truss member with four DOF, transformation matrix, global stiffness matrix, analysis of determinate/indeterminate trusses involving not more than three unknowns

Unit IV: Stiffness matrix method for beams and frames **6 Hrs**

a) Stiffness matrix for a beam member, member and structure approach problems involving not more than three unknowns

b) Stiffness matrix for a portal frame member, transformation matrix, member and structure approach problems involving not more than three unknowns

Unit V: Stiffness matrix method for grid structures **6 Hrs**

Stiffness matrix method for analysis of orthogonal grid structure, member stiffness matrix, transformation matrix, member and structure approach, problems involving not more than three unknowns

Unit VI: Stiffness matrix method for 3D structures and FDM **6 Hrs**

a) Stiffness matrix method for the analysis of space truss, member stiffness matrix, problems involving not more than three unknowns, Formation of stiffness matrix of space frame element (no numerical),

b) Applications of finite difference method (FDM): Determine deflection and moments in beams, critical buckling load of columns.

Reference Books

[1] Matrix Methods of Structural Analysis- Wang, C. K., International Textbook Co., 1970.
[2] Matrix Analysis of Framed Structures – Gere & Weaver- CBS Publications, Delhi
[3] Matrix & Finite Element analysis of structures – A.H. Shaikh and Madhujit Mukhopadhyay

Reference Books

[4] Numerical Methods for Engineering – S.C. Chapra& R.P. Canale Tata McGraw Hill Publication
[5] Structural Analysis – A Matrix Approach - Pandit& Gupta - Tata McGraw Hill Publication
[6] Matrix Methods of Structural Analysis – Meghare&Deshmukh- Charotar Publishing House, Anand.

@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@

401 005 Elective II (2)- Integrated Water Resources Planning & Management

Teaching Scheme: Lectures: 3 Hrs / week

Examination Scheme:
Paper In-sem. 30 Marks (1 hr),
Paper End-sem : 70 Marks (2.5 hr)

Unit1: (6 Hrs)

a) Introduction :World water resources, water resources in India, water as finite resource, variability of water in time & space, history of water resources development, water infrastructure-problems and perspectives, present institutional framework for water management.

b) Water laws: Constitutional provisions, National Water Policy, riparian rights / ground water owner ship, prior appropriation, permit systems, acquisition and use of rights, scope for privatization.

Unit2: Economics & Paradigm shift in water management (6 Hrs)

a) Economics of water :Water as economic good, intrinsic value, principles of water pricing & water allocation, capital cost, opportunity cost, internal rate of return, benefit cost analysis, principles of planning and financing of water resources project : Discussion on any two case studies.

b) Paradigm shift in water management:

Global and national perspectives of water crisis, water scarcity, water availability and requirements for human and nature, concepts of 'blue water', 'Green water', and 'virtual water', and their roles in water management. Sustainability principles for water management, framework for planning a sustainable water future.

Unit3: Basin scale hydrology (6 Hrs)

a) Estimation of surface water, estimation of ground water draft/recharge import/export of water (inter basin water transfer), recycling and reuse and storage, control of water logging, salinity, & siltation of storages.

b) Flood & Drought management: causes of floods, structural and non-structural measures, mitigation plan, flood damage assessment, use of geoinformatics for flood management. Types of droughts, severity index, drought forecasting, damage assessment, mitigation plan, use of geoinformatics for drought management

Unit 4: water demand and supply based management (6 Hrs)

a) Consumptive & non consumptive demands, irrigation demand estimation, water utilization, irrigation efficiency, water management in irrigation sector,

b) demand estimation in hydro/thermal/nuclear power sector, estimation & forecasting of water demands of domestic & industrial sector, navigation and recreational water demands

Unit 5: Environmental and social aspects (6 Hrs)

a) Environmental management: protection of vital ecosystem, water requirements for environmental management, aquaculture, minimum flows, water quality management for various uses.

b) Social impact of water resources development: direct/ indirect benefits, employment generation, industrial growth, agro-industry, enhanced living standards, education & health, co-operative movement, management of rehabilitation & resettlement.

Unit6: Basin planning &Watershed management (6 Hrs)

a) Perspective plan for basin development & management, Decision support system for Integrated Water Resources Management (IWRM), use of data driven techniques like Artificial Neural Networks, Genetic programming, Model Tree in water resources planning, development & management.

b) Watershed Management:

Watershed definition, classification of watersheds, integrated approach for watershed management, role of RS & GIS in watershed management, soil and water conservation-necessity- soil erosion- causes- effects-remedial measures, contour bunding- strip cropping-bench terracing-check dams.

Text Books

1) Water Resources Systems Engg, D. P. Loucks, Prentice Hall
2) Water Resources Systems Planning and Management, Chaturvedi, M.C. Tata McGraw Hill
3) Economics of Water Resources Planning, James L.D and Lee R.R, McGraw Hill
4) Water resources hand book; Larry W. Mays, McGraw International Edition
5) Design of Water Resources Systems, Arthur Mass, MacMillan 1962

Reference Books

6) Economics of Water Recourses Planning, L. D. James & R.R.Leo, McGraw Hills, NY 1971.
7) Water Resources Systems Engineering, W. A. Hill & J. A. Dracup.
8) Water shed Management – B.M. Tideman
9) Watershed management –J. V. S. MURTY, new Age International Publisher.
10)Integrated Watershed Management Perspectives and Problems - Beheim, E., Rajwar, G.S., Haigh, M., Krecek, J. (Eds.) , Springer Publication.
11)Managing Water in River Basins: Hydrology, Economics and Institutions -- M. Dinesh Kumar, Publisher: Oxford Universit Press
12)Water Resources Design Planning Engg and Economic; Edward Kuiper, Butterworth & Co.
13)ANN in Hydrology; Govinda Raju & Ramachandra Rao; PHI
14)Integrated Water Resources Management in Practice: Better Water Management for Development - R. L. Lenton, Mike Muller , Publisher Earthscan.
15)Sustainability of Integrated Water Resources Management - Editors**:** Setegn, Shimelis Gebriye, Donoso**,** Maria Concepcion (Eds.) Publisher Springer International Publishing .
16)Integrated Water Resources Management in the 21st Century: Revisiting the paradigm -Pedro Martinez-Santos, Maite M. Aldaya, M. Ramón Llamas, Publisher CRC Press, Taylor & Francis Group.
17)Key Concepts in Water Resource Management: A Review and Critical Evaluation - Jonathan Lautze, publisher Routledge.
18)Water Management – Jasapal Singh, M.S.Achrya, Arun Sharma – Himanshu Publication.

e - Resources

1. nptel.iitm.ac.in/courses /webcourse-contents / IISc-Bang/water resource management.

@@

401 005 Elective II –(3) TQM and MIS in Civil Engineering

Teaching scheme | **Examination scheme**
Lectures: 3 hours/week | **In semester exam: 30 marks---1 hour**
End semester exam: 70 marks—2.5 hours

Unit I: Quality in Construction (6 Hrs)

a) Quality – Various definitions and interpretation. Importance of quality on a project in the context of global challenges.

b) Factors affecting quality of construction, reasons for poor quality & measures to overcome.

Unit II: MIS (6 Hrs)

a) Introduction to Management Information systems (MIS) Overview, Definition.

b) MIS and decision support systems, Information resources, Management subsystems of MIS.

Unit III: TQM & Defects in Construction (6 Hrs)

a) TQM – Necessity, advantages, Six sigma as a tool in TQM.

b) Defects & it's classification in construction. Measures to prevent and rectify defects.

Unit IV: TQM, ISO & Quality Manual (6 Hrs)

a) Difference between, quality control, quality assurance, total quality control and total quality management (TQM).

b) Process based approach for achieving TQM. Study of ISO 9001 principles.

c) Quality manual – Importance, contents, documentation. Importance of check-lists in achieving quality. Typical checklist for concreting activity, formwork activity, steel reinforcement activity.

Unit V: Management Control (6 Hrs)

a) Management information system structure based on management activity whether for Operational control, management control or strategic planning.

b) Supply chain management as a tool in TQM, Benchmarking in TQM, Kaizen in TQM

c) Categories of cost of Quality.

Unit VI: Modern tools in TQM Implementation (6 Hrs)

a) Development of an MIS for a construction organization associated with building works, study and use of various modules of ERP software for construction.

b) Introduction to smart phone technology & incorporating GIS, GPS, Android subsystems for documentation and monitoring of construction projects.

***** Units IV, V & VI to be supplemented with case studies***

Text Books:

1.Total Quality Management-- Dr. Gunmala Suri and Dr. Puja Chhabra Sharma—Biztantra
2.Quality Control and Total Quality Management by P.L.Jain- Tata McGraw Hill Publ.Company
3.Total Quality Management - Dr. S.Rajaram and Dr. M. Sivakumar-- Biztantra
4.Total Engineering Quality Management – Sunil Sharma – Macmillan India Ltd.

Reference Books:

1. Juran's Quality Handbook – Juran Publication. Importance of quality on a project in the context of global challenges. Importance of quality on a project in the context of global challenges.
2. Management –Principal, process and practices by Bhat – Oxford University Press.
3. Financial management by Shrivastava- Oxford University Press
4. . Management Information Systems – Gordon B. Davis, Margrethe H. Olson – Tata McGraw Hill Publ. Co.
5. Total Project Management – The Indian Context - P.K.Joy Macmillan India Ltd.

E- Sources: www.nptel.ac.in , www.mobile.enterpriseappstoday.com

@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@

401 005 Elective II (4)- Earthquake Engineering

Teaching scheme | **Examination scheme**

Lectures: 3 hours/week | **In semester exam: 30 marks---1 hour**

End semester exam: 70 marks—2.5 hours

Unit I

Introduction to earthquakes:

Geology of earth, configuration of tectonic plates in a globe, influence of Geology on earthquake, behavior of plates, their motion and effects, causes of earthquake and their Characteristics, Earthquake parameters, magnitudes, intensity, scales, classification of earthquake seismic zoning of India, seismic coefficients for different zones, .Lessons from past earthquake: - Study of damages caused due to past, earthquakes in/ outside India and remedial measures.

Unit II

Theory of vibrations:

Vibrations - definition, causes, classifications. Single Degree of Freedom systems (SDOF) - Free, forced, damped, un-damped vibrations with basic examples. Introduction to Multi-degrees of

Freedom systems (MDOF) - derivations of related equations and solutions to two degree and three degree of freedom systems.

Unit III

Seismic design of RC structure:

Introduction to IS1893 (Part-I): 2002, Seismic design Philosophy, provision, Seismic coefficient method. Response Spectra, Basic requirement, estimation of story shear, effect of unsymmetrical geometry and masses, mass center and stiffness center, estimation of story shear for symmetrical and torsion for unsymmetrical buildings. IS code provision to response spectrum.

Concept of ductile detailing, IS 13920 (1993) provisions for RC frame.

Unit IV

Seismic foundation design:

Type of forces generated due to earthquake, effects on different types of foundation, design of RCC isolated footing for earthquake loading, liquefaction, causes and its remedial measure.

Unit V

Introduction of different control systems: Passive control: base isolation and active control: bracing system, TMD etc and some latest invention.

Introduction to Disaster Management: Types of Disaster, Phases of disaster management, Disaster rescue, psychology and plan of rescue operations.

Unit VI

Strengthening and Retrofitting: Need of retrofitting, Evaluation of existing buildings, aging, weathering, development of cracks, improper load Path, asymmetry, materials and equipments for restoring and retrofitting, methodology of retrofitting for walls, slabs roofs columns, foundations etc. for buildings in stones, bricks, RCC.

Concept of shear wall,

Notes: Every design should confirm to latest versions of IS 1893, 4326, 13920, 13827, 13828, 13935

Text Books

1.Earthquake resistance design of structure by Duggal- Oxford University Press.

2.Earthquake – Resistant Design of Building Structures-Dr. Vinod Hosur-- Wiley India

3 Earthquake Tips NICEE, IIT, Kanpur

4. Elements of Earthquake Engineering by Jaikrishna and Chandarsekaran.

Reference Books

5 Dynamics of structure by Clough R.W. and Penzin J. McGraw Hill Civil Engineering Series

6. Dynamics of structure by Anil Chopra, Prentice Hall India Publication

7. Dynamics of structure by Mario Paz, CBSPD Publication

8. Geo-technical Earthquake Engineering by Kramer S. L. Prentice Hall India Publication

9. Introduction to Structural Dynamics by John M. Biggs

10. Mechanical Vibrations by V. P. Singh

11. Relevant Latest Revisions of IS codes.

@@@

G.H. Raisoni College of Engineering and Management, Pune

An Autonomous Institute under UGC Act 1956 & Affiliated to Savitribai Phule Pune University

NAAC ACCREDITED

APPROVED BY AICTE, NEW DELHI, RECOGNIZED BY GOVT. OF MAHARASHTRA & AFFILIATED TO SAVITRIBAI PHULE PUNE UNIVERSITY

COURSE BOOK

M.TECH
(STRUCTURAL ENGINEERING)

Academic Year 2016-2017

Department of Civil Engineering

G.H. Raisoni College of Engineering and Management, Pune

College Vision and Mission

VISION:

To achieve excellent standards of quality education by keeping pace with rapidly changing technologies and to create technical manpower of global standards with capabilities of accepting new challenges.

MISSION:

Our efforts will be dedicated to impart quality and value based education to raise satisfaction level of all stakeholders. Our strength will be directed to create competent professionals. Our endeavor will be to provide all support to promote research & development activities.

Department of Civil Engineering

VISION:

To create globally competent technical manpower in dynamic changing world of civil engineering with self-learning & lifelong learning attributes to meet challenges by adopting changing technology

MISSION:

To impart quality education and knowledge which help in

- Meeting the requirements of the society by developing sustainable solutions and environment friendly systems
- Carrying out research and development to meet new challenges in the field of civil engineering.

Department of Civil Engineering

The department of Civil Engineering provides state of the art designing, analyzing and estimating facilities to the students and also promotes active industry-institute collaboration by identifying areas of interest and taking part in sponsored research projects. Some of the major research areas, on which the faculty members and students working are Design, Consulting, Execution, Surveying, Analysis, Estimation and management of Construction site. The following facilities are provided to encourage the students into research & development:

Various Computer UG Laboratories such as

1. Environmental Engineering Lab
2. Strength of Materials Lab
3. Geotechnical Engineering Lab
4. Concrete Technology Lab
5. Engineering Geology Lab
6. Surveying Lab
7. Fluid Mechanics Lab
8. Transportation Engineering Lab
9. UG Computer Lab
10. Engineering Mechanics Lab

Various Civil PG Laboratories Such as

1. PG Lab-1 (Civil Engg.)
2. Research Lab-1 (Civil Engg)

G.H. Raisoni College of Engineering and Management, Pune

Department of Civil Engineering

Programme Educational Objectives (PEO)

- **Lead successful career in multiple sector of engineering industry and / or higher studies by acquiring knowledge in mathematical, scientific and engineering fundamentals.**
- **Analyze and design civil engineering systems with social awareness and responsibility.**
- **Exhibit professionalism, ethical approach, communication skills, team work in their profession and adapt to modern trends by engaging in lifelong learning.**

G.H. Raisoni College of Engineering and Management, Pune
Department of Civil Engineering

Programme Outcomes (PO)

1 Apply knowledge of mathematics, basic science and engineering skills to civil engineering problems

2 Identify, formulate and research literature and solve analytically complex civil engineering problems

3 Design various structures or particular system that meets desired specifications and requirements.

4 Design and conduct experiments, interpret and analyze data, synthesize the information to provide conclusion.

5 Elect and use appropriate engineering techniques and software tools to analyze civil engineering problems with understanding of limitations.

6 Assess local and global impact of societal issues on civil engineering profession.

7 Able to understand the impact of engineering solutions on society and demonstrate the knowledge of, and need for sustainable development.

8 Demonstrate their professional and ethical responsibilities.

9 Able to function as a member or a leader on engineering and science laboratory teams, as well as on multidisciplinary teams.

10 Communicate effectively in both verbal and written forms.

11 Understand engineering and management principles and apply to their work as a member and/ or leader in a team to manage projects.

12 Adapt transform in industry by understanding the need of independent and lifelong learning

G.H. Raisoni College of Engineering and Management, Pune
Department of Civil Engineering

Programme Specific Outcomes (PSO)

On successful completion, program in Structural Engineering of Civil Engineering post graduate will be able to:

- **Post graduate program will be prepare student for basic principles and advanced course of technology in field of Structural Engineering so as to formulate, analyze and solve structural projects.**
- **To act as stepping stone for research work in field of structural Engineering.**
- **To prepare student to adopt the latest software tool available in field of Structural Engineering with proper knowledge of limitations.**

M. Tech. (Structural Engineering)

Course Structure

Effective from Academic Year 2016-2017

Scheme of Examination for M. Tech. Civil Engineering

Structural Engineering

Semester- I

Subject code	Subject Name	Teaching scheme (Weekly Load in hrs.)				Credits	Evaluation Scheme						ESE Duration (Hrs.)
							Theory			Practical		Total	
		Lecture	Tutorial	Practical	Total		TAE 20 %	CAE 20 %	ESE 60%	Cont. Asst.	External		
MSTL501	Advanced Mechanics of Solids	3	1	-	4	4	20	20	60	-	-	100	3
MSTL502	Structural Dynamics	3	1	-	4	4	20	20	60	-	-	100	3
MSTL503	Advanced Design of Steel Structures	3	1	-	4	4	20	20	60	-	-	100	3
MSTL504	Research Methodology	3	1	-	4	4	20	20	60	-	-	100	3
MSTL505	Elective –I	2	-	-	2	2	20	20	60	-	-	100	3
MSTP501	Lab Practice – I	-	-	4	4	2	-	-	-	50	50	100	-
MSDP501	Advanced Skill Development	-	-	2	2	AU	-	-	-	-		-	-
	Total	14	4	6	24	20	120	120	360	50	50	600	-

MSTL505 - Elective I

Code	Subjects	Code	Subjects
MSTL505A	Soil Structure Interaction	MSTL505D	Failure Analysis of Structures
MSTL505B	Plastic Analysis and Design of Steel Structures	MSTL505E	Structural Mechanics of modern materials
MSTL505C	Structural Optimization		

Scheme of Examination for M. Tech. Civil Engineering													
Structural Engineering													
Semester- II													
Subject code	**Subject Name EEDM**	**Teaching scheme (Weekly Load in hrs)**				**Credits**	**Evaluation Scheme**						**ESE Duration (Hrs.)**
							Theory			**Practical**		**Total**	
		Lecture	**Tutorial**	**Practical**	**Total**		**TAE 20 %**	**CAE 20 %**	**ESE 60%**	**Cont. Asst.**	**External**		
MSTL506	Finite Element Method	3	1	-	4	4	20	20	60	-	-	100	3
MSTL507	Theory of Plates and Shells	3	1	-	4	4	20	20	60	-	-	100	3
MSTL508	Advanced Design of Concrete Structures	3	1	-	4	4	20	20	60	-	-	100	3
MSTL509	Elective – II	3	-	-	3	3	20	20	60	-	-	100	3
MSTL510	Elective – III	3	-	-	3	3	20	20	60	-	-	100	3
MSTP502	Lab Practice-II	-	-	4	4	2	-	-	-	50	50	100	-
	Total	15	3	4	22	20	100	100	300	50	50	600	-

MSTL509 - Elective II

Code	**Subjects**	**Code**	**Subjects**
MSTL509A	Design of precast components	MSTL509C	Non-linear Analysis of structure
MSTL509B	Design of Foundation	MSTL509D	Design of Hydraulic Structures

MSTL510 - Elective III

Code	**Subjects**	**Code**	**Subjects**
MSTL510A	Advanced analysis of steel Frames	MSTL510C	Design of Concrete Shell Structures
MSTL5105B	Design of Boiler Structures	MSTL510D	Design of Tall Building

Scheme of Examination for M. Tech. Civil Engineering

Structural Engineering

Semester- III

Subject code	Subject Name	Teaching scheme (Weekly Load in hrs.)				Credits	Evaluation Scheme						ESE Duration (Hrs.)
							Theory			Practical		Total	
		Lecture	Tutorial	Practical	Total		TAE 20 %	CAE 20 %	ESE 60%	Cont. Ass.	External		
MSTP601	Technical Writing by LATEX	-	-	6	6	3	-	-	-	50	50	100	-
MSTP602	Seminar-I	-	-	4	4	4	-	-	-	50	50	100	-
MSTP603	Dissertation Phase - I	-	-	8	8	8	-	-	-	100	100	200	-
	Total	-	-	18	18	15	-	-	-	200	200	400	-

Scheme of Examination for M. Tech. Civil Engineering

Structural Engineering

Semester-IV

Subject code	Subject Name	Teaching scheme (Weekly Load in hrs.)				Credits	Evaluation Scheme						ESE Duration (Hrs.)
							Theory			Practical		Total	
		Lecture	Tutorial	Practical	Total		TAE 20 %	CAE 20 %	ESE 60%	Cont. Ass.	External		
MSTP604	Seminar – II	-	-	4	4	4	-	-	-	50	50	100	-
MSTP605	Dissertation Phase - II	-	-	16	16	16	-	-	-	200	100	300	-
	Total	-	-	20	20	20	-	-	-	250	150	400	-

M.Tech. (Structural Engineering)

Course Syllabus

Effective from Academic Year 2016-2017

SEMESTER – I

MSTL501: Advanced Mechanics of Solids		
Teaching Scheme:	**Examination Scheme (Theory)**	**Examination Scheme(Laboratory)**
Lectures: 4 Hrs/Week **Tutorials:** Nil **Practical:** Nil	**TAE:** 20 Marks **CAE:** 20 Marks **ESE:** 60 Marks	**Internal(TW):** Nil **External(OR)**: Nil **External(PR)** : Nil
Credit	**4**	

Course Objective:

1. The main objective of studying the course is to understand the theoretical concepts of material behavior with particular emphasis on their elastic properties.
2. To study the Behavior and properties of materials.

Course Outcomes: Students will be able

* To solve the problems related to Stresses and Strains
* To understand Stress Strain Relation.
* To understand the Coordinate System.
* To solve the problems of Stress Concentration.
* To analyze the Beams, which are Curved in Plan.
* To analyze the Beams, which are Curved in Elevation.
* To understand the concept of Torsion and analyze the Solid Bar for it.
* To analyze the Beams, which are resting on Elastic Foundation.

Course Contents:	Hrs
Module I	6
Analysis of Stresses and Strains : Concept of stress at a point, stress tensor, stress on inclined plane, stress components on a rectangular parallelepiped in Cartesian coordinate system, derivation of stress equilibrium equations, transformation of stresses, stress invariants. The state of strain at a point, strain displacement relations, strain compatibility condition and stress compatibility conditions, Relations between Elastic Constants, Problems on Navier Lame's Equilibrium Equations, Problems on Beltrami-Michell compatibility equations, Boundary value problems in Elasticity.	
Module II	6
Stress-Strain Relationship Generalized Hook's law for Isotropic, Orthotropic, plane stress, plane strain and Axisymmetric problems, Problems in 2D and 3D Cartesian coordinate system, Airy's stress function, bending of beams.	
Module III	6
Polar Coordinate System	

Relationship between Cartesian and Polar coordinate system, Equilibrium equations, Strain displacement relations, Stress-strain relationship, Strain-displacement relationship for plane stress and plane strain conditions	
Module IV	
Stress concentration problems Stress concentration problems such as stress concentration due to circular hole in stressed plate (Kirsch's Problem), stresses under concentrated load such as concentrated load acting on the vertex of a wedge (Michell's Problem) and Concentrated load acting on the free surface of a plate (Flamant's Problem), Axisymmetric Problems such as stresses in thick cylinders subjected to internal and external uniformly distributed pressures (Lame's Problem).	6
Module V	
Beams Curved in Plan Analysis of Beams Curved in Plan such as cantilever circular arc, Semicircular beams fixed at two ends and subjected to central concentrated load, simply supported semicircular beam subjected to UDL supported on three equally spaced columns, Analysis of circular ring beam.	6
Module VI	
Beams Curved in Elevation Analysis of Beams Curved in Elevation, Application to curved circular and elliptical Rings and Crane hooks.	6
Module VII	
Torsion Assumptions and Torsion equation for general prismatic solid bars, Warping of Non-circular sections and St. Venant's theory, Prandtle's stress function approach, Torsion of Circular, Elliptical and Triangular cross-section, Torsion of thin-walled structures by membrane analogy, Torsion of rolled sections and shear flow	6
Module VIII	
Beams on Elastic Foundation Differential equation, Infinite beams with concentrated load, concentrated moment, and finite uniformly distributed load. Semi-Infinite beams with free & hinged ends subjected to finite uniformly distributed load, hinged end. Finite beams with free end and hinged end.	6

Text Books:	
1.	L.S.Sreenath – Advanced Mechanics of Solids, Tata McGraw-Hill Publications
2.	Popov, Egor P.;Popov, E. P.;Balan, Toader A.-*Engineering Mechanics of Solids,* Lebanon, Indiana, U.S.A.: Prentice Hall, 1998, ISBN 10: 0137261594 / ISBN 13: 9780137261598

Reference Books:
1. Swaroop Adarsh---Mechanics of Materials------- New Age International Publishers
2. S. Crandall, N. Dahl and T. Lardner - Mechanics of Solids, McGraw Hill Publications
3. S.S.Bhavikatti – Structural Analysis-II Vikas Publishing House, Pvt Ltd.
4. Enrico Volterra and J. H. Gaines – Advanced Strength of Materials, Prentice Hall
5. Nautiyal, B.D.--Introduction to Structural Analysis--- New Age International Publishers
6. S M A Kazimi – Solid Mechanics, Tata McGraw-Hill Publications
7. Irving Shames, Mechanics of deformable solids, Prentice Hall
8. Scholer, Elasticity in Engineering, McGraw-Hill Publications
9. Sadhu Singh – Theory of Elasticity, Khanna Publishers
10. N. K. Bairagi- Advanced Solid Mechanics- Khanna Publishers, New Delhi.
11. Timoshenko and Goodier - Theory of Elasticity, McGraw-Hill Publications
12. Wang - Applied Elasticity, Dover Publications

MSTL502: Structures Dynamics		
Teaching Scheme:	**Examination Scheme (Theory)**	**Examination Scheme(Laboratory)**
Lectures: 4 Hrs/Week **Tutorials:** Nil **Practical:** Nil	**TAE:** 20 Marks **CAE:** 20 Marks **ESE:** 60 Marks	**Internal(TW):** Nil **External(OR)**: Nil **External(PR)** : Nil
Credit	**4**	

Course Objective:

1. The objective of this subject is to expose student to understand the basic theory of structural dynamics, structural behavior under vibratory load and the effect of damping.

Course Outcome: Students will be able

* To understand the fundamental theory of structural dynamics and study dynamics response of single and multi- degree-of freedom systems.
* To analyses Single Degree of Freedom System for Damped and Undamped Forces.
* To analyze Single Degree of Freedom System for Step and Ramp Forces.
* To understand Nonlinear Analysis.
* To understand Multiple Degree of Freedom System.
* To understand the concept of Mode Shapes and Tuned Dampers.
* To analyze Multiple Degree of Freedom System
* To analyze Continuous System.

Course Contents	Hrs
Module I	6
Nature of exciting forces, degrees of freedom and mathematical modelling of dynamic systems. Single degree freedom system (SDOF): An undamped and damped free vibrations, Viscous and Coulomb’s damping.	
Module II	6
SDOF system: Undamped and damped Forced Vibrations to harmonic excitations, Fourier analysis of periodic forces. Response to unit impulse and arbitrary loading by Duhamel’s integral.	
Module III	6
SDOF system: Step and Ramp forces, Pulse loadings, Response to ground motion and transmissibility	
Module IV	6
Non-linear analysis by step-by-step method with linear acceleration	
Module V	6
Multiple degrees of freedom (MDOF) system: Free vibrations of a shear building, fundamental frequencies and mode shapes	

Module VI	6
Orthogonality of mode shapes, Power and Stodola methods. Concept of Tuned Mass Dampers.	
Module VII	6
MDOF System: Forced Vibrations of shear building, transformation of coordinates and mode superposition method, Response to ground motion. Non-linear analysis by Wilson-Theta method	
Module VIII	6
Continuous system: Free transverse vibrations of beams for various boundary conditions. Free vibration analysis of a cantilever beam by Rayleigh Ritz and Finite Element Method.	

Text Books:
1. Mario Paz – Structural Dynamics Theory and Computation, CBS Publications
2. Anil K Chopra – Dynamics of Structures Theory and Applications to Earthquake Engineering, Prentice-Hall Publications

Reference Books:
1. Dynamics of structures--Poultre, Wiley India
2. R.W Clough and J Penzin – Dynamics of Structures, McGraw Hill Publications
3. R.C. Roy - Structural Dynamics an Introduction to Computer Methods, John Wiley & Sons Publications
4. Madhujit Mukhopadhyay – Structural Dynamics Vibrations and Systems, Ane Books India Publishers.

MSTL503: Advanced Design of Steel Structures		
Teaching Scheme:	**Examination Scheme (Theory)**	**Examination Scheme (Laboratory)**
Lectures: 4 Hrs/Week **Tutorials:** Nil **Practical:** Nil	**TAE:** 20 Marks **CAE:** 20 Marks **ESE:** 60 Marks	**Internal(TW):** Nil **External(OR)**: Nil **External(PR)** : Nil
Credit	**4**	

Course Objective:

1. To design the structures used for workshop buildings, foot bridges, road bridges
2. To study the IS codes.

Course Outcome: Students will be able

* To perform analysis and design of steel members and connections and understand the hoarding design
* To design Complex steel structural systems such as castellated beam.
* To understand the analysis and design of tower.
* To analyzed transmission tower by working stress method.
* To design of tubular Structures.
* To Analyze and Design the Cold form light gauge section.
* To design chimney.
* To design of steel chimney by Working Stress Method.

Course Contents	Hrs
Module I	
Hoarding Structures - Analysis and design of hoarding structures under dead, live and wind load conditions as per codal provisions by limit state method, introduction to fatigue failure.	6
Module II	
Castellated beams - Concept, fabrication of the castellated beam from rolled steel section, design of castellated beam for bending and shear as per codal provisions by limit state method.	6
Module III	
Microwave Towers - Introduction, structural configuration, function, analysis and design.	6
Module IV	
Transmission Towers - Introduction, structural configuration, bracing systems, analysis and design as per codal provisions. Use working stress method	6
Module V	
Tubular Structures - Design of tubular Trusses and scaffoldings using circular hollow, rectangular hollow sections as per codal provisions, detailing of joints.	6
Module VI	
Cold form light gauge section - Type of cross section, stiffened, multiple stiffened and un-stiffened	6

element flat-width ratio, effective design width, design of light gauge compression, tension and flexural members as per codal provisions.	
Module VII	
Design of chimneys – Introduction, type, joints, lining, ladder, forces acting on chimneys, design of thickness of steel plates for self-supporting chimney	6
Module VIII	
Design of base plate, anchor bolt and foundation, stability of steel chimneys. Use working stress method.	6

Text Books:
1. Punmia and Jain, Comprehensive Design of steel structure, Laxmi Publication, Delhi.
2. S K Duggal, Limit state design of steel structures, Tata McGraw Hill Education.

Reference Books:
1. Ram Chandra, Design of steel Structures, Volume II, Standard Book House, Delhi.
2. M Raghupathi, Design of steel structures, Tata McGraw Hill, New Delhi.
3. N Subramanian, Design of steel structures, Oxford University Press.
4. Sarwar Alam Raz—Structural Design in Steel---New Age International Publishers
5. IS: 800 - 2007, Code of Practice for General Construction in Steel, BIS, New Delhi.
6. IS: 800 - 1984, Code of Practice for General Construction in Steel, BIS, New Delhi.
7. IS: 801 - 1975, Code of Practice for use of cold formed light gauge steel structural members in general building construction, BIS, New Delhi.

MSTL504: Research Methodology		
Teaching Scheme:	**Examination Scheme (Theory)**	**Examination Scheme (Laboratory)**
Lectures: 4 Hrs/Week **Tutorials:** Nil **Practical:** Nil	**TAE:** 20 Marks **CAE:** 20 Marks **ESE:** 60 Marks	**Internal(TW):** Nil **External(OR)**: Nil **External(PR)** : Nil
Credit	**4**	
Course Objective:		

Course Outcome: Students will be able

* To understand the basic framework of research process.
* To understand the process of Developing a Research Proposal.
* To collect the information for literature Survey
* To understand data collection, Measuring, Sampling and Scaling.
* To Analyze Preliminary Data.
* To understand Advanced data analysis techniques.
* To write the Report.
* To Present the Research Work.

Course Contents	**Hrs**
Module I	
Introduction to Research, Meaning of research, types of research, process of research, Sources of research problem, Criteria / Characteristics of a good research problem, Errors in selecting a research problem, Scope and objectives of research problem, formulation of research hypotheses**.** Search for causation	6
Module II	
Developing a Research Proposal Format of research proposal, Individual research proposal, Institutional research proposal, Significance, objectives, methodology, Funding for the proposal, Different funding agencies. Framework for the planning	6
Module III	
Literature survey Definition of literature and literature survey, need of literature survey, sources of literature, elements and objectives of literature survey, styles of literature survey, and strategies of literature survey.	6
Module IV	
Data collection, Measuring, Sampling and Scaling— Classification of data, benefits and drawbacks of data, evaluation of data, qualitative methods of	6

data collection, methods of qualitative research, Sampling, sample size, sampling strategy, attitude measurement and scaling, types of measurements, criteria of good measurements, classification of scales.	
Module V	6
Preliminary data analysis- Testing of hypothesis- concepts and testing, analysis of variance techniques, introduction to non-parametric tests. Validity and reliability, Approaches to qualitative and quantitative data analysis,	
Module VI	6
Advanced data analysis techniques Correlation and regression analysis, Introduction to factor analysis, discriminant analysis, cluster analysis, multidimensional scaling, Descriptive statistics, Inferential statistics, Multi-dimensional measurement and factor analysis	
Module VII	6
Report writing Need of effective documentation, importance of report writing, types of reports, report structure, report formulation, Plagiarism	
Module VIII	6
Presentation of research Research briefing, presentation styles, impact of presentation, elements of effective presentation, writing of research paper, presenting and publishing paper, patent procedure	

Text Books:
1. Research Methodology: Methods and Trends', by Dr. C. R. Kothari--- New Age International Publishers
2. Research Methodology: concepts and cases—Deepak Chawla and Neena Sondhi,Vikas Publishing House Pvt.Ltd. (ISBN 978-81-259-5205-3)
Reference Books:
1. Research Methods for Business—Sekaran Uma and Rogure Boudie—Wiley,India
2. Research Methods in Education---Louis Cohen,Manion,Morrison---Routledge(Taylor &Francis Group) / --Cambridge University Press India Pvt. Ltd.-ISBN-978-0-415-58336-7
3. Research Methodology: An Introduction' by Wayne Goddard and Stuart Melville
4. Research Methodology: A Step by Step Guide for Beginners', by Ranjit Kumar
5. Research in Education---John Best and James Kahn,Prentice Hall of India Pvt.Ltd.

MSTL505: Elective- I

MSTL505A: Elective–I Soil Structure Interaction

Teaching Scheme:	**Examination Scheme (Theory)**	**Examination Scheme (Laboratory)**
Lectures: 2 Hrs/Week **Tutorials:** Nil **Practical:** Nil	**TAE:** 20 Marks **CAE:** 20 Marks **ESE:** 60 Marks	**Internal(TW):** Nil **External(OR)**: Nil **External(PR)** : Nil
Credit	**2**	

Course Objective:

Course Outcome: Students will be able

* To understand the Importance and applications of the Subject.
* To understand the concept of foundation.
* To analyze the stress distribution in Elastic and Plastic Condition.
* To understand the Seismic Soil-Structure Interaction
* To understand the Soil Structure Interaction in Retaining Structures.
* To understand the Soil-Pile Behaviour.

Course Contents	**Hrs**
Module I	
Introduction Importance and Applications of Soil Structure Interaction (SSI) a) Introduction to SSI, Importance of SSI, Applications and examples of SSI for structural engineer, Effects of structure roughness/smoothness on soil behaviour. b) General soil-structure interaction problems – Shallow Foundations, Sheet piles, Mat/Raft foundations etc., Contact pressures and soil-structure interaction for shallow Foundations, Fixed/Flexible Base	5
Module II	
a) Concept of sub grade modulus, effects/parameters influencing sub grade modulus, Flexiable and Rigid Foundations – Rigidity calculations, Static and Dynamic Spring Constants – Winkler Model, Estimation of soil spring constants/stiffness for foundations design. b) SSI Models - Elastic Continuum, Winkler Model, Multi-Parameter Models, Hybrid Model. Structure Contact Interface	5
Module III	
Arching in soils. Elastic and plastic analysis of stress distribution on yielding bases. Analysis of conduits/pipes in soils. Beams on elastic foundation concept, introduction to the solution of beam problems	5
Module IV	5

Seismic Soil-Structure Interaction - Dynamic response of soil, strain-compatibility, and damping characteristics of soil-structure. Shake-table tests.	
Module V	
SSI in Retaining Structures: Curved failure surfaces, their utility and analytical/graphical predictions from Mohr-Coulomb envelope and circle of stresses. Earth pressure computations by friction circle method. Earth pressure distribution on walls with limited/restrained deformations, Dubravo's analysis. Earth pressures on sheet piles, braced excavations. Design of supporting system for excavations.	5
Module VI	
Soil-Pile Behaviour: Introduction, axial and laterally loaded piles, load-displacement behaviour, Modified Ramberg Osgood Model, pile group, interaction effect in pile group, soil-pile modelling in FEM, Elastic continuum and elasto-plastic analysis of piles and pile groups. Non-linear load-deflection response.	5

Text Books:
1. Soil Structure Interaction, the real behaviour of structures, Institution of Structural Engineers, 1989.
2. Prakash, S., and Sharma, H. D., "Pile Foundations in Engineering Practice. "John Wiley & Sons, New York, 1990.

Reference Books:	
1.	Bowels J.E., "Analytical and Computer Methods in Foundation", McGraw Hill Book Co. New York.
2.	Desai C.S. and Christian J.T., "Numerical Methods in Geotechnical Engineering" McGraw Hill Book Co. New York.
3.	Elastic Analysis of Soil Foundation Interaction, Developments in Geotechnical Engg.vol-17, Elsevier Scientific Publishing Co.
General Reading Suggested: Codes/Hand books:	
1)	"Foundation Engineering Handbook," H.-Y. Fang, Editor, Van Nostrand Reinhold, 2nd Ed., New York, USA.

MSTL505B : Elective-I Plastic Analysis & Design of Steel Structure		
Teaching Scheme:	**Examination Scheme (Theory)**	**Examination Scheme (Laboratory)**
Lectures: 2 Hrs/Week **Tutorials:** Nil **Practical:** Nil	**TAE:** 20 Marks **CAE:** 20 Marks **ESE:** 60 Marks	**Internal(TW):** Nil **External(OR)**: Nil **External(PR)** : Nil
Credit	**2**	

Course Objective:

Course Outcome: Students will be able

* To understand the various mechanisms of Frames.
* To understand the effects of Forces on the Frames.
* To understand the concept and behavior of Ductile Structures.
* To understand the general methods of Analysis of Frames.
* To Design the rectangular and gable portal frames with Connection.
* To Design the Connections by various methods.

Course Contents	Hrs
Module I	
Plastic collapse loads of gable portal frames, various mechanisms. Analysis of Multi Bay- Multi Storey rectangular portal frame, Joint & Various mechanisms (Two bays - Three storeys)	5
Module II	
Secondary design considerations: Effect of axial force, shear, residual stresses and brittle fracture on moment capacity. Design of beams with high shear, interaction of bending & axial force: section and member strength.	5
Module III	
Concept of ductility; Behavior of ductile structures; Definition of collapse and characteristics of bending moment distribution at collapse; Fundamental theorems; Simple plastic theory of bending; Concept of plastic hinges and mechanisms; Hinge formation in indeterminate structures, Redistribution of moments, Assumption made for structures subjected to bending only; Concept of loaded factors and ultimate load as design criteria.	5
Module IV	
General methods of analysis- load interaction method; analysis by generalized hinge rotation; analysis by combinations of elementary mechanisms; analysis by adjustment of restraints; plastic moment distribution method; Upper and lower bounds.	5
Module V	
Design of rectangular and gable portal frames Design of corner connection with and without haunches. Review of semi-rigid connections.	5

Module VI	
Design of beam to column Moment resisting connections. End plate: Flush & extended, T-Stub connections. Combined tension & shear considerations in welded & bolted connection.	5

Text Books:
(1) "Limit State Design of Steel Structures", Dr. M R Shiyekar, PHI Publication, 3rd Print
(2) A.S. Arya and J.L. Ajmani – Design of Steel Structures, Nemchand& Bros., Roorkee

Reference Books:
1) "Limit state Design of Steel Structures", S K Duggal, McGraw Hill education, 2010
2) Ramchandra – Design of Steel Structures Vol – II, Standard Book House, Delhi
3) B.G. Neal – Plastic Method of Structural Analysis, Chapman & Hall
4) L.S. Beedle – Plastic Design of Steel Frames, John Willey & Sons
5) Structural design in steel by Salwar Alam Raz New Age International Publishers
6) Steel Designers Manual – ELBS
General Reading Suggested: Codes/Hand books: 1) Codes: IS: 800 - 2007 Code of Practice for General Construction in Steel Hand books 2) SP: 6 (6) – 1972 Handbook for Structural Engineers: Application of plastic Theory in Design of Steel Structures 3) Handbook for Structural Engineers SP 6 (8) 1972 (Reaffirmed 1993) – Bureau of Indian Standards. 4) NPTEL

MSTL505C : Elective –I Structural Optimization		
Teaching Scheme:	**Examination Scheme (Theory)**	**Examination Scheme (Laboratory)**
Lectures: 2 Hrs/Week **Tutorials:** Nil **Practical:** Nil	**TAE:** 20 Marks **CAE:** 20 Marks **ESE:** 60 Marks	**Internal(TW):** Nil **External(OR)**: Nil **External(PR)** : Nil
Credit	**2**	
Course Objective:		
Course Outcome: Students will be able * Student should be able to form a problem formulation by Linear Programming for a given structure * Student should be able to form a problem formulation by Non Linear Programming for a given structure. * Student should be able to form Analytical Structural Optimization. * Students should be impart with the knowledge of Formulation of Structural Optimization problems. * Student should be able to implement Sensitive Analysis * Student should be able to use Optimization Technics for 2D, 3D Structures.		

Course Contents	Hrs
Module I	5
Linear Programming I: Introduction to Optimization techniques, Linear programming basic concepts, graphical method, Simplex method	
Module II	5
Non Linear Programming: Unconstrained one Dimensional search methods: Dichotomous search method, Fibonacci, Golden section, Multivariable unconstrained techniques: Steepest ascent and Descent methods, Newton's methods, Constrained technique: Lagrangian Multiplier	
Module III	5
Analytical Structural Optimization Optimal cross-section area profile for the stiffest bar under arbitrary loading. Including the governing equations in the weak form. Imposing upper and lower limits on the area of cross-section. Min-max type problems with stress constraints. Min-max type stress constraint. Deflection constraint at a point. Worst load determination. A case of a single scalar unknown along with an unknown function. Revisiting of the concepts with beam examples. Design for deflection problem for a beam.	

Module IV	5
Numerical implementation of sensitivity analysis Numerical implementation of structural optimization. Beam optimization problem using the optimality criteria method. Truss and frame optimization problem for the desired deflection and an inkling of topology optimization problem. Sensitivity analysis for discretized structural optimization problems; direct and adjoint methods.	
Module V	5
Return to calculus of variations: vibrations, dynamics, and buckling Governing equation for the free vibration of a taut string; derivation using Hamilton's principle to get the eigenvalue problem. Minimum characterization of the eigenvalue problem; Rayleigh quotient. Derivation of the Raleigh quotient for the beam vibration and column buckling. Frequency and mode shape optimization problems for bars and beams. Structural optimization for transient (dynamic) problems.	
Module VI	5
General Structural Optimization Structural optimization of 2D and 3D elasticity problems for stiffness and flexibility. Simple Isotropic Material with Penalty (SIMP) approach to topology optimization. Structural optimization of electro-thermal-compliant actuator problem. Demonstration of the topology optimization programmes. Shape optimization and sensitivity analysis. Numerical optimization methods for structural optimization. Separable problems and dual methods; convex linearization, method of moving asymptotes, generalized convex approximation.	

Text Books:
1. Engineering Optimazation Theory & Practice – S.S. Rao., Wiely. Wiely.
2. Engineering Optimization—Methods and Applications—Ravindran,Wiely
3. Operation Research – Taha Hamdey A.

Reference Books:
1. Principles of Operation Research – Wagner, Prentice Hall.
2. Operation Research – Hira and Gupta, S.Chand.
3. Operation Research—Ravindran-- Wiely.
4. M. Gelfand and S. V. Fomin "Calculus of Variations", Dover publications
5. Smith, D. R., "Variational Methods in Optimization," Dover Publications, 1998.

6. Haftka, R. T. and Gurdal, Z., "Elements of Structural Optimization," Kluwer Academic Publishers, 1992.

<table>
<tr><td colspan="4">MSTL505D : Elective – I Failure Analysis of Structures</td></tr>
<tr><td>Teaching Scheme:</td><td>Examination Scheme (Theory)</td><td colspan="2">Examination Scheme (Laboratory)</td></tr>
<tr><td>Lectures: 2 Hrs/Week
Tutorials: Nil
Practical: Nil</td><td>TAE: 20 Marks
CAE: 20 Marks
ESE: 60 Marks</td><td colspan="2">Internal(TW): Nil
External(OR): Nil
External(PR) : Nil</td></tr>
<tr><td>Credit</td><td>2</td><td colspan="2"></td></tr>
<tr><td colspan="4">Course Objective:</td></tr>
<tr><td colspan="4">Course Outcome:
* Students will be eligible to understand the causes and types of Failure.
* Students will be able understand the different factors of assessment of Failure.
* Students will be able evaluate the Safety factors
* Students will know about different maintenance technique.
* Students will know about different legal responsibilities.
* Students will know about different sensors.</td></tr>
<tr><td colspan="3">Course Contents</td><td>Hrs</td></tr>
<tr><td colspan="3">Module I</td><td rowspan="2">5</td></tr>
<tr><td colspan="3">Causes of failure – Types of failure – why, what, how – durability of materials – Landmark case</td></tr>
<tr><td colspan="3">Module II</td><td rowspan="2">5</td></tr>
<tr><td colspan="3">Performance and shape inadequacy – statistics and reliability – life cycle assessment. Structural failure, material and load effects – environment effect - Non-structural and structural repairs.</td></tr>
<tr><td colspan="3">Module III</td><td rowspan="2">5</td></tr>
<tr><td colspan="3">Biocidal treatment and use of preservatives –deterioration of wood Macro micro level failures, component and sub-system failures - failure theories – analytical models – cases and type of problem in components –safety evaluation.</td></tr>
<tr><td colspan="3">Module IV</td><td rowspan="2">5</td></tr>
<tr><td colspan="3">Structural systems–case studies – pin-jointed steel systems – rigid jointed frames – concrete walls arches – reinforced concrete beams and frames – shells –repair of concrete bridge and water retaining structures. Bridge maintenance techniques</td></tr>
<tr><td colspan="3">Module V</td><td rowspan="2">5</td></tr>
<tr><td colspan="3">The refurbishment of buildings, legal responsibilities – Case studies.</td></tr>
<tr><td colspan="3">Module VI</td><td rowspan="2">5</td></tr>
<tr><td colspan="3">Definition of smartness –sensors – automatic and adaptive systems – smart components</td></tr>
</table>

Text Books:	
1.	Rasnom, W.H., Building Failures, E&F, N. SPON Ltd., 1980.
2.	Moskvin V, Concrete and Reinforced Structures – Deterioration and Protection, Mir Publishers, Moscow, 1980
3.	Kenneth and L. Carper, Forensic Engineering, 2nd Edition, CRC Press, 2001
4.	V K Raina, Concrete Bridge Practice Construction, Maintenance and Rehabilitation, 2nd Edition, Shroff Publishers and Distributors, August, 2010.

Reference Books:	
1.	Kenneth and L. Carper, Forensic Engineering, 2nd Edition, CRC Press, 2001
2.	V K Raina, Concrete Bridge Practice Construction, Maintenance and Rehabilitation, 2nd Edition, Shroff Publishers and Distributors, August, 2010.

MSTL505E : Elective – I Structural Mechanics of Modern Materials		
Teaching Scheme:	**Examination Scheme (Theory)**	**Examination Scheme (Laboratory)**
Lectures: 2 Hrs/Week **Tutorials:** Nil **Practical:** Nil	**TAE:** 20 Marks **CAE:** 20 Marks **ESE:** 60 Marks	**Internal(TW):** Nil **External(OR)**: Nil **External(PR)** : Nil
Credit	**2**	
Course Objective:		
Course Outcome: Students will be able * To know the properties of Modern Materials. * To understand the stress strain relations of Modern Materials. * To understand the failure theories of Modern Materials.		

Course Contents	**Hrs**
Module I	
Introduction to Modern Materials: Fiber-Reinforced Polymer Composite (FRPC) Materials: Definition, Historical development, applications. Fibers and Matrix, types and their properties. Manufacturing process and methods for composites.	5
Module II	
Types and classification of composite materials, properties, advantages over conventional materials. Piezoelectric Materials: History, crystal structure, applications. Shape Memory Alloys (SMA), Functionally Graded Materials (FGM): definition and applications.	5
Module III	
Engineering Properties of Modern Materials: FRPC Composite Lamina: Micromechanics approach, methods. Longitudinal and transverse elastic properties of composite lamina, in-plane shear modulus for continuous fibers. Stress-strain relationship, compliance and stiffness matrices for generally anisotropic, specially orthotropic material, transversely isotropic material, orthotropic, isotropic materials, Plane stress condition for thin lamina, transformation of stress.	5
Module IV	
Three dimensional transformations. Stress-Strain: Force Equilibrium, Strain Compatibility, Constitutive Laws of materials. Introduction to Fracture Mechanics.	5
Module V	
Design of Steel Fiber Concrete elements – flexure, shear, ductility etc., smeared concept, constitutive models for FRC, codal provisions for FRC (ACI, RILEM etc.), Hybrid Fiber composites, behaviour of macro-micro-nano fiber matrix. Stiffness matrix for Functionally Graded Materials. Pultruded Rod, GFR Composite, flexural members, Self healing Materials, Nano Composites.	5

Module VI	
Strength of Composite Lamina: Introduction. Failure theories, Maximum stress theory, Maximum strain theory, Energy based interaction theory (Tsai-Hill), Interactive tensor polynomial theory (Tsai-Wu), Failure mode based theory (Hasin-Rotem). Computation of lamina strength by Tsai-Wu theory for plane stress condition. Comparison of various failure theories.	5

Text Books:	
1.	Isaac M. Daniel and Ori Ishai - Engineering Mechanics of Composite Materials, Oxford University Press, Second Edition, New Delhi.
2.	Michael W. Hyer - Stress Analysis of Fiber-Reinforced Composite Materials, WCB/McGraw-Hill, Singapore.

Reference Books:	
1.	Jones R. M. – Mechanics of Composite Materials, McGraw-Hill, New York
2.	Roman Solecki and R Jay Conant – Advanced Mechanics of Materials, Oxford University Press, New York, Special Edition for sale in India.

MSTP501 :Lab Practice - I		
Teaching Scheme:	**Examination Scheme (Theory)**	**Examination Scheme (Laboratory)**
Lectures: Nil **Tutorials:** Nil **Practical:** 4 Hrs/Week	**TAE:** Nil **CAE:** Nil **ESE:** Nil	**Internal(TW):** 100 **External(OR)**: **External(PR)** : Nil
Credit	**4**	

Course Outcome: Students will be able

- To explore the field aspects of various Subjects.
- To solve the problems related to all the subjects
- To understand the working of Shake Table.
- To use software like STAAD-Pro / Anysis / Etabs / SAP.
- To give review on patent
- To conduct the Non Destructive Test for Old as well ssas New Structures.

Course Contents

The lab. Practice - I will be based on completion of assignments / practicals / reports of site visits, confined to the course in that semester. The term work will consist of --

i)	Visit reports of minimum three site visits, exploring the field aspects for various subjects
ii)	Report on minimum 3 assignments / designs / laboratory work on each subject.
iii)	Report on the experimental work based on Horizontal and Vertical Shake Table is mandatory.
iv)	Report on minimum 2 software applications on any subject of the semester.
v)	Report on at least one patent with its details studied in any subject of the semester.
vi)	Report on the experimental work based on Non Destructive Tests for Old Structures and New Structures.

SEMESTER – II

MSTL506: Finite Element Method		
Teaching Scheme:	**Examination Scheme (Theory)**	**Examination Scheme (Laboratory)**
Lectures: 4 Hrs/Week **Tutorials:** Nil **Practical:** Nil	**TAE:** 20 Marks **CAE:** 20 Marks **ESE:** 60 Marks	**Internal(TW):** Nil **External(OR)**: Nil **External(PR)** : Nil
Credit	**4**	

Course Objective:

Course Outcome: Students will be able

- Student will be able to understand variational calculation regarding FEM.
- Student will be able to understand Two dimensional element using calculus.
- Student will be able to formulate Load vector.
- Student will be able to understand shape function and three dimensional element.
- Student will be able to understand axisymetric problems.
- Student will be able to know formulation procedure.
- Student will be able to understand Thin plate bending element.
- Student will be able to calculate shell element of different shapes.

Course Contents	Hrs
Module I	6
a) Background on variational calculus. Galerkin methods, Collocation methods, Least squares methods. Variational methods of approximation- Rayleigh-Ritz method. b) Variational theorem; Principle of minimum potential energy, Use of polynomial displacement function. Variational approach for formulation of element stiffness matrix for truss and beam elements	
Module II	6
Two dimensional elements in plane stress /plane strain problems. CST, LST & Rectangular elements, modelling considerations; aspect ratio, Use of polynomial displacement functions, Pascal triangle. Requirements for convergence, Geometric Invariance, Grid refinement.	
Module III	6
Standard stiffness and load vector formulation procedure using variational principle.	
Module IV	6
a) Shape functions in cartesian & natural coordinate systems, shape functions for one dimensional element such as truss & beam. Shape function for two dimensional elements. b) Three dimensional elements such as Tetrahydron, Hexahydron, shape functions, stress strain relations	
Module V	

Axisymmetric elements in axisymmetric problems, stress strain relations, triangular and Quadrilateral elements.	6
Module VI	
Concept of isoparametric elements and isoparametric mapping, Jacobian Matrix, Formulation procedure for 2 D quadrilateral isoparametric element in plane elasticity problem, 3-D isoparametric elements.	6
Module VII	
Thin Plate bending elements, various Triangular and Rectangular elements, ACM (Adini, Clough, Melosh) and BFS (Bogner, Fox, Schimdt) elements Conforming & nonconforming elements, Concept of four noded & eight nodded isoparametric elements, Mindlin's hypothesis for plate bending element	6
Module VIII	
a) Flat & curved shell element, elements for cylindered shells, curved solid element b) Ahmad's degenerated solid element, Pawsey's eight noded shell element.	6

Lab Practice assignment for the term work	
1	Any three assignments based on FEM by using coding tools such as EXCEL, MATLAB etc. for a) Formulation of stiffness matrix for any 1-D element b) Formulation of stiffness matrix for any 2-D element c) Formulation of stiffness matrix for any 3-D element d) Assembly procedure using Jacobian matrix
2.	Finite Element Method – Software applications of any one of following cases using either SATDD-Pro / Anysis / Etabs / SAP . a) Plane stress / plane strain problem b) Axisymmetric problem c) Three dimensional problem d) Plate or shell structures

Text / Reference Books: Text Book to be decided by instructor.
1. S.S. Bhavikatti - Finite Element Analysis – New Age International Publishers, DelhI
2. Thompson, Introduction to the Finite Element,Method: Theory, Programming and Applications, Wiley,India
3. C.S. Krishnamoorthy – Finite Element Analysis – Theory & Programming – Tata McGraw Hill Publishing Co. Ltd
4. Zienkiewicz & Taylor - The Finite Element Method 4th Edition – Vol – I & II – McGraw Hill International Edition

5.	Robert D. Cook, D.S. Malkus, M. TECH. Plesha – Concepts & Applications of Finite Element Analysis – Wiley, India.
6.	J.N. Reddy – An Introduction to the finite element method – Tata McGraw Hill Publishing Co. Ltd
7.	S.S. Rao - The Finite Element Method in Engineering 4th Edition – Elsevier Publication
8.	G.R. Buchanan – Finite Element Analysis Schaum's outlines - Tata McGraw Hill Publishing Co. Ltd
9.	Segerlind L.J. – Applied Finite Element Analysis - John Wiley & Sons.
10.	Energy & Finite Element Methods in Structural Mechanics by Iriving Shames & Clive Dym, New Age International Publishers, Delhi.

<table>
<tr><th colspan="4">MSTL507: Theory of Plates and Shells</th></tr>
<tr><td>Teaching Scheme:</td><td>Examination Scheme (Theory)</td><td colspan="2">Examination Scheme (Laboratory)</td></tr>
<tr><td>Lectures: 4 Hrs/Week
Tutorials: Nil
Practical: Nil</td><td>TAE: 20 Marks
CAE: 20 Marks
ESE: 60 Marks</td><td colspan="2">Internal(TW): Nil
External(OR): Nil
External(PR) : Nil</td></tr>
<tr><td>Credit</td><td>4</td><td colspan="2"></td></tr>
<tr><td colspan="4">Course Objective:</td></tr>
<tr><td colspan="4">Course Outcome: Students will be able
* To understand the logic of thin plates and shells.
* To understand the basic of analysis of Plates.
* To analyze the Rectangular Plates.
* To analyze the Circular Plates.
* To understand the geometry of Shells.
* To design the cylindrical Shells.
• To solve complex problems by bending theory
• To solve complex problems by Beam theory of cylindrical shells</td></tr>
<tr><td colspan="3">Course Contents</td><td>Hrs</td></tr>
<tr><td colspan="3">Module I</td><td rowspan="2">6</td></tr>
<tr><td colspan="3">Introduction: Thin and thick plates, small and large deflections. Small deflection theory of Thin plates: Assumptions, Moment Curvature relations. Stress resultants. Governing differential equation in Cartesian co-ordinates, various boundary conditions. Pure Bending of Plates</td></tr>
<tr><td colspan="3">Module II</td><td rowspan="2">6</td></tr>
<tr><td colspan="3">Analysis of Rectangular Plates: Navier solution for plates with all edges simply supported. Distributed loads, point loads and rectangular patch load.</td></tr>
<tr><td colspan="3">Module III</td><td rowspan="2">6</td></tr>
<tr><td colspan="3">a) Levy’s Method: Distributed load and line load. Plates under distributed edge moments. Raleigh- Ritz approach for simple cases in rectangular plates.
b) Introduction to shear deformation theories. Reissener - Mindlin Theory, Moment curvature relationship for First order shear deformation theory</td></tr>
<tr><td colspan="3">Module IV</td><td rowspan="2">6</td></tr>
<tr><td colspan="3">a) Circular Plates: Analysis of circular plates under axi-symmetric loading. Moment Curvature relations. Governing differential equation in polar co-ordinates.
b) Simply supported and fixed edges. Distributed load, ring load, a plate with a central hole.</td></tr>
</table>

Module V	
a) Introduction: Classification of shells on geometry, thin shell theory, equations to shell surfaces, stress resultants, stress- displacement relations, compatibility and equilibrium equations. b) Shells of Revolution: Membrane theory, equilibrium equations, strain displacement relations, boundary conditions, cylindrical, conical and spherical shells.	6
Module VI	
a) Circular cylindrical shells: Membrane theory: Equilibrium equations, strain displacement relations, boundary conditions.	6
Module VII	
Bending Theory: Equilibrium equation, strain displacement relations, governing differential equation, solution for a simply supported cylindrical shell, various boundary conditions. Application to pipes and pressure vessels.	6
Module VIII	
Beam theory of cylindrical shells: Principles of Lundgren's beam theory, beam analysis, arch analysis and application to cylindrical roof shells.	6

Text / Reference Books: Text Book to be decided by instructor.
1. S. Timoshenko and W. Krieger, Theory of Plates and Shells, Mc Graw Hill.
2. Ansel C. Ugural Stresses in Plates and Shells, Mc Graw Hill
3. G. S Ramaswamy, Design and Construction of Concrete Shell Roofs, CBS Publications
4. Chandrashekhara K., Analysis of Concrete Shells, New Age International Edition
5. Chandrashekhara K., Analysis of Plates, New Age International Edition.

MSTL508: Advanced Design of Concrete Structures		
Teaching Scheme:	**Examination Scheme (Theory)**	**Examination Scheme(Laboratory)**
Lectures: 4 Hrs/Week **Tutorials:** Nil **Practical:** Nil	**TAE:** 20 Marks **CAE:** 20 Marks **ESE:** 60 Marks	**Internal(TW):** Nil **External(OR)**: Nil **External(PR)** : Nil
Credit	**4**	
Course Objective:		
Course Outcome: Students will be able * To analyze the special structures by Yield line theory. *To design various types of Slabs with relevant IS codes. *To design Flat Slabs with relevant IS codes. *To analyze and design various Elevated Service Reservoir with relevant IS codes. *To analyze and design Silos, Bunkers and Chimney. *To design Raft and Pile Foundations. *To design Shear Wall and Formwork.		

Course Contents	Hrs
Module I	6
Yield line theory for analysis of slabs, Various patterns of yield lines, Assumptions in yield line theory, Equilibrium and virtual work method of analysis,	
Module II	6
Design of various slabs such as rectangular, triangular, circular with various edge conditions Using yield line theory, Design for limit state of strength and serviceability orthotropically reinforced slabs,	
Module III	6
Grid and coffered floors, general features, rigorous and approximate method of analysis design of grid floor by approximate method, Design of flat slab, column and middle strip, proportioning of flat slab element,	
Module IV	6
Design methods for flat slabs, Design by direct method only of intermediate and end panel, total design moment, distribution of moments, effect of pattern loading, Design for shear.	
Module V	6
Elevated service reservoir – Rectangular and Circular type only flat bottom, Design of staging for wind and earthquake forces, Effect of joint reactions and continuity	
Module VI	6
Design of Bunkers, Silos, and chimney—Square and circular bunkers, silos shallow and deep	
Module VII	6
Design of raft foundations, Pile foundations, single pile, group of piles, Pile cap	
Module VIII	6
Design of Shear wall, design of form work for slabs, girders, columns etc.	

	Text / Reference Books: Text Book to be decided by instructor
1.	Advance R.C.C.DesignBy S.S.Bhavikatti, New Age International Publishers
2.	B.C. Punmia, Ashok K. Jain, Arun K. Jain – Reinforced Concrete Structures Vol. II, Laxmi Publications, New Delhi
3.	N.C. Sinha, S.K. Roy – Fundamentals of Reinforced Concrete, S. Chand & Co. Ltd, New Delhi
4.	P.C. Varghese – Advanced Reinforced Concrete Design, Prentice Hall of India Pvt. Ltd., New Delhi
5.	Reinforced Concrete design ---Dr.H.J.Shah—Charotar publishing house
6.	Design of R.C.C—S. Ramaamruthum -- Dhanpat Rai publications
7.	.IS: 456-2000 Indian Standard code of practice for plain and reinforced concrete, Bureau of Indian Standards, New Delhi.
8.	IS: 1893:-2002 Indian Standard Code of practice for criteria for Earthquake resistant design of Structures, Bureau of Indian Standards, New Delhi.
9.	IS: 3370-Indian Standard code of practice for concrete structures for storage of liquids, Bureau of Indian Standards, New Delhi

MSTL509A: Elective - II Design of Precast Components		
Teaching Scheme:	**Examination Scheme (Theory)**	**Examination Scheme (Laboratory)**
Lectures: 3 Hrs/Week **Tutorials:** Nil **Practical:** Nil	**TAE:** 20 Marks **CAE:** 20 Marks **ESE:** 60 Marks	**Internal(TW):** Nil **External(OR)**: Nil **External(PR)** : Nil
Credit	**3**	
Course Objective:		

Course Outcome: Students will be able

* To prepare a site plan for the precast construction.
* To define the loads acting on individual elements of the structure.
* To understand the Behaviour Prefabricated Components.
* To design for Flexure.
* To understand Necessity of Joints and Connections in construction.
* To Design the Ferrocrete Structures.

Course Contents	Hrs
Module I Introduction	6
History and Development of Precast concrete construction, Advantages and disadvantages of precast concrete construction; different types of units involved in general building construction, including residential, factory and industrial framed structure; their general principles of design; mechanical handling of large projects like stadium, bridges etc.	
Module II	6
Materials viz. Concrete, Self- Compacting Concrete, Grout, Reinforcement and structural welded wire cages. Requirements of industrialized buildings, standardization of precast elements and unification of building design. Influence of manufacture, transport and erection technologies on design solution (Modular and Tilt-Up); expansion and contraction joints.	
Module III	6
Prefabricated Components and Its Behaviour Design of Precast Concrete Components and Behaviour of structural components, large panel constructions, Construction of roof and floor slabs, Wall panels, Beams, Columns, Shear walls.	
Module IV	6
Design for Flexure: Strength Design (Depth of Stress block, Flanged Elements, Strength reduction factor, Limitations on reinforcement, Critical sections), Service load design. Design for Shear: Horizontal and vertical shear resistance.	

Module V	
Joints and Connections	6
Joints and connections in precast construction; classification and their requirements. Design of Concrete bracket and corbels; Cantilever beam-design method, Strut-and-tie method. Introduction to Hanger Connections. Design of bearing pads, column bases and moment connections. Typical connection designs for lateral load resisting systems.	
Module VI	
Design of Ferrocrete Structures	6
Design, analysis and optimization, Special design considerations, Typical features of ferrocrete affecting design, Design criteria, Rational method of design ferrocrete structure. Strength through shape, Shape and form of a structure, various structural forms and their behaviour, Comparative study of various forms	

Text / Reference Books: Text Book to be decided by Instructor	
1.	Ferrocement Construction Mannual-Dr. D.B.Divekar-1030,Shivaji Nagar, Model Colony, Pune
2.	CBRI, Building materials and components, India, 1990
3	Gerostiza C.Z., Hendrikson C. and Rehat D.R., Knowledge based process planning for construction and manufacturing, Academic Press Inc., 1994
4.	PCI Design Handbook – Precast and Prestressed Concrete (6th Edition), ISBN – 0-937040-71-1.
5.	Koncz T., Manual of precast concrete construction, Vols. I, II and III, Bauverlag, GMBH, 1971.
6.	Structural design manual, Precast concrete connection details, Society for the studies in the use of precast concrete, Netherland Betor Verlag, 1978.
7.	State-of-the-art report and guide for Design, Construction and Repairs of Ferrocement; ACI committee Report. No ACI549R- 88 and ACI 549.1R.88. Published by American Concrete Institute, Detroit, USA
8.	Ferrocement --- B R Paul and R P Pama. Published by International Ferrocement Information Centre. A. I. T. Bangkok, Thailand.
9.	Ferrocement and laminated cementitious composites--- A E Naaman.: Techno-press, Ann Arbor, Michigan, U S A.
10.	Ferrocement - Materials and applications-- Publication SP 61, A C I Detroit. U S A
11.	Concrete Technology by Kulkarni & Ghosh, New Age International Publishers
12.	Ferrocement code -ACI 549.1R

MSTL509B: Elective - II Design of Foundations

Teaching Scheme:	Examination Scheme (Theory)	Examination Scheme (Laboratory)
Lectures: 3 Hrs/Week **Tutorials:** Nil **Practical:** Nil	**TAE:** 20 Marks **CAE:** 20 Marks **ESE:** 60 Marks	**Internal(TW):** Nil **External(OR)**: Nil **External(PR)** : Nil
Credit	**3**	

Course Outcome:

* Student will be able to understand the Soil Structure Interaction.
* Student will be able to Design the Raft Foundations.
* Student will be able to understand the theory of Pile Foundation.
* Student will be able to Design Shell Foundations.
* Student will be able to Design precast and in situ Pile.
* Student will be able to analyze and design of various type of retaining wall.

Course Contents	Hrs
Module I	
Soil Structure Interaction Foundation objectives and their importance, Classification of foundations, Soil classification. Geotechnical design parameters, bearing capacity, settlements and factors affecting settlement. Loads for design, depth of foundation and depth of soil exploration. Parameters for design of foundation on various types of soil, soil structure interaction	6
Module II	
Design of Raft Foundations Types of rafts, Design of Flat slab raft foundation. Design of beam and slab raft foundation.	6
Module III	
Pile Foundation –I Function and Classification of piles, Concrete piles, Precast and cast-in-situ piles. Static point and skin resistance capacity of a Pile, Pile settlements. Laterally loaded Piles. Various pile group patterns, Efficiency of Pile in group, Negative skin friction.	6
Module IV	
Shell Foundations: Types and applications, Soil structure interaction, Membrane analysis for Hyper and Conical RC shells with and without edge beams, detailing of critical sections.	

Module V	
Pile Foundation-II IS code recommendations for structural design for various piles. Design of RC cast-in-situ and precast pile by IS code method. Pile group analysis by rigid and flexible methods, Design of pile cap.	6
Module VI	
Retaining Wall Function and Classification of retaining wall, IS code recommendation for structural design of various retaining wall, Design of Cantilever Retaining Wall.	6

Text / Reference Books:Text Book to be decided by Instructor	
1.	Kurain N.P, Modern Foundations: Introduction to Advance Techniques: TataMcGraw Hill,1982
2.	Kurain N. P, Design of foundation systems Principles and Practice, Narosa Publishing house, New Delhi, 2005.
3.	Dr. H.J.Shah, Reinforced Concrete, Vol II, Charotar Publishing House.
4.	Winterkorn H.F. and Fang H.Y. Ed., Foundation Engineering Hand Book, Van-Nostrand Reynold, 1975
5.	Bowles J.E., Foundation Analysis and Design (4th Ed.), Mc.Graw –Hill, NY, 1996
6.	Poulose H.G. and Davis E.H., Pile foundation Analysis and Design, John-Wiley Sons, NY, 1980.
7.	Leonards G. Ed., Foundation Engineering, Mc.Graw-Hill, NY, 1962
8.	Shamsher Prakash, Soil Dynamics, McGraw Hill
9.	Sreenivasalu & Varadarajan, Handbook of Machine Foundations, Tata McGraw Hill
10.	O'Neil, M.W. and Reese, L.C. "Drilled Shafts: Construction Procedures and Design Methods", FHWA Publication No. FHWA-IF-99-025, Federal Highway Administration, Washington, D.C., USA, 1999.
11.	P. C. Varghese, "Design of Reinforced Concrete Foundations", PHI Learning Pvt. Ltd., New Delhi, 2009.
12.	IS 1904: 1986 Code of practice for design and construction of foundations in soils: general requirements (Third Revision)
13.	IS 2911: Part 1: Sec 1 to3: 1979 Code of practice for design and construction of pile foundations: Part 1 Concrete piles
14.	IS 2911: Part 1: Sec 4: 1984 Code of practice for design and construction of pile foundations: Part 1 Concrete piles

15.	IS 2911: Part 3: 1980 Code of practice for design and construction of pile foundations: Part 3 Under-reamed piles
16.	IS 2950: Part 1: 1981 Code of Practice for design and construction of raft foundations: Part 1: Design
17.	IS 2974: Part 1to 5: 1982 Code of practice for design and construction of machine foundations
18.	IS 14458 PART 9 Design of RCC cantilever wall/buttresses walls /L-type walls

MSTL509C: Elective - II Non Linear Structural Analysis		
Teaching Scheme:	**Examination Scheme (Theory)**	**Examination Scheme (Laboratory)**
Lectures: 3 Hrs/Week **Tutorials:** Nil **Practical:** Nil	**TAE:** 20 Marks **CAE:** 20 Marks **ESE:** 60 Marks	**Internal(TW):** Nil **External(OR)**: Nil **External(PR)** : Nil
Credit	**3**	
Course Objective:		

Course Outcome: Students will be able

* To Validate Designs and Types of Nonlinearities.
* To Predict Product Performance and Geometrically Nonlinear Beam Problems.
* To use Nonlinear Analysis of Columns in practice.
* To use Nonlinear Analysis of Trusses and Nonlinear Elastic Analysis of Frames.
* To understand the basics of Nonlinear Static Analysis of Plates.
* To use detailed Nonlinear Static Analysis of Plates.

Course Contents	Hrs
Module I	6
Types of Nonlinearities - Geometric Nonlinearity, Material Nonlinearity, Nonlinear Governing Equation for Beams: Moment-curvature Nonlinearity, Geometric Nonlinearity Due to Stretching, Material Nonlinearity,	
Module II	6
Geometrically Nonlinear Beam Problems - Moment-Curvature Nonlinearity-Cantilever Beam, Centrally Loaded beam with two supports, Cantilever Beam subjected to Tip Load	
Module III	6
Nonlinear Analysis of Columns- Post buckling of cantilever column, Large deflection of column with both ends hinged	
Module IV	6
Nonlinear Analysis of Trusses and Nonlinear Elastic Analysis of Frames - Derivation of non-linear stiffness matrix, Matrix displacement method for nonlinear analysis of structures, Non-linear analysis of plane frames.	
Module V	6
Nonlinear Static Analysis of Plates- Geometric and Material Nonlinearities, Governing Nonlinear Equations of Plates: Stress Function Approach, Displacement Equations Approach.	
Module VI	6
Nonlinear Static Analysis of Plates - Boundary Conditions and method of solution, Large Deflection of Rectangular Plates.	

Text / Reference Books: Text Book to be decided by Instructor	
1.	M. Sathyamoorthy, ‘Nonlinear Analysis of Structures’, CRC Press, New York
2.	K.I. Majid, ‘Non Linear Structures’, Butter worth Publishers, London.
3.	N G R Iyengar, ‘Elastic Stability of Structural elements’, Macmillan India Ltd.

MSTL509D: Elective - II Design of Hydraulic Structures		
Teaching Scheme:	**Examination Scheme (Theory)**	**Examination Scheme (Laboratory)**
Lectures: 3 Hrs/Week **Tutorials:** Nil **Practical:** Nil	**TAE:** 20 Marks **CAE:** 20 Marks **ESE:** 60 Marks	**Internal(TW):** Nil **External(OR)**: Nil **External(PR)** : Nil
Credit	**3**	
Course Objective:		
Course Outcome: Students will be able * To prepare planning and investigation * To analyze and design the Dams. * To analyze and design the Arch Dams. * To work for construction of dams. * To work on foundation treatment. * To Design the Weirs on Permeable foundation.		

Course Contents	**Hrs**
Module I	6
Investigation and Planning -Preliminary investigations and preparation of reports, Layout of projects, Geological and hydrological investigations.	
Module II	6
Analysis and Design of Dams - Earthen Dam and Gravity Dam.	
Module III	6
Analysis and Design of Arch Dam, Infiltration Gallery, Collector wells.	
Module IV	6
Construction of Dams - Masonry, Concrete and Earthen Dams,	
Module V	6
Foundation for Dams –Principles of Foundation treatment, grouting methods.	
Module VI	6
Design of Weirs on Permeable foundation - Creep theory, Potential theory, Flow nets, design of weirs - Khosla’s theory	

Text . Reference Books:Text Book to be decided by Instructor	
1.	Creager, W.P. Justin D, and Hinds, J., Engineering for Dams Vol. I, II and III.
2.	Kushalani, K.B., Irrigation (practice and design) Vol. III and IV.
3.	P. Novak , A.I.B. Moffat , C. Nalluri , R. Narayanan , Hydraulic Structures, CRC Press, 4 edition, 2007.

4. Ken Weaver and Donald Bruce ,Dam Foundation Grouting, American Society of Civil Engineers, Rev Exp edition , 2007.		
MSTL510A: Elective - III Advanced analysis of steel Frames		
Teaching Scheme:	**Examination Scheme (Theory)**	**Examination Scheme (Laboratory)**
Lectures: 3 Hrs/Week **Tutorials:** Nil **Practical:** Nil	**TAE:** 20 Marks **CAE:** 20 Marks **ESE:** 60 Marks	**Internal(TW):** Nil **External(OR)**: Nil **External(PR)** : Nil
Credit	**3**	
Course Objective:		
Course Outcome: Students will be able * To analyze the Elastic Stability and Structural Instability. * To understand First Order Elastic and Inelastic Analysis of Portal Frames. * To consider Second Order in Elastic Analysis of Frames. * To perform Direct Second Order in Elastic Analysis for International Codal Provision. * To consider Second Order in Inelastic Analysis of Frames. * To Design the frames by using advanced analysis		

Course Contents	**Hrs**
Module I	6
Elastic stability & structural Instability, Review of critical loads of long columns for various boundary conditions; beam-columns, critical load of simple rectangular frames. Columns with initial imperfection.	
Module II	6
First order elastic (FOE) & first order inelastic (FOIE) (Plastic) analysis of rectangular portal frames. Elastic & limit state of strength of frame.	
Module III	6
Second order considerations in elastic analysis of frames P-δ & P-Δ effect. Critical load of single bay, single storey portal frame using P-δ & P-Δ effect; classical & semi geometrical approach.	
Module IV	6
Direct second order elastic analysis (SOE), international codal provisions, application for simple frame	
Module V	6
Second order inelastic (SOIE) analysis of frames, elastic plastic hinge analysis, plastic zone method, use of finite element method Refined plastic hinge analysis, reduction in stiffness of member due to plasticity at hinge. Advantages of advanced analysis.	
Module VI	6
Design of frame using advanced analysis. Use of suitable software illustrating difference in	

analytical results among all methods such as FOE, FOIE, SOE, SOIE.	

Text / Reference Books: Text Book to be decided by Instructor	
1	“Stability Analysis & design of Structures” M.L. Gambhir, Springer, SIE
2	“Stability of structures” , Ashwini Kumar, Allied Publishers Ltd.
3	“Advanced Analysis of steel frames, Theory Software and application”, W F Chen, S. Toma, CRC press, Tokyo
4	“Plastic Analysis and Design of Steel Structures”, M Bill Wong, Elsevier
1.	“LRFD steel design using Advanced Analysis”, W F Chen, S. Kim, CRC press.

MSTL510B: Elective - III Design of Boiler Structures		
Teaching Scheme:	**Examination Scheme (Theory)**	**Examination Scheme (Laboratory)**
Lectures: 3 Hrs/Week **Tutorials:** Nil **Practical:** Nil	**TAE:** 20 Marks **CAE:** 20 Marks **ESE:** 60 Marks	**Internal(TW):** Nil **External(OR)**: Nil **External(PR)** : Nil
Credit	**3**	
Course Objective:		
Course Outcome: Students will be able * To classify the boiler * To identify different components of Boiler Structure. * To design the Drum Lifting Structures. * To analyze and design the foundation for boiler structures. * To analyze and design platform structure. * To understand Buck stay beams-key channel		
Course Contents		

Module I	**Hrs**
Type of boilers: Top supported - Utility boilers- Tower type- Two pass system- Once through boiler- Bottom supported - Industrial boilers-Bi drum Layout configuration-Front mill layout-Rear mill layout- Side mill layout-column configuration for 210MW-250MW-500MW and lower capacity boilers.	6
Module II	
Boiler Structure Structural components- Columns-beams-vertical bracings- ceiling structure including ceiling girders-girder pin connection-horizontal truss work-platforms- weather protection structure-stair ways-mid landing plat forms-handrails - floor grills-post and hangers -inter connection platforms- lift structure-mill maintenance plat form structure-duct supports-furnace guide supports-Eco coil handling structure-ID system structure-Fan handling structure.	6
Module III	
Drum lifting Structure: Design loads: Dead loads – pressure parts-ducts-fuel pipe-platform-critical pipe - lining and insulation- silencer- weather protection roof-side cladding-cable tray and pipe rack Live load-wind load-seismic load-guide load-temperature load-customer load- handling loads-contingency load etc.,	6
Module IV	
Foundation analysis-Foundation materials-main columns-auxiliary columns-horizontal beams-vertical bracings-MBL concept-horizontal truss work-girder-pin connection- ceiling main girders-cross girders-pressure parts support beams-ceiling truss work- drum floor-stairs-mid landing plat	6

forms-hand rails-floor grills-fasteners	
Module V	6
Platform Structure: Access platforms required for ducts, equipment, and furnace etc-Air heater supports-Fuel pipe support-Duct support- Primary & Secondary air ducts - Bus duct- SCAPH-Flue gas duct supports.	
Module VI	6
Buck stay beams-key channel - leveller guides-vertical buckstay-furnace guide- corner connections-link ties-hanger tie rods-hanger spring - hopper truss work -goose neck truss work - wind box truss work-expansion measurement instrument	

Text / Reference Books:	
1.	Subramanian N, Design of Steel Structures, Oxford University Press, New Delhi 2008. Department of Civil Engineering, National Institute of Technology, Tiruchirappalli – 620 015. 26
2.	Bhavikatti, S.S., Design of Steel Structures, I.K. International Publishing House Pvt. Ltd., New Delhi, 2010.
3.	Punmia B.C., Comprehensive design of steel structures, Lakshmi Publications, New Delhi 2000.
4.	IS800:2007 – Code of Practice for general construction in steel.

<table>
<tr><th colspan="4">MSTL510C: Elective - III Design of Concrete Shell Structures</th></tr>
<tr><td>Teaching Scheme:</td><td>Examination Scheme (Theory)</td><td colspan="2">Examination Scheme (Laboratory)</td></tr>
<tr><td>Lectures: 3 Hrs/Week
Tutorials: Nil
Practical: Nil</td><td>TAE: 20 Marks
CAE: 20 Marks
ESE: 60 Marks</td><td colspan="2">Internal(TW): Nil
External(OR): Nil
External(PR) : Nil</td></tr>
<tr><td>Credit</td><td colspan="3">3</td></tr>
<tr><td colspan="4">Course Objective:</td></tr>
<tr><td colspan="4">Course Outcome: Students will be able
* To classify the plates and methods of analysis and design.
* To design the flat and concave plates.
* To understand Membrane and bending theory of Shells.
* To use modified beam methods.
* To design various shells.
* To Design of Pre-stressed cylindrical shell and dome.</td></tr>
<tr><td colspan="4">Course Contents</td></tr>
<tr><td colspan="3">Module I</td><td>Hrs</td></tr>
<tr><td colspan="3">Types of plates, scope and assumptions, Simpson and Iteration method of analysis and design, Ridge load resolution, edge shear, stress distribution, deflection and rotations, joint moment effect, design of north-light folded plate</td><td>6</td></tr>
<tr><td colspan="3">Module II</td><td rowspan="2">6</td></tr>
<tr><td colspan="3">Design of flat and concave plate circular in shape resting on ring beam, Continuous folded plate design.</td></tr>
<tr><td colspan="3">Module III</td><td rowspan="2">6</td></tr>
<tr><td colspan="3">Membrane and bending theory of shells, Theories in Matrix form, Boundary conditions, Shell Parameter selection, Stress resultant calculation, Reinforcement parameters and details, composition of Ferro-cement shells.</td></tr>
<tr><td colspan="3">Module IV</td><td rowspan="2">6</td></tr>
<tr><td colspan="3">Design by Beam theory, Beam and arch analysis, modified beam method,</td></tr>
<tr><td colspan="3">Module V</td><td rowspan="2">6</td></tr>
<tr><td colspan="3">Design of Multiple bay cylindrical shell, Design of North light cylindrical shell, continuous cylindrical shell, hyperbolic paraboloid shell,</td></tr>
</table>

Module VI	
Design of Pre-stressed cylindrical shell and dome, selection of optimum pre-stressing force, effect of pre-stressing force on stress distribution in shell	6

Reference Books:	
1.	G. S. Ramaswamy, ‘Design and construction of concrete shell roofs’, CBS publication
2.	Naaman `Ferrocement Construction
3.	S. Timoshenko and W. Krieger, Theory of Plates and Shells, McGraw Hill.
4. 5.	Ansel C. Ugural‘Stresses in Plates and Shells’, McGraw Hill Chandrashekhara K., ‘Analysis of Concrete Shells’, New Age International Edition
6.	Chandrashekhara K., ‘Analysis of Plates’, New Age International Edition
7.	S. S. Bhavikatti, ‘Theory of plates and shells’, New Age International Publication
8.	T.Y. Lin & Ned H. Burns – Design of Prestressed Concrete Structures, John Wiley Publication
9.	N. Krishna Raju – Prestressed Concrete, Tata McGraw Hill Publication Co
10	IS: 456: Indian Standard code of practice for plain and reinforced concrete, Bureau of Indian Standards, New Delhi.
11	IS: 1343: Indian Standard code of practice for Prestressed concrete, Bureau of Indian Standards, New Delhi.
12	IS: 1893: Indian Standard Code of practice for criteria for Earthquake resistant design of structures, Bureau of Indian Standards, New Delhi.
13	IS: 875 – 1964 Code of Practice for Structural Safety of Building: Loading Standards.

MSTL510D: Elective - III Design of Tall Building		
Teaching Scheme:	**Examination Scheme (Theory)**	**Examination Scheme (Laboratory)**
Lectures: 3 Hrs/Week **Tutorials:** Nil **Practical:** Nil	**TAE:** 20 Marks **CAE:** 20 Marks **ESE:** 60 Marks	**Internal(TW):** Nil **External(OR)**: Nil **External(PR)** : Nil
Credit	**3**	
Course Objective:		
Course Outcome: Students will be able *To understand the basic aspects of Earthquake and Wind loads *To analyze and design Shear walled building by mathematical Modeling. *To understand the design specifications of Multi-Story buildings. *To understand the ductility of materials with the help of codes. *To understand beam column joint for ductility in multistory building. *To analyze and design the floor diaphragm.		
Course Contents		

Module I	**Hrs**
Earthquake & wind load Calculations along with dead load & live loads by Static analysis.	6
Module II	
Introduction to Frame – shear wall buildings, Mathematical modeling of buildings with different Structural systems. Analysis & Design of shear walled buildings.	6
Module III	
Special aspects in Multi- Story buildings like effect of torsion, flexible first storey, p- delta effect, Soil – Structure Interaction on building response, drift limitations	6
Module IV	
Ductility of reinforced members subjected to flexure. Design of braced columns using codal provisions	6
Module V	
Beam – column jointed for ductile behaviors. Multistory building with bracings & infills.	6
Module VI	
Introduction to Diaphragm. Seismic design of floor diaphragm.	6

Text / Reference Books: Text Book to be decided by Instructor
1. Agrawal P. & , Shrikhande M., Earthquake Resistant Design of Structures, Prentice hall India, New Delhi, 4th Edition, 2007.
2. Verghese P.C., Advance Reinforced Concrete Design, Prentice hall of India, New Delhi, 2001
3. Park, R. & Paulay, T., Reinforced Concrete Structures, John Willey & Sons; 2nd Edition, 1975
4. Paulay, T. & Prestiley, M.J.N., Seismic design of R C & Masonry Buildings, John Willey & Sons; 2nd Edition, 1999
5. Farzad Naeim, Handbook on Seismic Analysis and Design of Structures, Kluwer Academic Publisher, 2001
6. Booth, E., Concrete Structures in Earthquake Regions, Longman Higher Education, 1994

<table>
<tr><td colspan="3">MSTP502: Lab Practice-II</td></tr>
<tr><td>Teaching Scheme:</td><td>Examination Scheme (Theory)</td><td>Examination Scheme (Laboratory)</td></tr>
<tr><td>Lectures: Nil
Tutorials: Nil
Practical: 4 Hrs/Week</td><td>TAE: Nil
CAE: Nil
ESE: Nil</td><td>Internal(TW): 50
External(OR): 50
External(PR) : Nil</td></tr>
<tr><td>Credit</td><td>2</td><td></td></tr>
</table>

Course Outcome: Students will be able

- To explore the field aspects for various subjects.
- To solve the problems related to all the subjects
- To use software based on Finite Element Methods like STAAD-Pro / Anysis / Etabs / SAP.
- To give technical review on patent.
- To give technical review and critique of a research article/paper.
- To give detail review and critique of a research article/paper.
- To design the program on FEM by EXCEL/MATLAB for formulation of Matrix.

Course Contents

The lab. Practice - II will be based on completion of assignments / practicals / reports of site visits, confined to the courses in that semester.

The term work will consist of --

1. Visit reports of minimum two site visits, exploring the field aspects for various subjects
2. Report on minimum 3 assignments / designs / laboratory work on each subject
3. Finite Element Method – Software applications of any one of following cases using either SATDD-Pro / Anysis / Etabs / SAP. a) Plane stress / plane strain problem b) Axisymmetric problem c) Three dimensional problem d) Plate or shell structures
4. Report on at least one patent with its details studied in any subject of the semester.
5. Technical review and critique of a research article/paper on any one of the topics – (1) Drilled Shaft (2) Caisson - Construction, Analysis, Design, Problems, Case Study
6. A detailed review and critique of a research article/paper in writing (5-10 pages) is expected from the students
7. Any three assignments based on FEM by using coding tools such as EXCEL, MATLAB etc. for
   a) Formulation of stiffness matrix for any 1-D element
   b) Formulation of stiffness matrix for any 2-D element
   c) Formulation of stiffness matrix for any 3-D element
   d) Assembly procedure using Jacobian matrix

SEMESTER – III

<table>
<tr><td colspan="4">MCEP601 : TECHNICAL COURSE-LATEX</td></tr>
<tr><td>Teaching Scheme:
Lectures: Nil
Tutorials: Nil
Practical: 6 Hrs. /Week</td><td>Examination Scheme : (Theory)
Teacher Assessment Examination: Nil
Class Assessment Examination: Nil
End Sem. Examination: Nil</td><td colspan="2">Examination Scheme (Laboratory)
Internal(TW): 50 Marks
External(OR): 50 Marks
External(PR) : Nil</td></tr>
<tr><td>Credit</td><td colspan="3">3</td></tr>
<tr><td colspan="4">Course Objectives:
· To learn use of advance programming, documentation, presentation and communication Tools
· To learn recent technologies in current IT trends
· To learn administrative skills and responsibilities
· To learn quantitative skills
· To learn technology skills</td></tr>
<tr><td colspan="4">Course Outcomes:
· Ability to understand need of technical competence required for problem solving
· Ability to understand employers requirements
· Ability to understand professional and group behavioral ethics</td></tr>
<tr><td colspan="3">Course Contents</td><td>Hrs</td></tr>
<tr><td colspan="3">Skill Development means developing yourself and your skill sets to add value for there your own career development. Fostering an attitude of appreciation for lifelong learning is the key to workplace success. Continuously learning and developing one's skills requires identifying the skills needed and then successfully seeking out trainings or on-the-job opportunities for developing those skills.

Course Write-up Theory shall include:
Understanding problem solving requirements: Customer Requirements, Employer requirements and technology requirements.

Competency assessment using:

Employer's perspective: Reliability, Integrity, Teamwork, Willingness to learn, Entrepreneurship, Self-discipline, Communication, Self-motivation, Flexibility, Technical leadership.
Students Perspective: Basic computer skills, Technical skills, Use of modern tools, Advanced computer skills, System design, Communication and gestures, Responsibility, Verbal communication, Application of knowledge, Creativity, Gender Co-existence, respect, social and ethical responsibilities.
Use of Supporting Technology Perspective: In addition to development tools it is very important to use group communication and information sharing technologies. Students are expected to acquire following skills :Posting a question on the blog or forum, writing and maintaining a mailing list mails, Writing outputs or logs using Post Bin tools or equivalent, use of GIT(refer to github Web site) for revision control or open source equivalent</td><td>36</td></tr>
</table>

MCEP602: SEMINAR-I		
Teaching Scheme: **Lectures:** Nil **Tutorials:** Nil **Practical:**4 Hrs./Week	**Examination Scheme: (Theory)** **Teacher Assessment Examination:** Nil **Class Assessment Examination:** Nil **End Sem. Examination:** Nil	**Examination Scheme: (Laboratory)** **Internal(TW):** 50 Marks **External(OR)**: 50 Marks **External(PR)** :Nil
Credit	**4**	

Course Contents	**Hrs.**
Seminar based on state-of-the art in the selected electives and approved by guide. The presentation and the report should cover motivation, mathematical modeling, data-table discussion and conclusion. The reports to be prepared using LATEX derivative. To maintain the quality of the seminar work it is mandatory on the seminar guides to maintain a progressive record of the seminar contact Hrs of 4Hrsper week per seminar which shall include the discussion agenda, weekly outcomes achieved during practical sessions, corrective actions and comments on the progress report as per the plan submitted by the students including dates and timing, along with the signature of the student as per the class and teacher time table (as additional teaching load); such record of progressive work shall be referred by the examiners during evaluation. Students should implement the idea of seminar topic using any technical open tools appropriately.	4 Hrs./Week

<table>
<tr><td colspan="4">MCEP603 : DISSERTATION PHASE-I</td></tr>
<tr><td>Teaching Scheme:
Lectures: Nil
Tutorials: Nil
Practical: 8 Hrs./Week</td><td colspan="2">Examination Scheme: (Theory)
Teacher Assessment Examination: Nil
Class Assessment Examination: Nil
End Sem. Examination: Nil</td><td>Examination Scheme (Laboratory)
Internal(TW): 100 Marks
External(OR): 100 Marks
External(PR) : Nil</td></tr>
<tr><td>Credit</td><td colspan="3">8</td></tr>
<tr><td colspan="3">Course Contents</td><td>Hrs.</td></tr>
<tr><td colspan="3">Motivation, Problem statement, survey of journal papers related to the problem statement, problem modeling and design using set theory, NP-Hard analysis, SRS, UML, Classes, Signals, Test scenarios and other necessary, problem specific UML, software engineering documents. Student should publish one International Journal Paper (having ISSN Number and preferably with Citation Index II); or paper can be published in reputed International Journal recommended by the guide of the Dissertation and in addition to above the term work shall include the paper published, reviewers comments and certificate of presenting the paper in the conference organized/sponsored by the University. To maintain the quality of the dissertation work it is mandatory on the dissertation guides to maintain a progressive record of the dissertation contact Hrs. of 8Hrs per week which shall include the dissertation discussion agenda, weekly outcomes achieved during practical sessions, corrective actions and comments on the progress report as per the plan submitted by the students including dates and timing, along with the signature of the student as per the class and teacher time table; such record of progressive work shall be referred by the dissertation examiners during evaluation. At the most 8 dissertations can be assigned to a guide.</td><td>8Hrs/Week</td></tr>
</table>

SEMESTER – IV

MCEP604 : SEMINAR-II		
Teaching Scheme: **Lectures:** Nil **Tutorials:** Nil **Practical:** 4 Hrs./Week	**Examination Scheme : (Theory)** **Teacher Assessment Examination:** Nil **Class Assessment Examination:** Nil **End Sem. Examination:** Nil	**Examination Scheme (Laboratory)** **Internal(TW):** 50 Marks **External(OR)**: 50 Marks **External(PR)** : Nil
Credit	**4**	

Course Contents	**Hrs.**
Seminar based on selected research methodology preferably algorithmic design advances as an extension to seminar-II, approved by the guide. The presentation should cover motivation, mathematical modeling, data-table discussion and conclusion. The reports shall be prepared using LATEX derivative. To maintain the quality of the seminar work it is mandatory on the seminar guides to maintain a progressive record of the seminar contact Hrs of 3Hrs per week per seminar which shall include the discussion agenda, weekly outcomes achieved during practical sessions, corrective actions and comments on the progress report as per the plan submitted by the students including dates and timing, along with the signature of the student as per the class and teacher time table (as additional teaching load) such record of progressive work shall be referred by the examiners during evaluation. Topic should be technically inclined to implementation of project. Students must do valid certification from industry or institute.	4 Hrs./ Week

<table>
<tr><td colspan="4">MCEP605: DISSERTATION PHASE-II</td></tr>
<tr><td>Teaching Scheme:
Lectures: Nil
Tutorials: Nil
Practical: 16 Hrs./Week</td><td>Examination Scheme : (Theory)
Teacher Assessment Examination: Nil
Class Assessment Examination: Nil
End Sem. Examination: Nil</td><td colspan="2">Examination Scheme (Laboratory)
Internal(TW): 200 Marks
External(OR): 100 Marks
External(PR) : Nil</td></tr>
<tr><td>Credit</td><td colspan="3">16</td></tr>
<tr><td colspan="3">Course Contents</td><td>Hrs.</td></tr>
<tr><td colspan="3">Selection of Technology, Installations, UML implementations, testing, Results, and performance discussions using data tables per parameter considered for the improvement with existing known algorithms and comparative graphs to support the conclusions drawn. Student should publish one International Journal Paper (having ISSN Number and preferably with Citation Index II); or paper can be published in reputed International Journal recommended by the guide of the Dissertation and in addition to above the term work shall include the paper published, reviewers comments and certificate of presenting the paper in the conferences. To maintain the quality of the dissertation work it is mandatory on the dissertation guides to maintain a progressive record of the dissertation contact Hrs of at least 4Hrs per week which shall include the dissertation discussion agenda, weekly outcomes achieved during practical sessions, corrective actions and comments on the progress report as per the plan submitted by the students including dates and timing, along with the signature of the student as per the class and teacher time table; such record of progressive work shall be referred by the dissertation examiners during evaluation. At the most 8 dissertations can be assigned to a guide.</td><td>16 Hrs./Week</td></tr>
</table>

Department of

First Year B.Tech.

F.Y.B.Tech Course Book

(2016 Pattern)

(With effect from June 2016)

Department of
First Year B.Tech.

Under Graduate (UG) Course Book

F.Y. B.Tech. (Common)

Semester I /II

INDEX

About First Year Department

- Department provides a common platform to all branches students by imparting fundamental knowledge
- Involvement of Experts from IITs, NITs, Govt. Colleges, Reputed Industries, Alumni and Students in development of curriculum
- Choice Based Credit System (CBCS)
- General Proficiency - Foreign Language (German, French, Japanese and Spanish)
- Remedial Teaching
- Sponsorship for Publications and IPR
- Research Mentorship
- Industry Internship
- Provision of Credit Transfer Scheme (CTS)
- Peer Teaching Scheme
- Teacher Guardian Scheme (TGS)
- Various Clubs and Hobby Modules
- Emphasis on English Communication
- Activity based learning

INSTITUTE VISION AND MISSION

VISION

To achieve excellent standards of quality education by keeping pace with rapidly changing technologies and to create technical manpower of global standards with capabilities of accepting new challenges.

MISSION

Our efforts are dedicated to impart quality and value based education to raise satisfaction level of all stake holders. Our strength is directed to create competent professionals. Our endeavor is to provide all possible support to promote research and development activities.

DEPARTMENT VISION AND MISSION

DEPARTMENT VISION

To achieve excellent standard of quality education through effective teaching and learning process and to create technical manpower with capabilities of global standards.

DEPARTMENT MISSION

To impart quality and value education by providing high standard technical knowledge to create competent professionals.

To inculcate research amongst students and faculties.

Program outcomes

Engineering Graduate will be able to:

PO1	**Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO2	**Identify**, formulate, review research literature, and analyse complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences
PO3	**Design/development of solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
PO4	**Conduct investigations of complex problems**: Use research-based knowledge and research methods including design of experiments, analysis, and interpretation of data, and synthesis of the information to provide valid conclusions.
PO5	**Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.
PO6	**The engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
PO7	**Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and a need for sustainable development.
PO8	**Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO9	**Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO10	**Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions
PO11	**Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
PO12	**Life-long learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

First Year B.Tech Structure & Evaluation Scheme

Semester - I														
SN	Subject Code	Subject Name	Teaching				Credits	Evaluation Scheme (Marks)						ESE Duration (Hrs)
			Lect.	Tut.	Pract.	Total		Theory			Practical		Total	
								TAE	CAE	ESE	Cont. Assessment	Ext		
1	BEML101	Engineering Mathematics-I	3	1	–	4	4	20	20	60	–	–	100	3
2	BPHL102 BPHP102 / BCHL103 BCHP103	Engineering Physics/Engineering Chemistry	4	1	2	7	6	20	20	60	25	25	150	3
3	BITL104 BITP104 / BECL105 BECP105	Programming in C / Basic Electronics Engineering	2	–	2	4	3	10	10	30	25	25	100	2
4	BEEL106 BEEP106 / BCEL107 BCEP107	Basic Electrical Engineering /Engineering Mechanics	3	1	2	6	5	20	20	60	25	25	150	3
5	BMEL108 BMEP108/ BHUL113, BMEP111, BFYP112	Basic Mechanical and Engineering Graphics/ Communication Skills, Workshop, Mini modeling	2	–	2	4	3	20	20	60	25	25	150	3
6	BHUP109 / BIDL101	Environmental Studies and Professional Ethics / Bio System in Engineering	2	–	–	2	Audit Course	–	–	–	–	–	–	–
Total			**16**	**3**	**8**	**27**	**21**	**90**	**90**	**270**	**100**	**100**	**650**	**14**

First Year B.Tech Structure & Evaluation Scheme

Semester - II														
S N	**Subject Code**	**Subject Name**	**Teaching**				**Credits**	**Evaluation Scheme (Marks)**						**ESE Duration (Hrs)**
								Theory			**Practical**		**Total**	
			Lect.	**Tut.**	**Pract.**	**Total**		**TAE**	**CAE**	**ESE**	**Cont. Assessment**	**Ext**		
1	BEML110	Engineering Mathematics-II	3	1	_	4	4	20	20	60	_	_	100	3
2	BPHL102 BPHP102 /BCHL103 BCHP103	Engineering Physics/ Engineering Chemistry	4	1	2	7	6	20	20	60	25	25	150	3
3	BITL104 BITP104 /BECL105 BECP105	Programming in C / Basic Electronics Engineering	2	_	2	4	3	10	10	30	25	25	100	2
4	BEEL106 BEEP106 /BCEL107 BCEP107	Basic Electrical Engineering / Engineering Mechanics	3	1	2	6	5	20	20	60	25	25	150	3
5	BMEP111	Workshop	_	_	2	2	1	_	_	_	50	_	50	_
6	BFYP112	Mini Modeling	_	_	2	2	1	_	_	_	50	_	50	_
7	BMEL108 BMEP108 /BHUL113 & BMEP111	Basic Mechanical and Engineering Graphics/ Communication Skills	2	_	_	2	2	10	10	30	_	_	50	2
8	BHUP109 / BIDL101	Environmental Studies and Professional Ethics / Bio System in Engineering	2	–	–	2	Audit Course	–	–	–	–	–	–	–
Total			**16**	**3**	**10**	**29**	**22**	**80**	**80**	**240**	**175**	**75**	**650**	**13**

Department of First Year B.Tech.

Detailed Syllabus

F. Y. B. Tech
Semester I/II

BEML101: Engineering Mathematics - I

Teaching Scheme	Examination Scheme (Theory)	Examination Scheme(Lab)
Lectures: 3 Hrs/Week	**Teachers Assessment Exam:** 20 Marks	**Internal(TW):** ---
Tutorials: 1 Hr/Week	**Class Assessment Exam:** 20 Marks	**External(PR) :**Nil
	End Semester Exam: 60 Marks	**External(OR) :** Nil
Credit	**4**	**-----**

Prerequisite: 12th Science Basics

Course Objective : After completing this course student will able

1. To understand system of linear equations arising in all engineering fields using matrix methods where knowledge of Eigen values and Eigen vectors are essential.
2. To introduce Successive Differentiation and its application in the field of Engineering.
3. To understand concept of convergence of sequences and series with applications to modeling of realistic problems
4. To understand concept of sphere, Cone and Cylinder that arise in vector calculus, electro-magnetic field theory, CAD-CAM, computer graphics etc.

Course Outcome:

1. It will be possible to express the physical problems in to mathematical formulation and to find the proper solutions and apply concepts of matrices and its application for solving engineering problems.
2. Able to find solution of linear algebraic equations with consistency and inconsistency.
3. Able to find the limits and continuity of functions of multiple variables and finding nth derivative by various methods.
4. Able to find the convergence, divergence and range of convergence of various series.
5. Able to find Reduction formulae of various functions and its applications.
6. Able to calculate Cartesian, spherical, polar co-ordinate system as well as equation of sphere, cone, cylinder with guiding curve.

Course Contents	**Hrs**
Unit – I : Matrices	6

Basics of Matrix, Rank of Matrix, Reduction methods Normal form, Row Echelon form and PAQ form, System of Linear algebraic equations , homogeneous and Non-homogeneous equations with consistency and inconsistency.

Unit – II : Linear Algebra 6

Linear dependence and independence of vectors, Linear and Orthogonal Transformation, Eigen values, Eigen vectors (Symmetric and Non Symmetric Matrices), Cayley-Hamilton theorem.

Unit –III: Differential Calculus and Expansion of Functions 8

Successive Differentiation, Finding Nth Derivative by standard function, trigonometrical transformation, Partial fraction method. Leibnitz's Theorem. Indeterminate Forms, L' Hospital's Rule, Taylor's Series and Maclaurine's series with standard expansion, differentiation and Integration, use of substitution.

Unit – IV : Infinite Series 6

Infinite Sequences, Infinite Series, Alternating Series, Tests for Convergence by Cauchy's nth root test, p test, comparison test, D'Alemberts Ratio test, Raabe's test, Leibnitz test, Absolute and Conditional Convergence, Range of Convergence.

Unit – V : Integral Calculus 8

Reduction Formulae, Beta and Gamma functions, Differentiation Under Integral Sign, Error Functions.

Unit – VI : Solid Geometry 8

Cartesian, Spherical, Polar and Cylindrical Co-ordinate Systems. Sphere, Cone and Cylinder

Tutorials

1. Basics & Problem solving of rank, LD & LI, Normal form.
2. Problem solving of Eigen values, Eigen vectors, Cayley-Hamilton theorem.
3. Leibnitz Theorem, Indeterminate forms.
4. Infinite Series, Taylor's & Maclaurine's Series.
5. Examples on Reduction Formulae, Beta & Gamma functions.
6. Examples on Right Circular Cone & Cylinder.

Text Books:

1. "Higher Engineering Mathematics", B.S. Grewal, Khanna Publishers.
2. Applied Mathematics (Volumes I and II) by P. N. Wartikar & J. N. Wartikar (Pune Vidyarthi Griha Prakashan, Pune)
3. Higher Engineering Mathematics by B.V. Ramana (Tata McGraw-Hill).

Reference Books:

1. Advanced Engineering Mathematics, 7e, by Peter V. O'Neil (Thomson Learning).
2. *Advance Engineering Mathematics* Erawin Kreyszig, Wiley India Pvt. Ltd New Delhi.
3. Advanced Engineering Mathematics, 2e, by M. D. Greenberg (Pearson Education).

Web Links:

- **Matrices:**
  https://www.youtube.com/watch?v=mYVbYBZZdW0
  https://www.youtube.com/watch?v=hbk01uhgsos
- ***Eigen value & Eigen Vectors***
  https://www.youtube.com/watch?v=XM4GU8hPoZs
  https://www.youtube.com/watch?v=P2pL5VThrzQ
- **Successive differentiation**
  https://www.youtube.com/watch?v=zWURS768QrA
- ***Leibnitz thm:***
  https://www.youtube.com/watch?v=67uJGwsZz-Q
- **Indeterminate forms:**
  https://www.youtube.com/watch?v=PNTnmH6jsRI
- **Infinite Series**
  http://ocw.mit.edu/courses/mathematics/18-01-single-variable-calculus-fall-2006/ video- lectures/lecture-37-infinite-series/
  https://www.youtube.com/watch?v=qNZxf0j41tw
- **Gamma function:**
  www.youtube.com/watch?v=Vc8dIykQRhy
  www.youtube.com/watch?v=SYfLj-koGJO
- **DUIS:**
  www.youtube.com/watch?v=NpXWv2jR4nC

BEML110: Engineering Mathematics – II

Teaching Scheme	**Examination Scheme (Theory)**	**Examination Scheme(Lab)**
Lectures: 3 Hrs/Week	**Teachers Assessment Exam:** 20 Marks	**Internal(TW):** Nil
Tutorials: 1 Hr/Week	**Class Assessment Exam:** 20 Marks	**External(PR) :**Nil
	End Semester Exam: 60 Marks	**External(OR) :** Nil
Credit	**4**	**-------**

Course Objective : After completing this course student will able

1. To analyze and solve first order differential equations

2. To aware of the applications of first order differential equations and modeling of various physical systems such as Newton's Law of cooling and simple electrical circuits.
3. To design and analysis of continuous and discrete system where the knowledge of Fourier series and Harmonic analysis required.
4. To understand multiple integration.
5. To understand concept of Partial Differential Equation in Engineering Applications such as Electric circuit, Heat transfer etc.
6. To understand Stationary Values of functions (Maxima and Minima), arising in optimization problems.

Course Outcome:

1. To compute solutions for first order ordinary differential equations using different analytic techniques and able to model and solve various simple real world phenomenon governed by ordinary differential equations of first order.
2. Able to understand application of differential equation.
3. Able to trace the curve and use multiple integral to formulate various engineering problems and find its area and volume.
4. Students are able to find maxima & minima, critical points, points of inflection, Errors and Approximations.
5. It will help to develop analytical skills to provide solution to the simple engineering problems.
6. Apply the fundamentals of mathematics in various branches of engineering.

Course Contents	Hrs
Unit – I :Differential Equations	6
Definition, Order and Degree of DE, Formation of DE. Solutions of Variable separable, Homogeneous DE, Exact DE (without Integrating Factor method), Linear DE and reducible to these types.	
Unit – II :Applications of Differential Equations	6
Applications of DE to orthogonal trajectories, Rate of decay of radioactive materials, Newton's Law of Cooling, Kirchhoff's Law of Electrical Circuits, Simple harmonic motion, One–Dimensional Conduction of Heat.	
Unit – III : Fourier series	8
Definition, Dirichlet's conditions, Full Range Fourier Series, Half Range Fourier Series, Harmonic Analysis and Applications to Problems in Engineering.	
Unit – IV : Multiple Integral & Applications	8

Basics of Curve Tracing, Double Integration, triple integration, Applications to Area , Volume.

Unit – V : Partial Differential Equation 8

Partial derivatives of composite function, variable to be treated as constants, Euler's theorem on homogeneous functions of two & three variables, Implicit functions, Total Derivatives.

Unit – VI : Application of Partial Differential Equation 6

Jacobians and their applications, Errors and Approximations, Maxima and Minima of Functions of two variables, Lagrange's Method of undetermined multipliers.

Tutorials

1. Basics & Problem solving of Differential Equations.
2. Problem solving of Newton's Law of Cooling, Electrical Circuits, Conduction of Heat.
3. Examples on Fourier series.
4. Examples on Multiple Integral & Applications
5. Examples on Partial differential equations.
6. Examples on Error & Approximations, Maxima & Minima.

Text Books:

1) Higher Engineering Mathematics by B. S. Grewal (Khanna Publication, Delhi).
2) Higher Engineering Mathematics by B.V. Ramana (Tata McGraw-Hill).
3) Applied Mathematics (Volumes I and II) by P. N. Wartikar & J. N. Wartikar (Pune Vidyarthi Griha Prakashan, Pune)

Reference Books:

1) Advanced Engineering Mathematics by Erwin Kreyszig, Volume I & II (Wiley Eastern Ltd)
2) Advanced Engineering Mathematics, 7e, by Peter V. O'Neil (Thomson Learning).
3) Advanced Engineering Mathematics, Wylie C.R. & Barrett L.C. (McGraw-Hill, Inc.)

Weblink:

- **Ordinary Differential Equations:**
  www.youtube.com/watch?v=P7gVp333B6M
- **Linear Differential Equations:**
  www.youtube.com/watch?v=1FnBPmEWpus
- **Fourier series:**

www.youtube.com/watch?v=3bXH7AkIV6C
www.imperial.ac.uk/worksspace/mathematics/Public

- **Multiple Integral:**
  http://freevideolectures.com/Course/2267/Mathematics-I/28#
  http://www.learnerstv.com/video/Free-video-Lecture-1823-Maths.htm
- **Partial Differential Equations:**
  http://nptel.ac.in/courses/111103021/
  https://www.youtube.com/watch?v=PTvvoVLzVCE

BPHL102: Engineering Physics

Teaching Scheme	Examination Scheme (Theory)	Examination Scheme(Lab)
Lectures: 4 Hrs/Week	**Teachers Assessment Exam:** 20 Marks	**Internal(TW):** 25 Marks
Tutorials: 1 Hr/Week	**Class Assessment Exam:** 20 Marks	**External(PR) :** 25 Marks
Practical: 2 Hrs/Week	**End Semester Exam:** 60 Marks	**External(OR) :** Nil
Credit	**5**	**1**

Prerequisite : Class XII Knowledge on the course

Course Objective:

1. To understand fundamental principles of Engineering physics specifically concern to electron optics and quantum physics and their engineering applications.
2. To use various techniques for measurement, calculation, control and analysis of engineering problems based on the principles of Electron Optics, Ultrasonic, Acoustics, Laser, Band theory of solids, Quantum Mechanics, Superconductivity, and Nanophysics
3. To provides the basic ideas and gives the solution for developing mathematical and analytical abilities with higher precision.

Course Outcome: At the end of the course student will be able to

1. Solve the problems related to the applications of uniform & non uniform electric and magnetic fields and its use related devices for engineering applications.
2. Understand the nature and characterization of acoustics and its applications.
3. Demonstrate the knowledge of semiconductors and their applications.
4. Apply the concepts of light in optical fibers, light wave communication systems, and holography and for sensing physical parameters
5. Apply knowledge of physics in mechanics, wave properties, properties of matter and to solve simple qualitative and quantitative problems

6. Apply the concepts of physics in various branches of engineering

Course Contents	Hrs
Unit – I : Electron Ballistics	
Motion of charges in uniform electric and magnetic fields; Electron optics: Bethe's law; Electrostatic and magneto static focusing; Devices: CRT, CRO and Cyclotron	8
Unit – II : Ultrasonics & Acoustics of Building	
Ultrasonics: Introduction, Production of ultrasonics waves, Magnetostriction and Piezo electric method, Detection of ultrasonics waves, Applications Acoustics of Building: Basic requirement of acoustically good hall, Reverberation, Sabine formula for reverberation, factors affecting the architectural acoustics and their remedy.	8
Unit – III : Lasers and Holography	
Introduction, Absorption and Emission of Radiation, Characteristics of Laser light, Pumping Scheme, Population Inversion, metastable state, Types of Laser i) two level – semiconductor laser, ii)three level l – Ruby laser, iii)four level – He:Ne laser Applications of Lasers – Holography, Recording and Reconstruction of Image, Applications of Holography, Optical Fiber communication system	8
Unit – IV : Band Theory of Solids	
Introduction, Distinction between Insulators, Semiconductors and Conductors, Intrinsic Semiconductor, Extrinsic Semiconductor, Hall Effect, Fermi Distribution Function, Fermi level in Intrinsic and Extrinsic Semiconductors, band structure of PN junction diode under i) zero bias, ii) forward bias, iii) reverse bias, Working of transistor (NPN only) on the basis of band diagram, photovoltaic effect, working of solar cell on the basis of band diagram and its applications.	9
Unit – V : Quantum Mechanics	
Introduction, Wave particle duality, de Broglie waves, Phase and Group velocities, Heisenberg Uncertainty Principle, Wave function and its Physical Significance, Time Independent and Time dependent Schrodinger Equation, Applications of Schrodinger Equation (infinite potential well – with derivation of energy and wave function), Tunneling through potential barrier, Applications of Tunnel Effect.	9
Unit – VI : Advanced Trends in Physics	6

BPHL102: Engineering Physics

Part A: List of Practical (Any Six)

1. Application of Velocity filter using CRT: To determine e/m by Thomson's method.
2. Study of Lissajou's Figure using CRO
3. Ultrasonic interferometer for the determination of compressibility of liquid
4. Determination of band gap of a given semiconductor
5. Characteristics of Solar cell and Calculation of fill factor
6. Determination of thickness of wire using LASER.
7. Determination wavelength of Laser using Diffraction Grating.
8. Determination of electrical resistivity of semiconductor by using four probe method.

Part B:Mini Project Modeling

Every Students has to performed mini project in a group based on curriculum courses

Instructions to Student:

1. Maximum Three Students are permissible in each group
2. Project must be based on the contents of syllabus of subject.
3. Project report has to be prepared and attach in practical file individually.

Text Books:

1. Engineering Physics, Hitendra K. Malik & A. K. Singh, Tata McGraw Hill, New Delhi, 2010
2. Engineering Physics, Avadhanulu, Kshirsagar, S. Chand Publications
3. Engineering Physics, Guar, Gupta, Dhanpat Rai and Sons Publications

Reference Books:

1. Fundamentals of Physics, Resnick and Halliday, John Wiley and Sons.
2. Lectures on Physics, Volume 1, 2 and 3 by Richard P. Feynman, Narosa Publisers /
3. Pearson Education.
4. Laser and Non-Linear Optics, B. B. Laud (Oscar publication)

Web Links:

1. https://www.youtube.com/watch?v=Lcy3f3QkTIw (Electron Ballistics)
2. http://www.nptel.ac.in/courses/122107035/6 (Acoustics)
3. https://www.youtube.com/watch?v=HFvPzXr7rxU (Nanophysics)
4. https://www.youtube.com/watch?v=knVD1AfiozA (Fermi energy & Fermi level)
5. https://www.youtube.com/watch?v=T8WCr5axQXM (Energy Bands)
6. https://www.youtube.com/watch?v=GglT1RoBPzg (Superconductivity)

BCHP103: Engineering Chemistry

Teaching Scheme:	Examination Scheme (Theory)	Examination Scheme(Lab)
Lectures: 4Hrs/Week	**Teachers Assessment Exam:** 20 Marks	**Internal(TW):** 25 Marks
Tutorials:1 Hr/Week	**Class Assessment Exam :** 20 Marks	**External(PR) :**25 Marks
Practical: 2Hrs/Week	**End Semester Exam:** 60 Marks	**External(OR) :**Nil
Credit	**5**	**1**

Prerequisite : 12th Standard Curriculum

Course Objective:

1. Technology involved in improving quality of water for its industrial use.
2. The basic concept of Electro analytical techniques that facilitate rapid and reliable measurements.
3. Chemical structure of Polymers and its effect on various properties when used as engineering materials.
4. Study of Fossil fuel and derived fuels with its properties and applications.
5. The principles of chemical and electrochemical reactions causing corrosion and methods used for minimizing.
6. An insight in to Nano materials and advance materials aspect of modern chemistry.

Course Outcome:

1. To apply the knowledge of basic science in engineering and technology and also understand the concept of applied chemistry and analyze it with experiments.
2. The broad education necessary to understand the impact of engineering solutions in global, economic and in environmental context.
3. An ability to design and conduct experiments as well as to organize, analyze and interpret data.
4. An ability to use the techniques, skills and modern engineering tools necessary for engineering practice.
5. To apply the knowledge of advance engineering materials for varied engineering applications.
6. The significance of teaching the aforementioned course is realized in both research, and development of innovative technologies by the student's successful participation in various basic level research oriented programs, and competitions, both at the national and international levels..

Course Contents	Hrs
Unit – I : Water technology and Green chemistry	8

Impurities in water. Hardness of water &its determination by EDTA method. Alkalinity of water and its determination and Numerical on alkalinity and hardness. Ill effects of hard water in boilers. Boiler feed water treatment -1) Internal treatment-calgon and phosphate conditioning, 2) External treatment- a) Zeolite process & its numerical b) Ion exchange method. Desalination of brackish water/Purification of water by Reverse osmosis and Electro dialysis.

Green Chemistry: Introduction, Twelve Principles of green Chemistry Major uses- traditional and green path ways of synthesis of adipic acid, indigo dye.

Unit – II : Electro analytical techniques

Type of reference electrode (calomel electrode), indicator electrode (glass electrode), Ion selective electrode, Half-cell reaction and complete cell reaction.

Conductometery: Introduction, Kohlrausch's law, Conductivity cell, Measurement of conductance, applications-Counductometric titrations, Acid-Base Titrations, precipitation titration, Potentiometry: Introduction, Potentiometric titrations-differential plots. Applications- 8
redox titrations Fe^{2+}/Ce^{4+}titration. UV/Visible spectroscopy: Beer lambert's law, chromophore and auxochrome, types of electronic transitions. Instrumentation and principle- block diagram of single and double beam spectrophotometer. Applications of uv-visible spectroscopy.

Unit – III : Synthetic Organic Polymers

Introduction, functionality of monomer, polymerization-Free radical mechanism & step growth polymerization, Tm and Tg, Thermoplastic and Thermosetting polymers. Compounding of plastics. Preparation, properties & engineering applications of: Polyethylene (LDPE & HDPE) and Bakelite. Elastomers- Natural rubber-processing & vulcanization by sulphur. Synthetic rubbers-SBR. Specialty polymers: Engineering 8
thermoplastics- Polycarbonate, Biodegradable polymers- Poly (hydroxyl butarate-hydroxyvalanate), Conducting polymers- Polyacetylene, Liquid Crystal polymer-Kevlar.

Unit – IV : Fuel & Combustion

Fossil Fuels: Definition, Calorific values, Determination- Bomb calorimeter, Numerical Boy's gas calorimeter, Numerical Solid fuel-coal-Proximate analysis, Ultimate analysis & Numerical. Liquid fuels-Petroleum-composition and refining. Octane number of petrol, Cetane number of diesel, Power alcohol, Biodiesel. Gaseous fuel-Composition, properties 8
and applications of NG, CNG & LPG, Combustion- Chemical reactions, Calculations for air required. Numerical.

Fuel cell: Introduction, applications.

Unit – V: Corrosion science

Introduction. Types of corrosion- Dry corrosion- mechanism, Pilling-bed worth rule. Wet corrosion- mechanism. Factors influencing corrosion- Nature of metal, Nature of environment, Catholic and anodic protection, Use of corrosion Inhibitors Protective coatings: surface preparation 8

a) Metallic coatings:, Electroplating & Electro less plating.

b) Non-metallic coatings: chemical conversion coatings

Unit –VI : Advances in Engineering Chemistry

Nanomaterial: Graphite, Carbon nanotube (CNT) & Fullerenes- Structure, Properties, Applications, Lubricants: Introduction, classification of lubricants, (Liquid, semi– solid (Grease). Biomaterial: classification, Properties, Examples. Biosensor- Introduction, Classification, Applications. Smart Material: Introduction, Shape Memory Alloy and its Example, Advantages, Disadvantages, Applications. 8

BCHP103: Engineering Chemistry

Part A:List of Practical(Any Six)	**Hrs.**
1.Determination of hardness of water by EDTA method.	02
2.Determination of alkalinity of water.	0 2
3.To determine maximum wavelength of absorption of $CuSO_4$ / FeSO4, verify Beer's law and find unknown concentration in given sample	02
4.Titrationofmixture of weak acidands trong acid with strong base using conductometer.	02
5. Preparation of Urea-formaldehyde resin and its characterization.	02
6.Determination of molecular weight/radius of macromolecule polystyrene/polyvinylalcohol	02
7.Proximate analysis of coal	
8. Preparation of nickel coating on copper metal using electroplating & electro less plating	02
9.TO calculate the electrochemical equivalent of copper by electrolysis of copper sulphate solution using copper electrode.	02
10.Determination of acid value of given lubricating oil.	02

Part B:Mini Project Modeling

Every Students has to performed mini project in a group based on curriculum courses 02

Instructions to Student:

1. Maximum Three Students are permissible in each group
2. Project must be based on the contents of syllabus.
3. Project report has to be prepared and attach in practical file individually.

Text Books:

1. Engineering chemistry by O.G. Palana, Tata Mcgraw Hill Eduction Pvt. Ltd.
2. Engineering chemistry by Dr. S.S. Dara Dr. S.S.Umare, S. Chand & company ltd.

Reference Books:

1. Engineering chemistry by Wiley India Pvt. Ltd. First edition
2. Inorganic chemistry, 5e, by Shriver and Atkins, Oxford university press.
3. Shashi Chawala Text book of Engineering Chemistry Sudharani (Dhanpat Rai Publishing Company)

Laboratory Manual:

1. Vogels text book of Quantitative Chemical analysis ,6e,by Mendham, R.C.denney, J.D. Barnes, M.J. K. Thomas, Pearson Education Ltd.
2. Applied Chemistry Theory and Practice ,2e, by O. P. Virmani and A.K. Narula , New age International (P) Ltd.
3. Laboratory manual Engineering Chemistry by Dr. Sudharani (Dhanpat Rai Publishing Company.)

Web Links:

1. www.nptel.ac.in/course/105/04/02-water technology
2. www.nptel.ac.in/syllabus/syllabus.php?subjectId=103/08/00 -electro analytical technique
3. www.nptel.ac.in/courses/113/05028 -polymer
4. www.nptel.ac.in/courses/103/05/10/-fuel & combustion
5. www.nptel.ac.in/courses/113108051/ corrosion science
6. http://nptel.ac.in/course.php?disciplineId=102 – advance materials

BITL104: Programming in C

Teaching Scheme	**Examination Scheme (Theory)**	**Examination Scheme(Lab)**
Lectures:	**Teachers Assessment Exam:** 10 Marks	**Internal (TW) :** 25
2Hrs/Week	**Class Assessment Exam:** 10 Marks	**External (PR) :** 25
Practical: 2Hr/Week	**End Semester Exam:** 30 Marks	**External (OR)** : Nil
Credit	**2**	**1**

Prerequisite :

1. Basic Knowledge of Computer

Course Objective:

1. To make students aware of basics about computers, hardware, software & Operating system.
2. To understand the role of constants, variables, identifiers, operators, type conversion and other building blocks of C Language.
3. To understand the Use of conditional expressions and looping statements to solve problems associated with conditions and repetitions.
4. To understand concept of array and passing array through function
5. To understand the concept of structure and union
6. To develop programming skill in a student to write programs in C language.

Course Outcome:

1. Students are able to understand basic concepts of programming.
2. Students are able to understand the basic terminology used in 'C' programming.
3. Students are able to design programs involving decision structures and loops.
4. Students are able to use different data types in a computer program.
5. Students are able to apply functions and array in program.
6. Students are able to write, compile and debug programs in C language.

Course Contents **Hrs.**

Unit – I :Basics of Programming 4

Basics of programming: approaches to Problem solving, concept of algorithm and flow charts with e.g., types of computer languages: Machine language, assembly language and high level language, concept of assembler, compiler, loader and linker.

Unit – II : C Programming fundamentals 4

Types of programming language , Introduction to C language, tokens, character set, constants, variables, data types, keywords, expressions, operators in C and its types, standard input-output statements in C, structure of C-program.

Unit –III Conditional Program Execution 4

Conditional Program Execution: Applying if and switch statements, nesting if and else, restrictions on switch values, use of break and default with switch, Uses of while, do and for loops, multiple loop variables, assignment operators, using break and continue.

Unit – IV : Introduction to function and Arrays 4

Standard library functions and user defined functions, function declaration, function definition

and function call - call by value and call by reference, return statement, recursion, **Introduction to array**, One and Two Dimensional Arrays, Initialization, Operations on one & two dimensional arrays.

Unit –V Introduction to String 4

Definition of string, Declaration of string, Reading, Writing, String handling operations using and without using library functions, Examples of stings.

Unit – VI : Structure 4

Introduction to Structure definition. Initializing, Assigning values, passing of structure as arguments, Unions, Programming Examples. **Standard C preprocessors,** defining and calling macros, Storage Classes with types.

Practical/Assignments		**Hrs.**
1.	Study of Operating Systems – Window & Linux with their Commands	2
2.	Write programs to implement simple/basic concepts of C.	2
3.	Write programs to implement decision making and control statements in C – if-else, nested if else, if-else-if and switch-case statement.	2
4.	Write programs to implement loops in C – while, do-while.	2
5.	Write programs to implement for loop in C.	2
6.	Write programs to implement string operations in C – strlen(), strcpy(), strcat(), strrev() etc.	2
7.	Write programs to implement string operations in C without using library functions.	2
8.	Write programs to implement functions in C.	2
9.	Write programs to implement of concept call by value & call by reference in C.	2
10.	Write programs to implement of Array concept (One dimensional)	2
11.	Write programs to implement of Array concept (Two dimensional)	2
12.	Write programs to implement structures in C.	2
13.	Write a programs to implement union in C.	2

Text Books:

1. E.Balagurusamy, “Programming in ANSI C” , Tata McGraw Hill
2. B.W. Kernighan, D.M. Ritchie, “The C Programming Language”, Prentice Hall of India.
3. Yeshwant Kanetkar, “Let Us C”, BPB Publication.

Reference Books:

1. R.G. Dromey, “How to Solve It By Computer”, Pearson Education
2. K. R. Venugopal, Sudeep R. Prasad, “Programming with C”, Tata McGraw Hill.
3. E.Balagurusamy,“Fundamentals of Computers”, Tata McGraw Hill

Web Links

1. www.w3schools.com
2. www.cprogromming.com
3. www.eskimo.com/~scs/cclass /notes/top.html
4. www.cprogrammingexpert.com/

BECL105: Basic Electronics Engineering

Teaching Scheme:	**Examination Scheme (Theory)**	**Examination Scheme (Laboratory)**
Lectures:2Hrs/Week	**Teachers Assessment Examination:** 10 Marks	**Internal(TW):** 25 Marks
Practical: 2 Hrs/Week	**Class Assessment Examination :** 10 Marks	**External(PR) :** 25Marks
	End Semester Examination: 30 Marks	**External(OR) :**Nil
Credit	**2**	**1**

Prerequisite : 12^{th} Physics

Course Objective:

1. To give the basic knowledge of basic components & circuit.
2. To study logic gates and their usages in digital circuits
3. To expose the student to working of power electronic devices and transducers
4. To introduce basic aspect of electronic communication system

Course Outcome ; After completion of this course student will be able to

1. Student can acquire the basic knowledge of electronic components and circuits.
2. To gain the concepts of Semiconductor physics
3. Students will be able to effectively employ basic knowledge for new application
4. To design and analyze basic electronic circuits
5. Students will be able to effectively employ technology for their use.
6. To measure the performance parameters of electronic circuits

Course Contents	Hrs
Unit – I : Diode Circuits	
Half wave rectifier, Full wave rectifier, D.C Regulated Power supply, Diode application: clipper, Clamper. LED Diodes and Photodiode.	4
Unit – II : BJT circuits	
BJT structure and its operation with normal biasing, DC operating point, DC load line	6

analysis in various operating region of BJT. Transistor as an amplifier in CE mode and as a switch.

Unit – III : Linear Integrated Circuit

Introduction to Op-Amp, Op-amp input modes and parameters, Op-Amp with negative feedback: summing amplifier, integrator, and differentiator, IC555 as a astable multivibrator. 6

Unit – IV: Basic Digital Electronics

Introduction to logic gates with their truth table, Boolean algebra, D Morgan's Law, Simplification of logical expressions, Sum of product & product of sum, Implementation of SOP (using 3 variable)on Karnaugh map and solving technique. Implementation of expression with basic gates. 6

Unit – V : Digital Electronics Fundamental

Number system: Binary, Gray, octal, Hex, Half adder, Full Adder, Mux, Demux, Flip-flop, Registers, Mod Counter, Sequential and combinational circuits. 4

Unit – VI : Power devices and Transducers

SCR, DIAC, Triac, Transducer like Thermocouple, RTD, thermister, load cell and its application like Digital thermometer, weighing machine. 6

BECP105: Basic Electronics Engineering

Part A :List of Practical(Any Ten)

1. Study of different electronics components.
2. Study of different electronics measuring devices.
3. Study of regulated DC power supply.
4. Study of V-I characteristics of Diode.
5. Study of Clipper circuits.
6. Study of Clamper circuits.
7. Study of single stage BJT common emitter amplifier circuit.
8. Study of Op-Amp circuits as i) Adder ii) Integrator
9. Study of i) MUX ii) Demux
10. Study of IC555 as a timer
11. Study of Half Adder
12. Study of Full Adder
13. Verify the truth tables of different digital ICs like: AND, OR, NAND, NOR.
14. Study of design of AND,OR by universal gate

15. Study of synchronous counter.
16. Study of asynchronous counter.
17. Study of V-I characteristics of SCR.
18. To design electronic circuit for given application
19. Use of PCB for making circuits.
20. Study of function generator to generate various signals like sinusoidal, triangular, ramp observe the waveform on CRO.

Part B-Mini Project Modeling

Every Students has to performed mini project in a group based on curriculum courses

Instructions to Student:

1)Maximum Three Students are permissible in each group

2) Project must be based on the contents of syllabus.

3) Project report has to be prepared and attach in practical file individuallyProject report has to be prepared and attach in practical file individually.

Text Books:

1. Electronic Devices & circuits – Floyd (Pearson Education India)
2. Modern digital Electronics- R.P. Jain(TMH Publication)
3. Electronics Instrumentation- H.S. Kalsi(Tata McGraw Hill)
4. Communication Electronics principle & Application-Frenzel ((Tata McGraw Hill)
5. Electronic Devices & circuits – salivahanan Tata McGraw Hill

Reference Books:

1. Jacob Miliman, C CHalkias, Chetan Parikh- Integrated Electronics.(Tata McGraw Hill)
2. Debashish De, Kamakhya Prasad Ghatak- Basic Electronics(Pearson Education)
3. J R Cogdell- foundation of Electronics(Pearson Education)

Web Links:

Unit I : PN junction diode & Rectifier

1. http://www.electronics-tutorials.ws/diode/diode_1.html
2. http://www.allaboutcircuits.com/textbook/semiconductors/chpt-3/introduction-to-diodes-and-rectifiers/

Clipper & Clamper

http://www.daenotes.com/electronics/devices-circuits/clipper-clamper

Unit II: BJT

1. Applicationhttp://www.electronics-tutorials.ws/transistor/tran_1.html
2. BJT CE Amplifier:http://www.electronics-tutorials.ws/amplifier/amp_2.html
3. BJT as a switch:http://www.electronics-tutorials.ws/transistor/tran_4.html

Unit III: Linear Integrated Circuit

1. Op amp Application:http://www.electronics-tutorials.ws/opamp/opamp_7.html
2. http://www.electronics-tutorials.ws/opamp/opamp_4.html

IC 555:

3. https://electrosome.com/astable-multivibrator-555-timer/

Unit IV: Basic Digital Electronic

http://www.electronics-tutorials.ws/counter/count_3.html

1. **Unit V:: Digital Electronics Fundamental**
2. Half & Full adderhttp://www.circuitstoday.com/half-adder-and-full-adder
3. http://www.radio-electronics.com/info/data/semicond/thyristor/structure-fabrication.php

Unit VI: Power Devices and Transducers

http://www.radio-electronics.com/info/cellulartelecomms/cellular_concepts/mobile-basics-

Transducers:http://www.electronics-tutorials.ws/io/io_1.html

BEEL106: Basic Electrical Engineering

Teaching Scheme	Examination Scheme (Theory)	Examination Scheme(Lab)
Lectures: 3 Hrs/Week	**Teachers Assessment Exam:** 20 Marks	**Continuous**
Tutorials: 1 Hr/Week	**Class Assessment Exam:** 20 Marks	**Assessment:** 25 Marks
Practical: 2 Hrs/Week	**End Semester Exam:** 60 Marks	**External(PR) :** 25 Marks
Credit	**4**	**1**

Course Objective:

1. To expose the undergraduate first-year engineering students to the fundamental laws of electricity and their applications in day-to-day life.
2. To lay a course foundation for the students who would be trained in the related core subjects like electrical, electronics, instrumentation and control, tele-communications etc.
3. Demonstrate the awareness on social issues like conservation of electrical energy, electrical safety etc.
4. Develop abilities to analyze circuits quantitatively.

Course Outcome:

1. Apply basic electric circuit laws to solve electric circuit problems and design basic D.C. electric circuit using circuit analysis techniques.
2. Apply basic A.C. electric circuit laws in solving A.C. circuit problems and able to perform A.C. power calculation.
3. Learner should understand and grasp the analytical treatment of electrical quantities with the help of phasor-algebra.
4. To understand the difference between DC and AC Systems and between Single-phase and three phase utility AC Source.
5. To understand functioning of basic electrical circuits, useful in domestic and industrial power supplies.
6. To train the learner in adequate experimentation related to high power electricity and in measurements of electrical quantities such as voltage, current and power

Course Contents	Hrs
Unit – I : D.C. Circuits	
Ohm's law, Simplification of networks using series - parallel combinations, Current and Voltage sources, Kirchhoff's laws, Superposition theorem, Thevenin's theorem, Maximum Power Transfer theorem.	07
Unit – II : Single Phase A.C. Circuits	
Concept of AC quantities, Concepts of cycle, Period, Frequency, Generation of alternating voltage and currents, RMS and Average value, Form factor, Crest factor, Phase and Phasor diagrams, AC through Pure resistance, Inductance &Capacitance, R-L , R-C and R-L-C series circuits, Power and Power factors.	07
Unit – III :Three Phase A.C. Circuits	
Three Phase Circuits:- Concept of three phase supply, Phase sequence, Concepts of line, Phase, Neutral etc., Power relations in a Three phase balanced Star and Delta connections, Three phase phasor diagrams.	06
Unit – IV : Fundamentals of Transformer	
Construction, Working Principle, EMF equation, Rating of transformer, Transformer on no load and on Full load, Transformer losses, Calculation of Efficiency and Regulation.	06
Unit – V : Work , Power and Energy	
Energy conversions from one form to another such as Electrical, Thermal and Mechanical, and Numerical problems based on different energy conversions in real life cases.	04

Unit – VI : Electrical Machines

Fundamentals of DC and AC Machines, DC Series and Shunt Motor, AC Single Phase Induction Motor, Stepper Motor, Servo Motor. 06

BEEP106: Basic Electrical Engineering

Part A:List of Practical/Assignments (Any Six)

1. Study of :
   a) Different wiring components, switches, holders, cables, tube circuit, CFL, Megger.
   b) Energy conservation and safety precautions.
2. Study of :
   a) Control of lamp from two switches.
   b) Study of staircase wiring.
3. Verification of Kirchhoff's laws.
4. Verification of Superposition theorem.
5. Verification of Thevenin's theorem.
6. Study of R. L. C. series circuits.
7. Verification of current relations in three phase balanced star and delta connected loads.
8. Single phase transformer:
   a) Voltage and Current ratio
   b) Efficiency and regulation by direct loading method.
9. Load test on DC series motor.

Part B-Mini Project Modeling

Every Student has to perform mini project in a group based on curriculum courses.

Instructions to Student:

1) Maximum Three Students are permissible in each group

2) Project must be based on the contents of syllabus of subject.

3) Project report has to be prepared and attach in practical file individually .

Text Books:

1. **Electrical Technology** Volume-I–B.L. Theraja, S.Chand and Company Ltd.,New Delhi.
2. **Basic Electrical Engineering**, V. K. Mehta , S. Chand and Company Ltd., New Delhi.
3. **Theory and problems of Basic Electrical Engineering**- I. J. Nagrath and Kothari, Prentice-Hall of India Pvt. Ltd.

Reference Books:

1. **Electrical Technology**- Edward Hughes, Seventh Edition, Pearson Education
2. **Elements of Electrical Technology**- H. Cotton, C.B.S. Publications
3. **Electric Machines** by AshfaqHussain - Dhanpatrai

Web Links:

Unit1: correlation on effect of temperature:

1. http://arxiv.org/ftp/arxiv/papers/0903/0903.1334.pdf

Unit-2: Single phase AC Circuit:

2. http://elearning.vtu.ac.in/13/ENotes/BEE/BasicElectricalNotes.pdf

Unit-3: Three Phase AC Circuit:

3. http://www.allaboutcircuits.com/textbook/alternating-current/chpt-10/three-phase-y-delta-configurations/

Unit4: Core construction of Transformer:

4. wapyoutub.com/download/video/How...**Transformer**.../vh_aCAHThTQ

Problems on Transformer:

5. https://www.youtube.com/watch?v=zg0piCo5ZTA
6. https://www.youtube.com/watch?v=9TTxUY0vNb8

Unit-5: Work , Power , Energy:

7. http://www.efm.leeds.ac.uk/CIVE/CIVE1140/
8. docs/mechanics_sec03_full_notes02.pdf

Unit-6: Electrical Machines:

9. https://www.rockwellautomation.com/resources/downloads/rockwellautomation/che/pdf/
10. Application_basics_operation_three_phase_induction_motors.pdf
11. http://www.solarbotics.net/library/pdflib/pdf/motorbas.pdf
12. http://www.baldor.com/Shared/manuals/1205-394.pdf

http://uotechnology.edu.iq/dep-ee/lectures/3rd/Communication/machine/PART%203.pdf

BCEL107: Engineering Mechanics

Teaching Scheme:	**Examination Scheme (Theory)**	**Examination Scheme(Lab)**
	Teachers Assessment Exam: 20 Marks	**Internal(TW):** 25 Marks
Lectures: 3 Hrs/Week	**Class Assessment Exam:** 20 Marks	**External(PR)** : 25 Marks
Tutorials: 1 Hrs/Week	**End Semester Exam:** 60 Marks	**External(OR)** :- Nil
Practical: 2 Hrs/Week		
Credit	**4**	**1**

Prerequisite: Knowledge of basic physics and geometry of XIIth standard

Course Objective:

1. Basic concepts of Mechanics for Static and Dynamics have to be implanted into the student.
2. To describe and be able to predict the conditions of rest or motion of the bodies under the action of forces
3. To understand the basic concepts of forces moments, couples in two dimensional force syst

Course Outcomes: After Completion of this course student will be able to

1. Understand the principle of work and energy
2. Comprehend the effect of friction on equilibrium.
3. Understand the laws of motion, the kinematics of motion and the interrelationship.

Course Content	Hrs
Unit – I : Coplanar Force System 1.1 System of Coplanar forces:- Resultant of Concurrent forces, Parallel forces, Non Concurrent Non Parallel system of forces, Moment of force about a point, Couples, Lami's Theorem, Varignon's Theorem. Distributed Forces in plane, Resultant of general force system 1.2 Center of Gravity and Centroid for plane Laminas	6
Unit – II :Equilibrium of Force System 2.1 Equilibrium of system of coplanar forces:- Condition of equilibrium for concurrent forces, parallel forces and Non concurrent Non Parallel general forces and Couples. 2.2 Analysis of plane trusses by using Method of joints and Method of sections.	6
Unit – III : Analysis of Beams, Frames & Cables 3.1 Beams: Types of beams, Types of supports, Types of loading. 3.2 Frames : Analysis of Trusses &Frames	6
Unit – IV : Friction 4.1 Friction: Dry Friction, Laws of friction, angle of friction & resultant reaction, wedge friction, ladder friction, belt friction. 4.2 Kinematics- Basic concepts, equation of motion for constant acceleration and motion under gravity. Variable acceleration and motion curves.	6
Unit – V : Dynamics **A] Kinematics of Particle**: - Velocity & acceleration in terms of rectangular co-ordinate system, Rectilinear motion, Motion along plane curved path, Tangential & Normal component of acceleration, Motion curves (a-t, v-t, s-t curves), Projectile motion.	6

B] Kinetics of a Particle: Force and Acceleration:-Introduction to basic concepts, Newton's Second law of motion. D'Alemberts Principle.

Unit – VI : Principle of Work Energy & Impulse Momentum

A] Work energy principle for particle: Work, Power, Energy, conservative forces & Potential Energy, Conservation of Energy, Work energy principle for motion of particle. 6

B] Impulse momentum principle for particle: Linear Impulse & Momentum, Conservation of momentum, Direct central impact & coefficient of restitution, Impulse momentum principle

Assignments :

Analytical solution of at least four problems / question on each unit based on above syllabus

BCEP107: Engineering Mechanics

Part A :List of Experiments (Any Six)

1. Study of law of parallelogram of forces
2. To Determine the Reaction at The Supports of Simply Supported Beam
3. To determine coefficient of Friction using Belt Friction
4. Verification of law of polygon of forces by graphical method.
5. Study of Lami's Theorem
6. To Determine the Moment of Inertia of Fly-Wheel.
7. To study kinematics of curvilinear motion of a particle
8. To find coefficient of restitution

Text Books:

1. F. L. Singer, Engineering Mechanics, Third Edition, Harper Publication, 2012
2. Engineering Mechanics – Statics and Dynamics by A Nelson, Tata McGraw Hill Education private Ltd, New Delhi 2009.

Reference Books:

1. Vector Mechanics for Engineers, Tata McGraw Hill Company Beer & Johnston, 2012, 9th Edition.
2. Engineering Mechanics, Pearson Education Asia Pvt. Ltd., Iriving K. Shames, 2009, 4th Edition.
3. Engineering Mechanics, Prentice Hall, R.C.Hibbler, 2003, Tenth Edition
4. Engineering Mechanics, DhanpatRai Publishing Company, S. Ramamrutham, 2009, 9th Edition.
5. Engineering Mechanics, DhanpatRai Publishing Company, R. K. Rajput, 2011, 3rd Edition
6. Engineering Mechanics, S. Chand Publication , R.S. Khurmi& Gupta,30july 2015.

Web Links:

Unit I : Resultant of concurrent force System

1. http://www.ae.msstate.edu/vlsm/forcesys/concurrent_force_systems/resultant.html
2. http://www.brainchamp.net/parallelogram-law-of-coplanar-concurrent-forces/
3. http://www.slideshare.net/guestb54490/concurrent-forces

Lamis theorem

1. http://me-mechanicalengineering.com/lamis-theorem/
2. http://www.tutorvista.com/content/physics/physics-iii/motion-laws/lamis-theorem.php
3. http://encyclopedia2.thefreedictionary.com/Lami's+theorem

Varignos theorem

1. nptel.ac.in/courses/Webcourse-contents/IIT-%20Guwahati/.../lec1.htm
2. me-mechanicalengineering.com/varignons-theorem
3. fsinet.fsid.cvut.cz/en/u2052/node40.htm

Moment & couple

1. www.mathalino.com/reviewer/engineering-**mechanics**/**moment**-force
2. web.mit.edu/4.441/1_lectures/1_lecture5/1_lecture5.html
3. physicsnet.co.uk/a-level-physics-as-a2/mechanics/moments/

Unit II : Analysis of structure (join method & section method)

1. www.mathalino.com › Engineering Mechanics › Analysis of Structures
2. www.thelearningpoint.net/home/...**mechanics/analysis-of-structure**
3. www.ce.memphis.edu/3121/notes/notes_03b.pd
4. https://en.wikipedia.org/wiki/**Structural_analysis**

Unit III : Beam & types of beam & FBD

1. https://en.wikipedia.org/wiki/**Beam**_(structure)
2. www.ecourses.ou.edu/cgi-bin/ebook.cgi?topic=me&chap_sec
3. https://www.quora.com/What-are-the-**types-of-beams**

Unit IV : Friction

1. study.com/academy/.../what-is-friction-definition-formula-forces.html
2. www.physicsclassroom.com › Physics Tutorial › Newton's Laws

Unit V : Dynamics

1. http://www.real-world-physics-problems.com/curvilinear-motion.html
2. http://nptel.ac.in/courses/122103010/md07_experiment/module2/lectures/lect4/slides/slide1.htm
3. www.iitg.ac.in/kd/Lecture%20Notes/ME101-Lecture27-KD.pdf
4. study.com/academy/lesson/projectile-motion-definition-and-examples.html
5. https://www.khanacademy.org/...newtons-laws/newtons-laws.../ne...
6. www.crackthehack.com/bnd/epress/2012/.../d-alemberts-principle-and-its-applications...

Unit VI : Principle of Work-Energy & Impulse

1. https://www.khanacademy.org/.../work...energy/work...energy.../...
2. www.spumone.org/courses/dynamics-notes/impulse_momentum/
3. https://www.coursera.org/.../module-12-define-coefficient-of-restitution-solve-an-imp...

BMEL108 : Basic Mechanical & Engineering Graphics

Teaching Scheme:	Examination Scheme (Theory)	Examination Scheme(Lab)
Lectures: 2 Hrs/Week	**Teachers Assessment Exam:** 20 Marks	**Internal(TW):** 25 Marks
Practical: 2 Hrs/Week	**Class Assessment Exam:**20 Marks	**External(PR) :** 25Marks
	End Semester Exam: 60 Marks	**External (OR) : Nil**
Credit	**2**	**1**

Prerequisite:

1. XII^{th} Physics and its principles.
2. Basic Geometry and concepts.

Course Objective:

1. To describe the scope of mechanical engineering in multidisciplinary industries.
2. To understand and identify common machine elements with their functions and power transmission devices.
3. To learn conventional machine tools , manufacturing processes and understand the design in mechanical engineering.
4. To develop imagination power of student of physical objects to be represented on paper for engineering communication in technical field.
5. To develop the manual drawing skill, drawing interpretation skill.
6. To develop the physical realization of the dimension of the objects.

Course Outcomes:

1. The students will understand the mechanical engineering in general; they will get information of power transmission shafts, keys, coupling, bush, ball bearing, friction clutches, and brakes.
2. The Students will get information of Individual & group drives, gear train, gear drive etc.
3. The Student will get information of basic Manufacturing processes as well as working principle and types of operations with block diagram of Lathe Machine, Drilling Machine, Grinding Machine.
4. The student will get idea of first & third angle method of projection, projection of lines which are inclined to both planes i.e. H.P & V.P. by first angle method of projection.

5. The student will able to draw Engineering Curves, Projection of Solids, Section of Solids and Development of Solids on sheets with their imagination power; they acquire knowledge of method of drawings adapted all over the world and able to read sheets in engineering field, their dimensioning.
6. The students will get idea of Auto-CAD software which is user friendly to draw 2D and 3D object with uniform dimensioning.

Course Contents	Hrs
Unit – I : Basic Mechanical Devices	
A] Machine Elements : Power transmission shafts, coupling, bush and ball bearing and friction clutches, brakes (Types & application only)	4
B] Drives : Individual and group drives, belt drive, chain drive, rope drive, gear drive and Spur Gear Drive arrangement with gear train (Types & application only)	
Unit – II: Manufacturing Processes & Machine Tools	
A] Manufacturing Processes	
Basic Manufacturing Processes overviews, Sheet metal forming processes : drawing and bending, Sheet metal Cutting processes : Blanking, Piercing ,Metal Joining Processes : Welding , Soldering , Brazing methods and application	6
B] Machine Tools& Operations: Basic Elements, Working Principle, Types of Operations with Block Diagram**:** Lathe Machine, Drilling Machine.	
Unit – III : Projection of Lines, Projection of Solids, Development of Solid & Orthographic Projection	
A] Introduction to lines and **Engineering Curves** -Ellipse, Parabola, Hyperbola by Focus Directrix and Rectangle Method	8
B] Introduction to projection of solids and section of solids and Development of Solid(Prism and Pyramid Maximum with six sides)	
C] Orthographic projections of given pictorial view by First Angle Method of Projections.	
Unit – IV : Isometric Projection & Auto-CAD	
A] Introduction to Isometric View with the example of Cube Isometric axes, scale, Isometric Projection and Isometric Views. Drawing isometric views of simple solids and objects dimensioning-only Length, width and height of Isometric views.	6
B] Introduction to AutoCAD, Commands, AutoCAD drawing of simple 2D objects	

BMEP 108: Elements of Mechanical & Engineering Graphics

Part A- List of Practical/Assignments (Any Eight Out of which 9 & 10 compulsory) **Hrs.**

1.	Study of power transmitting Elements – Gears, Couplings, Bearings	2
2.	Study of Automobile Clutches.	1
3.	Study of Mechanical Brakes.	1
4.	Study, demonstration & working of Lathe Machine	2
5.	Study ,demonstration & working of Drilling Machine	2
6.	Four problems on Projection of lines	4
7.	Two problems on Projection of Solids	4
8.	Four problems on Engineering Curves and Development of Lateral Surfaces.	4
9.	AutoCAD Drawing- 2 Problem on orthographic	4
10.	AutoCAD Drawing- 2 Problem on Isometric Projection	4

Part B-Mini Project Modeling

Every Students has to performed mini project in a group based on curriculum courses

Instructions to Student:

1. Maximum Three Students are permissible in each group
2. Project must be based on the contents of syllabus.
3. Project report has to be prepared and attach in practical file individually.

Text Books:

1. N. D. Bhatt & V. M. Panchal, Engineering Drawing, Plane and Solid Geometry, Charotor Publication House, Anand, Gujrat, India.
2. Dhananjay A. Jolhe, Engineering Drawing with an Introduction to Auto CAD, Tata Mcgraw- hill Publishing Co. Ltd., New Delhi, India.
3. G. Shanmugam S. Ravindran " Basic Mechanical Engineering",Tata McGraw- Hill Publisher Co. Ltd.
4. R. K. Purohit " Foundation of Mechanical Engineering" , Scientific Publishers.

Reference Books :

1. K. Venugopal, Engineering Drawing and Graphics, New Age Publication.
2. N. B. Shaha and B. C. Rana, Engineering Drawing, Pearson Education.
3. C. Jensen, J. D. Helsel and D. R. Short, "Engineering Drawing and Design", Tata McGraw-Hill Education Pvt. Ltd., New Delhi, 2012
4. Surinder kumar , " Basics of Mechanical Engineering". Ane Books Pvt. Ltd., New Delhi, 2011
5. T. J. Parbhu , V. Jaiganesh and S. Jebaraj, " Basic Mechanical Engineering" , Scitech Publications (India) Pvt. Ltd. Chennai, 2010.

Weblinks :

Unit – I

- https://www.google.co.in/webhp?sourceid=chrome-instant&ion=1&espv=2&ie=UTF-8#q=machine+Elements+Shaft+%2C+keys%2C+Coupling
- http://www.codecogs.com/library/engineering/theory_of_machines/belt-and-rope-drives-brakes.php

Unit – II

- https://en.wikipedia.org/wiki/List_of_manufacturing_processes
- http://www.egr.msu.edu/~pkwon/me478/operations.pdf

Unit – III

- http://nptel.ac.in/courses/112103019/20
- http://www.iitg.ernet.in/rkbc/ME111/Lecture4%20Engineering%20Curves%20and%20Theory%20of%20projections.pdf
- http://nptel.ac.in/courses/112103019/29
- http://www.iitg.ernet.in/rkbc/ME111/Lecture11%20Sections%20of%20solids.pdf
- http://www.engineeringessentials.com/ege/ortho/ortho_page2.htm

Unit – IV

- http://home.iitk.ac.in/~cvrm/TA101_L12_IsometricProjections_Basics.pdf
- http://cms.cerritos.edu/uploads/engt/autocad%20basics.pdf

BHUL109: Environmental Studies and Professional Ethics

Teaching Scheme:	**Examination Scheme (Theory)**	**Examination Scheme (Lab)**
Lectures: 2 Hrs/Week	**Teachers Assessment Exam:** Nil	**Internal(TW):** Nil
Tutorial: Nil	**Class Assessment Exam:** Nil	**External(PR) :**Nil
	End Semester Exam: Nil	**External(OR) :** Nil
Credit	**Audit Course**	

Course Objective: After completing the course students wil be able to

1. Understand fundamental concepts of Environmental systems
2. Understand fundamental concepts from the social sciences and humanities underlying environmental thought and governance.

Course Outcome: At the end of the course the student shall be able to:

1. Understand the concepts and methods and their applications in environmental problem-solving.
2. To get knowledge about impact of different types of pollutions.
3. To get knowledge about effect of water pollution on health and different energy recourses.
4. Demonstrate self confidence and self esteem.
5. Present appropriate etiquettes, style, manners and graceful personality.

Course Contents	Hrs
Unit – I : Environmental Science, Climate Change and need of public awareness	
Definition, scope importance and objectives, guiding principle of Environmental studies, climate change and Need for public awareness. Concept of ecosystem biotic & abiotic components, types of ecosystems. Explain different ecosystems- forest, grassland, desert, aquatic.	4
Unit – II : Pollution and Waste Management	
Air Pollution & Automobile Pollution: Definition, Effects – Global Warming, Acid rain & Ozone layer depletion, Animal husbandry, controlling measures. **Solid Waste Management** - E-Waste Management & Biomedical Waste Management - Sources, Characteristics & Disposal methods.	4
Unit – III : Natural Resources, Material Cycles and Energy	
Natural Resources - Water resources – Availability & Quality aspects, Water borne diseases &water induced diseases, Fluoride problem in drinking water. **Wealth Material Cycles –** Phosphorous Cycle, Carbon Cycle, Nitrogen Cycle & Sulphur Cycle. **Energy** – Different types of energy, Conventional sources & Non-Conventional sources of energy. with examples such as Solar energy and Hydro electric energy.	4
UNIT-IV: Ethics, Value System & Value Education	
Ethics: Behavioral Values, Code of Conduct in College Premises, Addiction, Patriotism – Building respect for the Country, National Anthem and National Flag, Ragging, Respect for Individuals & Environment, Peer – Pressure & Support, Moral Uprightness, Importance of Altruism, Living by the Rules. **Value System & Value Education:** Understanding how value system affects behavior and perception, Difference between Values, Moral & Ethics, Concept of Equality, Acceptance, Humility. Importance of Value education for College Student, Understanding the meaning of Vishwas : Differentiating between intention and competence, How to resolve ethical dilemma, “Right” and “Wrong” Action	4
UNIT-V: Copyrights, Corruption & Integrity and Goal Setting ,Self Improvement and Self Analysis	8
Introduction, Moral Obligations, Copyright Infringement, Patent Law, Case Study Analysis **Goal Setting:** - The importance and benefits of proper goal setting is explained to the students. The following topics are covered: S.M.A.R.T. Goals, Principles of Goal Setting, Steps for Goal	

- Setting Activity. Grooming & Body Language: The students are trained on various aspects of self-grooming and body-language.
- Attitude Development: Types of Attitude, How society affects attitude, Importance of right attitude, Activity.
- Vocabulary Building, Public Speaking & Extempore: Vocabulary Building, Crosswords, Word & Meaning, Spellings, Conversation Practice, Extempore Practice, Intonation, Speech Anxiety.

Self Analysis:

- Self Awareness& Mindfulness: Being Self Aware, Self Awareness in relationships, SWOT, Developing Self Awareness, Self Mastery, JoHari Window.

Mini Project Modeling

Every Students has to performed mini project or a survey report in a group based on following topics.

1.Air pollution

2.Noice pollution

3. water treatment

4.Sewage treatment

5.Human Rights ACTs.(right to equality, education, own a private land, other constitutional rights)

6.Recent studies on minimization of solid waste.(electronic waste, biomedical waste, plastic waste etc)

7. Latest existing status regarding rural development. (sanitary, agricultural, lifestyle, use of technical knowledge for improving different perspects of life, health awareness of both humans and animals)

8. Green building

9. Effects of Global warming

10. Impacts of climate change

Instructions to Students

1. Maximum Three Students are permissible in each group
2. Project must be based on the contents of syllabus.
3. Project report has to be prepared and attach in practical file individually.

Reference Books:

1. A textbook of Environment and Ecology – by Shashi Chawla
2. Textbook for Enviornmental Studies for Undergraduate Courses of all Branches of Higher Education by eran barucha.
3. Solid waste management- by chandrappa, Ramesh, Brown and Jeff.
4. A Textbook of Environmental Chemistry & Pollution Control: S SDara, S. Chand & Company, New

Delhi (2002).

5. "Essentials of Ecology & Environment Science" by Rana. S.V.S.; EPI Publications.
6. Gleick, H.P.1993. Water in crisis, Pacifics Institute for Studies in Dev., Environment & Security. Stockholm Env. Institute. Oxford Univ. Press.473p
7. Robert Schuller, Success Never Ends, Failure is Never Final, Revised Edition, Paperback, 1990 Page 14 of 323
8. Allen Pease, Body Language b, First Edition, Paperback, 2005

BMEP111: Workshop

Teaching Scheme:	Examination Scheme: (Theory)	Examination Scheme:(Lab)
Lectures: Nil	**Teachers Assessment Exam:** Nil	**Continuous Assessment:**
Practical: 2Hr/Week	**Class Assessment Exam:** Nil	50 Marks
Tutorial: Nil	**End Semester Exam:** Nil	
Credit	_	**1**

Course Objective:

1. To introduce to names, uses and setting of hand tools for Fitting, Carpentry and Welding used in mechanical engineering workshop.
2. To introduce students to components and PCB making so as to be able to do work related to Mini-Model making in Electronics workshop.

Course Outcome: At the end of this course student are able to

1. Understand and demonstrate workshop safety regulations.
2. Use tools and processes in fitting, carpentry and welding operations.
3. Demonstrate knowledge of component identification and PCB making.

Course Contents	Hrs
Unit – I : Utility Tools	
Carpentry – 1 Job	
Introduction to wood working, kinds of woods, hand tools and machines. Types of joints, wood turning. Pattern making, types of patterns, contraction, draft and machining allowances.	4
Term work to include one job involving joint and woodturning.	
Fitting – 1 Job	
Types of fits, concepts of interchangeability, datum selection, location layout, marking, cutting, shearing, chipping, sizing of metals, drilling and tapping.	4

Term work to include one job involving fitting to size, male-female fitting with drilling and tapping. 4

Sheet Metal Practice – 1 Job

Introduction to primary technology processes involving bending, punching and drawing various sheet metal joints, development of joints.

Term work to include a utility job in sheet metal.

Joining – 1 Job

Includes making temporary and permanent joints between similar and dissimilar material by processes of chemical bonding, mechanical fasteners and fusion technologies. 4

Term work includes one job involving various joining processes like riveting. Joining of plastics, welding, brazing etc.

Unit – II : Demonstrations (Any Four)

Assembly and Inspection

Assembly and Disassembly of some products, tools etc. Videos of advancement in manufacturing technology. Inspection of various components using different measuring instruments. Introduction to measuring equipment used in Quality Control.

Safety in Workshop

Fire hazards, electric short circuit- causes and remedies. Machine protection, Human protection, Accident prevention methods, developing ability to observe safe working habits.

Forging

Hot working, cold working processes, forging materials, hand tools and appliances, hand forging, power forging. 2

Moulding

Principles of moulding, methods, core & core boxes, preparation of foundry sand, casting, plastic moulding.

Plumbing

Types of pipe joints, threading dies, Pipe fitting.

PCB Making

Layout drawing, positive and negative film marking, PCB etching and drilling.

Machine Tools

Turing, Milling, Grinding, Planning – Machines, Tools and Accessories.

Note: All demonstrations to be engaged by teaching faculty and corresponding teaching load be shown in the time table for respective teaching faculty.

Submissions :

Two jobs as mentioned above.

Brief write-up with illustration / sketches on the demonstration (not more than 3 pages for each demonstration.)

Text Books:

Chaudhary, Hazra, “Elements of Workshop Technology,: Volume I & II Media Promoters and Publishers, Mumbai.

Course in Workshop Technology Volume-I, B. S. Raghuwanshi, Laxmi Publication-Revised Edition

BFYP112: MINI MODELING

Teaching Scheme	Examination Scheme: (Theory)	Examination Scheme: (Laboratory)
Lectures: Nil	**Teachers Assessment Examination:** Nil	**Continuous Assessment:** 50 Marks
Practicals: 2 Hrs./Week	**Class Assessment Examination:** Nil	
Tutorials: Nil	**End Semester Examination :**Nil	
Credit	**----**	**1**

Prerequisite: 12th Science Basics

Course Objective : After completing this course student will able

1. To understand different phase of model development.
2. To learn various techniques of model development.

Course Outcome: student shall be able to:

1. Developing the skills of planning and designing to develop a working Mini Model.
2. Implement knowledge of concepts learnt and workshop practices to prepare a model.
3. Use innovative ideas and convert these into physical models.

Sr. No	Themes for Mini Modeling (value addition Venture)
1	Mechatronics
2	Modeling a) AutoCAD/Autodesk b) Nx4/Ansys/CATIA/Uni Graphics c) Metro Rail/Automobiles

3 Transducers and sensors
   a) Simulink
   b) Lab view
4 Energy conversion and conservation
5 Renewable energy sources
6 Energy Audit
7 Alternate fuels
8 Environmental issues related projects
9 Environmental Audit
10 Designing application based projects PCB Fabrication
11 Agriculture Based Projects
12 Design of web page
13 Bio-Engineering

BHUL113 : Communication Skill

Teaching Scheme:	**Examination Scheme (Theory)**	**Examination Scheme (Lab)**
Lectures: 2Hr/Week	**Teachers Assessment Exam:**10 Marks	**Internal(TW):** Nil
Tutorials: Nil	**Class Assessment Exam:**10 Marks	**External(PR) :**Nil
	End Semester Exam: 30 Marks	**External(OR) :** Nil
Credit	**2**	_

Course Objective:

1. To develop an understanding in the students regarding communication skills
2. To develop the four essential communication skills in the students i.e. reading, writing, listening and speaking
3. To develop the vocabulary and English proficiency of the students
4. Train students to common words, phrases relevant to the immediate communication tasks
5. Enable students to comprehend the concept of communication.
6. Teach students the four basic communication skills – Listening, Speaking, Reading and Writing

Course Outcome: At the end of the course the student shall be able to:

1. The students will develop an understanding regarding communication skills.
2. Development of the four essential communication skills in i.e. –reading, writing, Listening and speaking in students.
3. Enhancement of vocabulary and English proficiency of the students.

Course Contents	Hrs
Unit – I : INTRODUCTION TO COMMUNICATION	
Importance of Communication; Importance of Communicating effectively in English; Communication Process , Channels of communication; Barriers to effective communication, Need of communication skills for Engineers.	2
Unit – II : TECHNICAL COMMUNICATION	
Introduction to Technical Communication; differences between General and Technical Communication; importance of Technical Communication; Technical Communication Skills – Listening, Speaking, Reading, Writing	2
Unit – III : LISTENING SKILLS	
Listening Process; Hearing and Listening; Poor listening habits; Traits of a good listener; Types of Listening Principles of Communication – Communication as coding and decoding – signs and symbols – verbal and non –verbal symbols – Language AND communication; language VS communication – media/channels for communication.	4
Unit – IV : SPEAKING SKILLS	
Phonetics and Diction – Theory and Practical; Body Language; Miscellaneous tips and techniques on speaking. Articles reading.	3
Unit – V : READING SKILLS	
Reading Comprehension Techniques for good comprehension, Interpreting charts and tables, Practical Exercises; Developing reading speed – Theory and Practical; Loud Reading – Practical Exercises in class	3
Unit – VI : TECHNICAL WRITING	
Characteristics of Technical Writing – introduction, characteristics, techniques; Choice of right words, phrases and sentences; Principles of paragraph writing	2
Unit – VII : WRITING BUSINESS LETTERS AND EMAILS	
Business Letters – The 7 Cs of Letter Writing, structure of business letters, writing business letters (applications, enquiry, quotations, complaints, cover letters); Writing professional emails	2
Unit – VIII: OTHER WRITTEN COMMUNICATION	
Writing reports, proposals, press release, articles, essays; drafting of Notices and Advertisements (for newspapers); note-making	2
Unit – IX: VOCABULARY DEVELOPMENT	2

Effective use of dictionary; etymology; homophones and homonyms; synonyms and antonyms; words frequently confused or miss spelt, idioms and phrases

Unit – X: BASICS OF FUNCTIONAL ENGLISH GRAMMAR 2

Parts of Speech – introduction, prepositions; articles; tenses; narration; punctuation; voice

Text Books:

1. Mason, Margaret M. Examine Your English, Hyderabad: Orient Longman, 1980
2. Sharma, R.S. Technical Writing. Delhi: Radha Publication, 1999
3. Sudarsanam, R. Understanding Technical English. Delhi: Sterling Publishers Pvt. Ltd., 1992
4. Gannon, Robert, Edt. Best Science Writing: Readings and Insights. Hyderabad: University Press (India) Limited, 1991
5. M. Ashraf Rizvi, Effective Technical Communication, First Edition, Tata McGraw Hill, 2012
6. P C Wren and H Martin, High School English Grammar and Composition, Revised First Edition, S Chand, 2005
7. Meenakshi Raman & Sangeeta Sharma, Communication – Principles & Practice, First Edition, Oxford University Press, 2011

Web Reference Links:

- http://www.youtube.com/watch?v=egeyiUpFsaw
- http://www.youtube.com/watch?v=8Oos1qoYe4o
- http://www.youtube.com/watch?v=9Y88Zw7eWZc
- http://www.youtube.com/watch?v=_pFTsGzGuOk
- http://www.youtube.com/watch?v=eB9Bq3YJGcA
- http://www.youtube.com/watch?v=UWBSlMaplT0
- http://www.youtube.com/watch?v=VFrp9ROB44c&feature=pyv&ad=4735114004&kw=success
- http://www.youtube.com/watch?v=e4g0op2P_yY
- http://www.youtube.com/watch?v=AFGNKJruxdg

BIDL101: Bio Systems in Engineering

Teaching Scheme	Examination Scheme (Theory)	Examination Scheme (Lab)
Lectures:2Hrs/Week	**Teachers Assessment Exam :**Nil	**Continuous Assessment:** Nil
Tutorials: Nil	**Class Assessment Exam:** Nil	**External(PR) :**Nil
	End Semester Exam: Nil	

Credit	**Audit Course**	**-------**

Course Objective :

This course introduces general biological concepts

1. It helps students to understand importance of biological concepts in engineering fields.
2. To understand application of engineering concepts in medical instrumentation.

Course Outcome:

Upon successful completion of the course, students will be able to

1. Use bioinstrumentation, required in cellular or molecular biology investigations.
2. Apply the concepts of engineering in different streams of biomedical field.

Course Contents	**Hrs**
Basics of Biology: Introduction to Human Anatomy and Physiology, The Nervous System, Cardiovascular System. **Biomedical Instrumentation:** Bioelectric Signals, Biomedical Instrumentation System, Biomedical transducers, Electrodes and Their Characteristics. Bio-imaging techniques, ECG, Computer aided ECG, X-Ray, MRI, CT Scan, Blood pressure measurement instrument. **Applications of Biomedical Engineering.**	24

Text Books:

1. “Joseph J. Carr and John M. Brown, “**Introduction to Biomedical Equipment Technology**”, 4 th Edition, Prentice Hall, 2000.
2. R. Rangayan, “**Biomedical Signal Analysis**”, Wiley 2002**.**

Reference Books:

1. R.S.Khandpur, “**Handbook of Biomedical Instrumentation**”, Tata McGraw Hill, New Delhi, 2003, Edition-II.
2. Sörnmo, “**Bioelectrical Signal Processing in Cardiac & Neurological Applications**”, Elsevier.
3. “**Biomedical Instrumentation** Arumugam,Anuradha Publishers,2002,First Edition

****

Department of
Computer Engineering

(NAAC Accredited)

S. Y. B.Tech. Course Book

(2016 Pattern)

(With effect from June 2017)

Department of
Computer Engineering

(NAAC Accredited)

Under Graduate (UG) Course Book

S.Y. B.Tech (Computer)

Semester- III/IV

INDEX

About Computer Engg. Department

- NAAC Accredited Computer Engg. Programme
- Involvement of Experts from IITs, NITs, Govt. Colleges, Reputed Industries, Alumni and Students in development of curriculum
- Choice Based Credit System (CBCS)
- Choice of Electives
- Remedial Teaching
- Sponsorship for Publications and IPR
- Research Mentorship
- Industry Internship
- Provision of Credit Transfer Scheme (CTS)
- Peer Teaching Scheme
- Teacher Guardian Scheme (TGS)
- Various Clubs and Hobby Modules
- Proficiency Courses
- Recognized Research Centre under Savitribai Phule Pune University
- Industry Supported Labs.
- MOUs with Industries.

G. H. RAISONI COLLEGE OF ENGINEERING & MANAGEMENT
PUNE

INSTITUTE VISION AND MISSION

VISION

To achieve excellent standards of quality education by keeping pace with rapidly changing technologies and create technical manpower of global standards with capabilities of accepting new challenges

MISSION

Our efforts are dedicated to impart quality and value based education to raise satisfaction level of all stake-holders. Our strength is directed to create competent professionals. Our endeavor is to provide all possible support to promote research and development activities

DEPARTMENT VISION AND MISSION

VISION

To produce global standards ethical professionals, innovators, and entrepreneurs having strong knowledge and urge to learn latest technologies in the field of Computer Engineering

MISSION

The department continuously strives to:

M1: Pursue excellence in Computer Engineering, able to adapt changing technologies through effective teaching-learning process

M2: Develop competent professionals for global market with the spirit of self-study, team work, innovation and ethics

M3: Promote continuous learning, entrepreneurial skills and research

PUNE

Programme Educational Objectives (PEOs)

PEO1: Capability to analyse, design and develop cost effective solutions to the real life problems by applying the acquired knowledge

PEO2: Adoptability to learn latest technological advancement and interdisciplinary approaches by engaging in lifelong learning process

PEO3: Willingness to pursue higher education, entrepreneurship, and research in the field of Computer Engineering

PEO4: Being responsible towards society, environment, and ethical responsible team member with interpersonal and leadership skill

Program Specific Objectives (PSOs)

At the end of the programme students will be able to demonstrate:

PSO1: The ability to analyze, design and develop software systems applying the knowledge acquired in computer core courses such as Operating system, database, computer network, computer organization and architecture, software engineering.

PSO2: The utilization of skills assimilated in basic Computer Engineering Courses to build up expertise in advanced areas of Database, Networking such as WSN, VANET, MANET, IoT, Computing etc.

PSO3: Oneself as a global standard computer professional with good morals, ethics and sensitivity towards mankind and as a responsible team member.

Program Outcomes (POs)

Engineering Graduates will be able to:

1. **Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
2. **Problem analysis**: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
3. **Design/development of solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
4. **Conduct investigations of complex problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
5. **Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.
6. **The engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
7. **Environment and sustainability**: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
8. **Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
9. **Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
10. **Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
11. **Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
12. **Life-long learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

PUNE

Department of Computer Engineering S. Y. B. Tech.

Course Structure and Scheme of Examinations for S. Y. B. Tech.												
SEMESTER-III												
Sub. Code	**Name of the Course**	**Teaching Scheme (Hrs/Week)**				**Credits**	**Evaluation Scheme**					**Duration of Exam**
							Theory			**Practical**		**Total**	**Hours**
		TH	**TU**	**PR**	**Total**		**TAE**	**CAE**	**ESE**	**Int**	**Ext**		
BEML204	Engineering Mathematics III	3	1	-	4	4	20	20	60	-	-	100	3
BCOL201	Data Structures	3	1	-	4	4	20	20	60	-	-	100	3
BCOP201	Data Structures	-	-	4	4	2	-	-	-	25	25	50	3
BCOL202	Microprocessor Based Systems	4	-	-	4	4	20	20	60	-	-	100	3
BCOP202	Microprocessor Based Systems	-	-	2	2	1	-	-	-	25	25	50	3
BCOL203	Computer Architecture& Organization	3	-	-	3	3	20	20	60	-	-	100	3
BITL201	Digital Electronics & Logic Design	3	-	-	3	3	20	20	60	-	-	100	3
BITP201	Digital Electronics & Logic Design	-	-	2	2	1	-	-	-	25	_	25	–
BCOP204	Hardware Maintenance and Trouble Shooting	-	-	2	2	1	-	-	-	25	-	25	–
MBL102	GENERAL PROFICIENCY:-II Foreign Language	1	**-**	**2**	3	Audit Course	-	-	-	-	-	-	-
Total	**17**	**2**	**12**	**31**	**23**	**100**	**100**	**300**	**100**	**50**	**650**		

TAE – Teachers Assessment Evaluation
CAE – Class Assessment Examination
ESE – End Semester Examination
Cont. Ass – Continuous Assessment

Th - Theory
Tu – Tutorial
Pr – Practical
Ext – External

Course Structure and Scheme of Examinations for S. Y. B. Tech.

SEMESTER-IV

Sub. Code	Name of the Course	Teaching Scheme				Credits	Evaluation Scheme						Duration of Paper
							Theory			Practical		Total	Hours
		TH	TU	PR	Total		TAE	CAE	ESE	Int	Ext		
BITL204	Graph Theory & Combinatorics	3	1	-	4	4	20	20	60	-	-	100	3
BCOL205	Operating system	4	-	-	4	4	20	20	60	-	-	100	3
BCOP205	Operating System	-	-	4	4	2	-	-	-	25	25	50	3
BITL202	Object Oriented Programming	3	1	-	4	4	20	20	60	-	-	100	3
BITP202	Object Oriented Programming	-	-	4	4	2	-	-	-	25	25	50	3
BITL205	Data Communication	4	-	-	4	4	20	20	60	-	-	100	3
BHUL201	Principles of Management	3	-	-	3	3	20	20	60	-	-	100	3
MBL103	GENERAL PROFICIENCY:- III: Hobby Classes	1	-	**2**	3	Audit Course	-	-	-	-	-	-	-
Total		18	**2**	**10**	**30**	**23**	**100**	**100**	**300**	**50**	**50**	**600**	

TAE – Teachers Assessment Evaluation
CAE – Class Assessment Examination
ESE – End Semester Examination
Cont. Ass – Continuous Assessment

Th - Theory
Tu – Tutorial
Pr – Practical
Ext – External

Department of Computer Engineering

Detailed Syllabus

S. Y. B. Tech.

Semester-III

BEML204: ENGINEERING MATHEMATICS III

Teaching Scheme	Credit	Examination Scheme
TH: 03 Hours/Week **TU:01 Hour/Week**	**04**	**TAE: 20 Marks** **CAE: 20 Marks** **ESE: 60 Marks**

Prerequisite (if any): Engineering Mathematics-I (BEML101), Engineering Mathematics-II (BEML110)

Course Objectives

1. Linear differential equations of higher order applicable to Control systems, Computer vision and Robotics.
2. To introduce Partial Differential Equations and its applications in the field of Electronics and Telecommunication engineering.
3. Transform techniques such as Fourier transform, Z-transform and applications to Image processing.
4. To introduce Vector differentiation and integration required in Electro-Magnetics and Wave theory.
5. Complex functions, conformal mappings and contour integration applicable to Image processing, Digital filters and Computer graphics

Course Outcome: On completion of the course, student will be able to

1. Identify the various methods in Differential equations, Vector Calculus, Complex variables and Transforms that applies to the problems in Computer engineering
2. Interpret the root concepts of mathematics required for the analysis of problems in Computer engineering field
3. Solve the problems in Computer engineering field using above concepts
4. Analyze complex problems in practice, categorize it into parts and infer the relation between them

Course Contents	Hrs
Unit–I: Linear Differential Equations (LDE) and Applications LDE of nth order with constant coefficients, Method of variation of parameters, Cauchy‘s & Legendre‘s DE, Simultaneous & Symmetric simultaneous DE. Modeling of Electrical circuits	**9**
Unit–II: Partial Differential Equation & Its Applications Partial Differential equation of first order first degree i.e. Lagrange’s form. Linear non homogeneous Partial Differential equation of nth order with constant coefficient, method of separation of variables. Application to transmission lines.	**8**
Unit–III: Z-Transforms & Fourier Transforms The Z transform- definition & properties, inverse & relation with Laplace Transform, Application to z transform to solve difference equations with constant coefficients. Fourier Transforms: Fourier Integral theorem, Fourier transforms and their simple properties.	**7**
Unit–IV: Vector Differentiation	**6**

Physical Interpretation of Vector Differentiation, Vector Differential Operator: Gradient, Divergence& curl, Directional Derivative, Solenoidal, Irrotational and Conservative Fields, Scalar Potential.	
Unit–V: Vector Integration	**6**
Line, Surface and Volume integrals, Work-done, Green's Lemma , Gauss's Divergence Theorem, Stokes Theorem, Applications to Problems in Electromagnetic Field	
Unit–VI: Complex Variables	**9**
Functions of Complex variables, Analytic functions, Cauchy-Riemann equations, Conformal mapping, Bilinear transformation, Cauchy's integral theorem, Cauchy's integral formula, Laurent's series, and Residue theorem	

Text Books

1. B. S. Grewal, "Higher Engineering Mathematics", Khanna Publication, 43rd edition.
2. H. K. Dass, 'Engineering Mathematics', S. Chand Publication 20e, New Delhi

Reference Books

1. Chandrika Prasad, 'Mathematics for Engineer', S Chand Publication, 8th edition
2. PeterV. O'Neil, "Advanced EngineeringMathematics", 7e, CengageLearning
3. Jain, R.K. and Iyengar,S.R.K, Advanced Engineering Mathematics, 3rd Edition, New Delhi, Narosa Publishers, 2007
4. Erwin Kreyszig, "Advanced Engineering Mathematics", 9e, Wiley India

BCOL201 DATA STRUCTURES

Teaching Scheme	Credit	Examination Scheme
TH: 03 Hours/Week **TU:01 Hour/Week** **PR: 04 Hours/Week**	**04+02**	**TAE: 20 Marks** **CAE: 20 Marks** **ESE: 60 Marks** **Cont. Ass: 25 Marks** **Ext. : 25 Marks** **Total: 50 Marks**

Prerequisite (if any): Programming in C

Course Objectives

1. To gain knowledge about basic concepts of data structures.
2. To learn the representation, implementation and applications of linear data structures
3. To acquire knowledge of stacks and queues with their applications.

4. To aware about the concepts of trees with their applications.
5. To learn and design the algorithm for graphs with their applications.

To get the knowledge of tables and multi-way trees

Course Outcome: On completion of the course, student will be able to

1. Describe the concepts of Data Structure
2. Apply the concepts of linked list, searching and sorting
3. Develop algorithms using stack and queues
4. Identify the applications of data structure
5. Create applications using data structure

Course Contents	Hrs
Unit–I: Review of C	7
Functions: Parameter passing call by value and call by reference, scope rules, functions and pointers, function returning pointer and pointer to function, String manipulations using arrays, pointer to pointer. Structure and Union: Passing and returning structure as parameter for function, structure and pointer, Recursion: Definition, writing recursive functions & how recursion works.	
Unit–II: Sorting and searching techniques	7
Need of sorting and searching, sorting order & stability in sorting. **Sorting Techniques**: Algorithms for Bubble sort, Selection sort, Insertion sort, Shell sort, Radix sort, Quick sort and Merge sort, Analysis of Bubble, Insertion and Quick sorting technique for best, worst and average case, Concept of Internal & External sorting. **Searching Techniques**: Algorithms for Sequential search, Binary search, Fibonacci search & concept of Index Sequential search, analysis of sequential and binary searching technique for best, worst and average case.	
Unit–III: Linear Data Structures using Link List Organization	8
Limitations of static memory allocation. Dynamic memory allocation in C. Concept of linked organization, Singly linked list, Doubly linked list, Circular linked list. Operations like insertion, deletion, traversal & other operations on these data structures. **Applications:** Representation & manipulation of polynomials using circular linked lists, Application of doubly linked list in dynamic storage management.	
Unit–IV: Stacks and Queue	7
Stacks: Concept of stack as ADT, Representation and implementation of stack using sequential & linked organization. **Applications of Stacks:**, Arithmetic expression conversion & evaluation, reversing a string, parsing : well- formed parenthesis checking. **Queues**: Concept of queue as ADT, Representation and implementation of linear queue & circular queue using sequential organization. **Applications of Queues:** Job scheduling, Queue simulation, Categorizing data,	

Types of Queue: Priority Queue, DEQUE.	
Unit–V: Trees	**9**
Basic tree concepts, binary trees and their properties, representation using linked organization, full and complete binary trees, converting tree to a binary tree, binary tree traversals, Binary search trees & operations. BST as an ADT, Threaded binary trees, Insertion and deletion of nodes in in-order threaded binary tree, pre-order, in-order and post order traversals of in-order threaded binary tree, AVL tree, and applications of trees: Gaming and Expression trees.	
Unit–VI: Graphs	**7**
Graph as an ADT, operations, graphs storage structures: Adjacency list, Adjacency Matrix, Traversals: DFS, BFS, Minimum spanning trees: Kruskal's and Prim's. Algorithm for shortest path and topological sorting.	
Text Books	
1. Horowitz,Sahani, "Fundamentals of Data Structures in C" second edition, Universities Press	
Reference Books	
1. Thomos H. Corman, Charls E. Leiserson, Ronald E. Rivest, Clifford Stein,"Introduction to Algorithms", Third Edition, Prentice Hall India Learning Pvt. Ltd. 2. Data Structures using c,Aron M. Tanenbaum, Pearson Education, 1 Edition(2003).	

BCOP201 DATA STRUCTURES
List of Practical
1. Write a program to perform Set operations - Union, Intersection, Difference, and Symmetric Difference.
2. Write a program to perform various string operations such as Copy, Length, Reversing, Palindrome, and Concatenation and to find occurrence substring with and without using library functions.
3. Implement Sorting Methods using functions- Bubble Sort, Selection Sort and Quick Sort.
4. Implement Sorting Methods using Insertion Sort, and Shell Sort, and Merge Sort.
5. Implement Searching Methods-Sequential Search, Binary Search
6. Write a menu driven program to perform following operations on SLL: Create, Insert – Start, end, between, Search & delete -- Start, end, between, Reverse without creating temporary list, Display

7.	Perform polynomial addition using a CLL.
8.	Implement Stack using an array and use this stack to perform conversion of an expression from infix to postfix form
9.	Implement Stack using a linked list. Use this stack to perform evaluation of a postfix expression.
10.	Implement binary tree using linked list and perform recursive and non-recursive traversals
11.	Implement in-order threaded binary tree using linked list and perform traversals.
12.	Implement graph using adjacency list or matrix and perform DFS and BFS
13.	Implement graph using adjacency matrix and generate minimum spanning tree using Prim's algorithm
14.	Determine single source shortest paths for a graph represented using adjacency matrix
15.	Mini Project - Implement the Mini Project of Student Database using Linked list for following requirements: a. Creation of Student Database in memory containing student ID, Name, Name Initials, Address, Contact No and Date of Birth . b. Insertion, Deletion, Modification of student record for a given student ID. c. Sorting on name initials and searching a particular student record on name initials

BCOL202: MICROPROCESSOR BASED SYSTEMS

Teaching Scheme	Credit	Examination Scheme
TH: 04 Hours/Week **PR: 02 Hours/Week**	**04+01**	**TAE: 20 Marks** **CAE: 20 Marks** **ESE: 60 Marks** **Cont. Ass: 25 Marks** **Ext. : 25 Marks** **Total: 50 Marks**

Prerequisite (if any): NA

Course Objectives

1. To get familiar with the basics of microprocessor.
2. To gain knowledge about programming of microprocessor.
3. To acquire knowledge of basic peripherals and their interfacing with 8086 microprocessor.
4. To ensure understanding of special purpose programmable peripheral devices and their

interfacing. **5.** To learn and describe the design of microprocessor based systems. **6.** To identify and describe the recent advancements in microprocessor architectures	
Course Outcome: On completion of the course, student will be able to	
1. Explain the taxonomy of microprocessors **2.** Apply addressing modes and instruction set of different processors **3.** Analyze hardware and software aspects of microprocessor based systems **4.** Recognize the recent microprocessor architecture	
Course Contents	**Hrs**
Unit–I: Introduction to 8086 Microprocessor	**8**
Building Concepts of Microprocessor, Introduction to 16, 32, 64 bit Microprocessor, Comparison of 8086 / 8088 CPU Architecture, Microprocessor Evolution - INTEL 8086 to Pentium with focus on- Clock Speed, Concurrent operation of EU and BIU, Register organization, Memory Organization & Interfacing	
Unit–II: 8086 Programming	**8**
Addressing modes, Instruction set, Programming examples, Pseudo Opcodes, Assembler Directives, Macro and procedure, Introduction to Software and Hardware tools. [Cross assemblers, Logic analyzers, Emulators, Simulators]	
Unit–III: Interrupt Structure	**8**
Examples on Programming. Interrupt Structure , Interrupt service Routine, Interrupt Vector Table, Hardware and Software Interrupts, INTR ,NMI , Interrupt, Execution of an ISR, Priority of Interrupts	
Unit–IV: 8255 Interfacing	**8**
80386 Architecture, Introduction to Real and Protected Mode, Register Model, Memory Management Unit logical to linear/physical address translation in real mode	
Unit–V: Advanced Microprocessor-I	**8**
Making the Sketch Do Your Bidding, Using Mathematical Operators, Serial Communications, Simple Digital and Analog Input, Getting Input from Sensors, Visual Output, Physical Output	
Unit–VI: Advanced Microprocessor-II	**8**
Audio Output ,Remotely Controlling External Devices, Using Displays, Using Time and Dates, Communicating Using I2C and SPI, Wireless Communication, Ethernet and Networking	
Text Books	

1. A.K. Ray & K.M. Bhurchandi, Advanced Microprocessors and peripherals- Architectures, Programming and Interfacing, Third Edition, McGraw-Hill Education India Pvt.Ltd., 2007.
2. Yu-cheng Liu, Glenn A.Gibson, Microcomputer systems: The 8086 / 8088 Family architecture, Programming and Design, Second Edition, Prentice-Hall, 2007.

Reference Books

1. Kenneth Ayala, The 8086 Microprocessor: Programming & Interfacing the PC, Second Edition, Cengage Delmar Learning, 1992.
2. Barry B. Brey, The Intel Microprocessors: 8086/8088, 80186/80188, 80286, 80386, 80486, Pentium, Pentium Pro Processor, Pentium II, Pentium III, Pentium 4 and Core2 with 64 - bit Extensions, Eighth Edition,Pearson Education, 2009.
3. Programming Arduino: Getting Started with Sketches (Tab) , McGraw-Hill Education TAB; 2 edition (June 29, 2016), Programming Arduino: Getting Started with Sketches (Tab) , McGraw-Hill Education TAB; 2 edition (June 29, 2016)

BCOP202:MICROPROCESSOR BASED SYSTEMS (A)

List of Practical

1. To study the architecture of microprocessor 8086 & perform following programs
   a) Addition of two 8-bit numbers
   b) Multiplication of two 16-bit numbers.
2. Write an ALP to add array of N hexadecimal numbers stored in the memory. Accept input from the user.
3. Write an ALP to accept a string and to display its length.
4. Write a program to convert 4-digit hex number into its equivalent BCD number. Make your program user friendly to accept the choice from user for: (A) HEX to BCD (B) EXIT.
5. Write a program to convert 5-digit BCD number into its equivalent HEX number.Make your program user friendly to accept the choice from user for: (A) BCD to HEX(B) EXIT
6. Write 8086 Assembly language program (ALP) toConcatenate two strings entered by the user
7. Write 8086 Assembly language program (ALP) to compare two strings entered by the user
8. Write 8086 ALP to interface DAC and generate following waveforms on oscilloscope. Any two a)Square wave b) Ramp wave c) Trapezoidal wave d) Stair case wave
9. 8253: Write 8086 ALP to program 8253 in various modes.
10. Write ALP to interface 8086 with Stepper motor to rotate motor with different step angles and speeds

BCOP202:MICROPROCESSOR BASED SYSTEMS (B)
List of Practical
1. Testing Arduino kit
2. Interfacing LED with Arduino
3. LED Blinking with Arduino
4. Interfacing buzzer with Arduino
5. Buzzer beeping with Arduino
6. Interfacing Push Button with Arduino
7. Interfacing Potentiometer with Arduino
8. Fade an LED with Arduino
9. Interfacing DC Motor with Arduino
10. To Monitor how much light is hitting a photoresistor using Arduino

BCOL203:COMPUTER ARCHITECTURE & ORGANIZATION		
Teaching Scheme	**Credit**	**Examination Scheme**
TH: 03 Hours/Week	**03**	**TAE: 20 Marks** **CAE: 20 Marks** **ESE: 60 Marks**
Prerequisite (if any): Basics of Electronics Engineering		
Course Objectives		
1. To introduce basic fundamental units of a computer system. **2.** To perform arithmetic operations using various algorithms. **3.** To develop skills to understand control unit design. **4.** To build concepts of memory system. **5.** To study communication of I/O devices.		
Course Outcome: On completion of the course, student will be able to		
1. Describe fundamental units of Computer System **2.** Analyse organization and design of memory system **3.** Identify different ways of communicating with I/O devices and interfaces		

4. Analyse the working of serial and parallel system

Course Contents	Hrs
Unit–I: Basic Structure of Computers	**7**
The Evolution of Computers, Functional Units, Basic operational concepts , Bus Structure, Performance Measures , System Architecture, VLSI Era, Von Neumann Architecture. Addressing modes, Execution of a Complete Instruction	
Unit–II: Data Path Unit	**8**
Data Representation, Fixed and Floating point numbers, Signed numbers,Fixed-Point Arithmetic, Booths Algorithm, Division: Restoring and Non Restoring algorithms, Arithmetic Logic unit, Floating point representations, IEEE standards, Floating point arithmetic	
Unit–III: Processing Unit	**6**
Basic Concept, Hardwired control, Micro programmed Control, Coprocessor, Pipeline Control, Pipeline Performance	
Unit–IV: Memory Organization	**8**
Characteristics of memory, Internal and External Memory, Types of memory: RAM: SRAM, DRAM, SDRAM,RDRAM ROM: PROM, EPROM, EEPROM, Cache Memory, Virtual Memory, Associative Memory, Secondary Memory, Performance	
Unit–V: Input /Output Organization	**7**
I/O mapped I/O and memory mapped I/O, interrupts and interrupts Handling Mechanisms, Direct Access Memory, Buses: synchronous vs. asynchronous, Interface Circuits, Standard I/O Interface: PCI,SCSI,USB. Computer Peripheral: I/O devices such as magnetic disk, magnetic tape, CDROM, USB systems	
Unit–VI: Parallel Organizations	**7**
Superscalar Processors, Multiple Processor Organizations, Symmetric Multiprocessors, Clusters, Non -uniform Memory Access, Vector Computations, Bus allocation Schemes. **RISC**: Instruction execution characteristics, use of large register file, compiler based register optimization, RISC architecture and pipelining. RISC Vs CISC	

Text Books

1. John Hayes, ‘Computer Architecture and Organization”, McGraw Hill, 3rd Edition.
2. V.C.Hamacher, Z.G.Vranesic and S.G.Zaky, ‘Computer Organization’, McGraw Hill, 5th edition, 2002.

Reference Books

1. A. S. Tanenbaum, “Structured Computer Organization” 4th Edition, Pearson Education.

2. M Mano, “Computer System and Architecture”, Pearson Education. 3. W. Stallings, “Computer Organization & Architecture”, Pearson Education

BITL201: DIGITAL ELECTRONICS & LOGIC DESIGN		
Teaching Scheme	**Credit**	**Examination Scheme**
TH: 03 Hours/Week **TH: 02 Hours/Week**	**03+ 01**	**TAE: 20 Marks** **CAE: 20 Marks** **ESE: 60 Marks** **Cont. Ass: 25 Marks** **Total: 25 Marks**

Prerequisite (if any): Basics of Electronics Engineering

Course Objectives

1. To possess knowledge and skills in designing of different code convertors.
2. To develop, design and implement skills of combinational and sequential circuits.
3. To learn and understand basics of Programmable Logic Devices.
4. Use the knowledge of digital electronics concept to design a digital system.
5. Understand basic digital design techniques.
6. To introduce digital logic design software such as VHDL

Course Outcome: On completion of the course, student will be able to

1. Summarize the basic concepts of digital electronics and design combinational & sequential circuits.
2. Implement various types of state machines.
3. Classify various logic families and illustrate various gates.
4. Design & develop an application using VHDL.

Course Contents	**Hrs**
Unit–I: NUMBER SYSTEM AND CODES	**8**
Introduction, Binary number System, Sign-Magnitude representation, One's and Two's complement representation, Binary arithmetic, 2's complement arithmetic, Octal number System, Hexadecimal number System, BCD code, Excess-3 code, Gray code. Code conversion, Boolean algebra: Basic theorems and properties, K-Map: Representation of truth-table, SOP form, POS form, Simplification of logical functions, Minimization of SOP forms using K- Map. Code converters	
Unit–II: COMBINATIONAL & SEQUENTIAL LOGIC CIRCUITS	**8**

Part A: Half- Adder, Full Adder, Half Subtractor, Full Subtractor, Binary adder (IC 7483),look ahead carry generator Introduction to MSI functions & chips - Multiplexers (IC 74153), Decoder / Demultiplexer(IC 74138), Encoder **Part B:** Introduction of flip-flop (F.F), 1 bit memory cell, clocked S-R F.F., J-K F.F. race around condition, M/S J-K F.F, flip-flop truth table, excitation table, flip-flop conversion, flip flop characteristics. T and D F.F, Design of 4 – bit UP-Down ripple counter using J-K flip-flop, Design of Synchronous 3 bit up/down counter, mod-n counters (IC -7490)	
Unit–III: DESIGN OF SEQUENTIAL CIRCUITS	**7**
Shift register (SISO, SIPO, PISO& PIPO), 4 bit bi-directional universal shift register, application of shift registers (Ring counter, Sequence generator, Johnson's counter.) Introduction to PLD's:- ROM, PAL,PLA, Applications of PLAs to implement combinational and sequential logic circuits Introduction to :FPGA, CPLD	
Unit–IV: LOGIC FAMILIES	**6**
Characteristics of Digital ICs: Speed, Power dissipation, fan-out, current and voltage parameters, noise margin, operating temperature etc., TTL: Operation of TTL NAND gate, Standard TTL, TTL Characteristics, Active pull-up, Wired-AND, totem pole, open collector, Unconnected Inputs. CMOS Logic: CMOS Inverter, CMOS characteristics.	
Unit–V: ALGORITHMIC STATE MACHINES	**6**
Algorithmic State Machines: Finite State Machines (FSM) and ASM, ASM charts, notations, construction of ASM chart and realization for sequential circuits, Sequence Generator, Types of Counters	
Unit–VI: INTRODUCTION TO VHDL AND PROGRAMMING	**6**
Introduction to VHDL - Library, Package, Entity, Architecture, Data Objects (Variable, signal & constant), Data Types (scalar, composite array type & predefined data types, Attributes (necessity and use. event attribute) VHDL Modeling styles – Dataflow, behavioral & structural VHDL statements - Concurrent Statements (With Select, When Else), Sequential Statements (if else, case)VHDL design Examples - Multiplexer, binary adder, counter, shift register	

Text Books

1. R. Jain, "Modern Digital Electronics", 3rd Edition, Tata McGraw-Hill, 2003, ISBN 0 – 07 – 049492 – 4.
2. "A VHDL Primer", J. Bhaskar, Englewood Cliffs, Prentice Hall, 1994, ISBN-13: 978-0131814479, 2nd Edition.

Reference Books

1. Digital Design", M. Mano, Pearson Education, 2002, ISBN - 81 - 7808 - 555 – 0, 3rd Edition.
2. Malvino, D.Leach" Digital Principles and Applications", 5th edition, Tata McGraw Hill

BITP201: DIGITAL ELECTRONICS &LOGIC DESIGN
List of Practical
1. Design (truth table, K-map) and implementation of 4 bit Code converters. i. Binary to gray and vice versa ii. BCD to Excess-3 and vice versa
2. Multiplexer - e.g. 16:1 Mux using 4:1 Mux (IC 74153) &. Decoder – (IC 74138)HA/FA.
3. Verify the truth table of one bit and two bit comparators using logic gates and IC(7485).
4. BCD adder –using IC 7483.
5. Synchronous 2 bit up down Counter.
6. Ripple (asynchronous) mod –N counter using IC 7490.
7. Design (State diagram, state table, K map, Bush table & Bush diagram) and implementation of Sequence Generator (with & without bushing) shift register IC 74194.
8. Full adder using behavioral &structure modeling in VHDL.
9. 4:1 multiplexer using dataflow &structure modeling in VHDL.

BCOP204: HARDWARE MAINTENANCE AND TROUBLESHOOTING

Teaching Scheme	Credit	Examination Scheme
PR: 02 Hours/Week	01	Cont. Ass: 25 Marks Total: 25 Marks

Prerequisite (if any): NA

Course Objectives

1. Introduction of different hardware Units of system and its assembly
2. Skills the students about the installation of system and application software
3. Develop student’s skills to identify problems occurring in the system and its Trouble Shooting
4. Develop student’s skills to identify methods to protect System from Virus, Spyware and Malware

Course Outcome: On completion of the course, student will be able to

1. Know the Motherboard, BIOS, and Storage devices features and functions.
2. Assemble Personal Computer.
3. Create Partitioning of Hard disk.
4. Install Operating System and Application software.
5. Establish small network between two or more PC’s.
6. Configure Operating System to protect it from Virus, Spyware and Malware

List of Practical
1. Study of Motherboard of Pentium-4.
2. Study of Storage devices.
3. Study and Configuration of BIOS.
4. To demonstrate Assembling of Personal Computer.
5. To demonstrate Partitioning of Hard disk
6. To demonstrate Windows 2007.
7. To demonstrate installation of Linux
8. To demonstrate Protecting PC from Virus, Spyware and Malware.
9. To Configure Structured Cabling.
10. To Configure a LAN
11. To Build Small Home Network
12. To demonstrate File and Printer Sharing in Network.
13. To demonstrate mounting xp files in Linux using NFS
14. Configuration of Wi-Fi Basics

MBL102 GENERAL PROFICIENCY-II : FOREIGN LANGUAGE

Teaching Scheme	Credit	Examination Scheme
TH: 01 Hour/Week **PR: 02 Hours/Week**	**Audit Course**	

Course Objectives:

1. To learn foreign languages to improve inter personal skills.
2. To enable improving business communications and having access to literature in globally recognized languages.
3. To help communicate at international forums and explore opportunities for employment

Course Outcomes:

1. Communicate effectively in more than one globally recognized language like French, Spanish, German, Japanese, etc.
2. Interact with technical and business communities at international forums.

Course Contents

Topics	Learning Goals	Activities
The Alphabets and accents	Pronunciations techniques	Worksheet and charts
Number 1 to 20		
Greetings & Salutations,	Articles , Personal Pronoun Day timing	Daily routines forms of respects , Vocabulary
Family and relations	Shapes and colors , Possessive Pronouns , Gender , Negative Sentence	Relations, Day of week
Weather and Seasons	Climate , Fabrics & Clothes ,	Group Activities , Paragraph

	sizes , interrogatives , Basic verbs	writing including , Names of months , Seasons, Sky , Stars
House & Household things.	Describing neighborhood Present Tense	Furniture , Household articles, Colors
Visit to supermarket	Learning the shopping etiquettes , vocabulary of food items , conversing with shopkeepers etc , Plurals	Project on vocabulary of vegetables and fruits , Bakery products , Group Activity / Role play
Timing , Telephonic Conversions	How to Ask time , converse on telephone	Timing and clock (Hours & Minutes)
Visit to city , Prominent places and park	Nature, Directions, Means of transportations, Tenses	Self introductions , Role-play , preparing charts
In Restaurant / Hotel	Ordering eatables , Table manner .Verbs	Enhancing vocabulary of food Dishes , cutlery
Visit to Doctor.	Health matters, illness. Commonly used verbs contd.	Worksheets , projects
French / German /Spanish culture – monuments , delicacies , wines visa vis Indian culture Diwali festival	Vocabulary of clothes , Accessories , Cuisines , Beverages , Adjectives	Presentations by students , situation based conversations
Receiving Guests/ Entertaining people / Good Bye’s	Customs , Traditions , Manners , welcome & Audieu’s	Activities , Role play , Assignments

Department of Computer Engineering

SY B.Tech.

Course Book

AY: 2020-21

Semester-IV

G. H. RAISONI COLLEGE OF ENGINEERING & MANAGEMENT
PUNE

Course Structure and Scheme of Examinations for S. Y. B. Tech.														
SEMESTER-IV													
Sub. Code	**Name of the Course**	**Teaching Scheme**				**Credits**	**Evaluation Scheme**						**Duration of Paper**
							Theory			**Practical**		**Total**	**Hours**
		TH	**TU**	**PR**	**Total**		**TAE**	**CAE**	**ESE**	**Int**	**Ext**		
BITL204	Graph Theory & Combinatorics	3	1	-	4	4	20	20	60	-	-	100	3
BCOL205	Operating system	4	-	-	4	4	20	20	60	-	-	100	3
BCOP205	Operating System	-	-	4	4	2	-	-	-	25	25	50	3
BITL202	Object Oriented Programming	3	1	-	4	4	20	20	60	-	-	100	3
BITP202	Object Oriented Programming	-	-	4	4	2	-	-	-	25	25	50	3
BITL205	Data Communication	4	-	-	4	4	20	20	60	-	-	100	3
BHUL201	Principles of Management	3	-	-	3	3	20	20	60	-	-	100	3
MBL103	GENERAL PROFICIENCY:- III: Hobby Classes	1	-	**2**	3	Audit Course	-	-	-	-	-	-	-
Total		18	**2**	**10**	**30**	**23**	**100**	**100**	**300**	**50**	**50**	**600**	

TAE – Teachers Assessment Examination

CAE – Class Assessment Examination

ESE – End Semester Examination

Cont. Ass – Continuous Assessment

Th - Theory

Tu – Tutorial

Pr – Practical

Ext - External

PUNE

BITL204 GRAPH THEORY AND COMBINATORICS

Teaching Scheme	Credit	Examination Scheme
TH: 03 Hours/Week TU: 01 Hour/Week	04	TAE: 20 Marks CAE: 20 Marks ESE: 60 Marks

Prerequisite (if any): Engineering Mathematics III

Course Objectives

1. To use appropriate set, function and relation models to understand practical examples, and interpret the associated operations and terminologies in context.
2. Learn graphs and trees to use different data structure.
3. Formulate problems precisely, solve the problems and apply groups and rings.
4. Introduce combinatorial structures and apply algebraic techniques to combinatorial problems

Course Outcome: On completion of the course, student will be able to

1. Describe the fundamental concepts of discrete mathematics to solve the engineering problems.
2. Identify, select & apply the data structures to solve real life problems.
3. Apply the counting principles to determine probabilities.

Course Contents	Hrs
Unit–I: LOGIC AND SET THEORY	9
Propositional logic, application of propositional logic, propositional equivalences, predicates and quantifiers, normal forms, mathematical induction, sets, finite and infinite sets, un-countable infinite set, set operation, function, cardinality of sets	
Unit–II: NUMBER THEORY	7
Divisibility and modular arithmetic, integer representations and algorithms, primes and greatest common divisors, solving congruence, applications of congruence	
Unit–III: RELATION	8
Relation, closure of relation, warshall algorithm, equivalence relation, matrix of relation, transitive closure of relation, partial ordering relation, hasse diagram, recurrence relation, linear recurrence relation with constant coefficient	
UNIT–IV: GROUPS AND RINGS	7
Algebraic systems, groups, semi group, monoid, subgroup, homomorphism, permutations groups, properties of cyclic groups, generator of group, quotient group,rings, fields, integral domain, group codes, : hamming distance	
Unit–V: GRAPHS THEORY AND TREES	8

Graphs and its types, subgraph, euler path, hamilton path, in-degree, out-degree, cycle, adjacency matrix, graph isomorphism, shortest-path problems, planar graphs, graph coloring, trees, tree traversal, minimum spanning trees: kruskal'sand prims algorithm	
Unit–VI: COMBINATORICS	**6**
Definition of generating functions and examples, proof of simple combinatorial identities, Probability, G.F. $p(t) = \sum p_n t^n$, $E(x) = p'(t)$, examples. Permutation, Combination,binomial coefficient & identifier, generation of permutation and combination	

Text Books

1. Kenneth Rosen. Discrete Mathematics and Its Applications, 7th Edition , McGraw Hill Publishing Co., 2012.
2. Discrete Mathematical structure with application to computer science by Trembley&Manohar (Mc. Graw Hill).
3. Discrete Mathematical Structure byKolmann , Busby & Ross (PHI).

Reference Books

1. C.L. Liu, 'Element of Discrete Mathematics' 2nd second edition TMH 2000.
2. John Truss , 'Discrete Mathematics' Addison Wesley, 2000 .
3. K. D. Joshi, 'Foundations of Discrete Mathematical' Willey Eastern.
4. M. L. Khanna , 'Modern Algebra' , Jai PrakashNath& Company Meeru.

BCOL205 OPERATING SYSTEM

Teaching Scheme	Credit	Examination Scheme
TH: 04 Hours/Week **PR: 04 Hours/Week**	**04 + 02**	**TAE: 20 Marks** **CAE: 20 Marks** **ESE: 60 Marks** **Cont. Ass: 25 Marks** **Ext. : 25 Marks** **Total: 50Marks**

Prerequisite (if any): NA

Course Objectives

1. To introduce general idea, structure and functions of operating system
2. To make aware of basic mechanisms used to handle processes, manages memory, and manages storage devices and files.

3. 3. To provide the details of designing operating systems	
Course Outcome: On completion of the course, student will be able to	
1. Explain the basics of operating system **2.** Apply the concepts of process, memory, I/O devices **3.** Evaluate the performance of memory system **4.** Detect deadlock on advanced applications	
Course Contents	**Hrs**
Unit–I: INTRODUCTION	**9**
Evolution of OS, Types of OS, Basic hardware support necessary for modern operating systems, services provided by OS, system programs and system calls, system design and implementation	
Unit–II: PROCESS SCHEDULING AND SYNCHRONIZATION	**8**
Process concept, process control block, Types of scheduler, context switch, threads, multi threading model, IPC concept, types of IPC, Goals of scheduling and different scheduling algorithms, Concurrency conditions, Critical section problem, software and hardware solution, semaphores, conditional critical regions and monitors, classical inter process communication problems	
Unit–III: DEADLOCKS DETECTION & AVOIDANCE	**8**
Deadlock definitions, Prevention, Avoidance, detection and Recovery, Goals of Protection, access matrix, Deadlock implementation, Recent trends in Operating System, Introduction to Advanced OS & its Application	
UNIT–IV: MEMORY MANAGEMENT	**7**
Contiguous allocation, Relocation, Paging, Segmentation, Segmentation with paging, demand paging , Virtual Memory Concepts, page faults and instruction restart , page replacement algorithms , working sets , Locality of reference, Thrashing, Garbage Collection	
Unit–V: FILE SYSTEMS	**8**
File systems: File concept, Access methods, Disk space management and space allocation strategies, directory structures, Recovery, Log-structured File System, disk arm scheduling strategies, File system of windows ,Linux, android	
Unit–VI: DEVICE MANAGEMENT	**8**
Secondary-Storage Structure: Overview of Mass-Storage Structure, Disk Structure, Disk Attachment, Disk Scheduling, Disk Management, Swap-Space Management, RAID Structure. **I/O Systems :** Overview, I/O Hardware, Application I/O Interface, Kernel I/O Subsystem, Transforming I/O Requests to Hardware Operations, STREAMS.	

Text Books
1. Operating System concepts – Silberchatz& Galvin, Addison Wesley, 6th Edn. 2. Modern Operating Systems – Tanenbaum, Pearson Edn. 2ndedn.
Reference Books
1. Operating Systems – S R Sathe, Macmillan Publishers, India, 2008 2. 2. Operating System –Milan Milenkovik, McGraw-Hill, 1987 3. 3. Operating Systems - 3rd Edition by Gary Nutt, Pearson Education

BCOP205 OPERATING SYSTEM
List of Practical
1. Study of Unix/Linux general purpose utility command list obtained from (man, who,cat, cd, cp, ps, ls, mv, rm, mkdir, rmdir, echo, more, date, time, kill, history, chmod,chown, finger, pwd, cal, logout, shutdown) commands.
2. Write a shell script to write your user name as a banner and send to the printer.
3. Write a shell script to print the first five arguments in reverse order.
4. Write a shell script that gives how many times that person is logged on.
5. Write a shell script program to check whether given file is a directory or not.
6. Write a shell script that takes a "uid" as an argument and prints that person's name, home directory, shell and group number, and other groups that person may belongs to.
7. Write a shell script program to develop a scientific calculator
8. Write a program for creating child process by fork () command.
9. Write a shell script program to check variable attributes of file and processes.
10. Write an IPC program using pipe. Process A accepts a character string and Process B inverses the string. Pipe is used to establish communication between A and B processes using Python or C++.
11. Use Python for Socket Programming to connect two or more PCs to share a text file.
12. Write a program in C++ to read display the i-node information for a given text file, image file.
13. Write a program in Python/C++ to test that computer is booted with Legacy Boot ROM BIOS or UEFI.
14. Write program in python for Reader writer problem.
15. Create an iso boot image using open source tools.

BITL202: OBJECT ORIENTED PROGRAMMING

Teaching Scheme	Credit	Examination Scheme
TH: 04 Hours/Week **PR: 04 Hours/Week**	**04 + 02**	**TAE: 20 Marks** **CAE: 20 Marks** **ESE: 60 Marks** **Cont. Ass: 25 Marks** **Ext. : 25 Marks** **Total: 50Marks**

Prerequisite (if any): NA

Course Objectives

1. To learn and understand the difference between object oriented programming and procedural programming.
2. To learn and understand the basic principles of Object Oriented Programming.
3. To be aware about the concepts of functions, constructors & operator overloading.
4. To learn and understand the concepts of inheritance and polymorphism.
5. To know the console I/O operations & templates.
6. To learn file handling and exception handling.

Course Outcome: On completion of the course, student will be able to

1. Describe the fundamental principles of Object oriented programming.
2. Understand and Implement appropriate methods to solve a problem.
3. Integrate the various strengths of object oriented programming concepts and develop suitable application
4. Design and Build solution for real world problems using object oriented concepts

Course Contents	Hrs
Unit–I: PRINCIPLES OF OBJECT ORIENTED PROGRAMMING	**8**
Introduction of Procedure oriented programming, object oriented programming paradigm. **Fundamental of object oriented programming:** objects, classes, data members, methods, messages, data encapsulation, data abstraction and information hiding, inheritance, polymorphism, benefits of OOP, application of OOP. **Beginning with C++:** Introduction of C++, Simple C++ Program, Structure of C++, Creating Source File, Compiling and Linking, cin, cout, iostream, and namespace.	
Unit–II: FUNCTION IN C++	**8**
Tokens, identifiers and constant, keywords, data types, operators, variables, expression and control structure, static and dynamic memory allocation, default and constant argument. **Function in C++:** Introduction, function prototype, call by reference, return by reference,	

inline function, defining member functions	
Unit–III: CONSTRUCTORS AND OPERATOR OVERLOADING	**8**
Constructor: Introduction to constructor, types of constructors (default, parameterized and copy constructor), destructors. **Operator Overloading**: Introduction to operator overloading, rules of operator overloading, unary and binary operator overloading, operator overloading using friend function and using member function, type of conversion	
UNIT–IV: INHERITANCE AND POLYMORPHISM	**6**
Inheritance: Introduction, Need of inheritance, types of inheritance , ambiguity in multiple inheritance, base and derived classes, member access control, virtual base class **Polymorphism:** Introduction, pointer, pointers to object, this pointer, pointer to derived classes, virtual function and pure virtual function	
Unit–V: CONSOLE I/O OPERATIONS AND TEMPLATES	**6**

BITP202: OBJECT ORIENTED PROGRAMMING

Console I/O operations: Introduction, C++ stream, C++ streams classes, I/O operations formatted and unformatted I/O operations. **Templates:** Class templates, class templates with multiple parameters, function templates, function templates with multiple parameters	
Unit–VI: EXCEPTIONS AND FILE HANDLING	**8**
Exception handling: Introduction, basic of exception handling, mechanism of exception handling: try, catch, and throw. **File handling**: Introduction, Classes for file stream operations, file operations: open, close, read, write, detect end of file, file modes, File pointers and their manipulations, error handling during file operations	

Text Books

1. Object oriented programming with C++, E Balagurusamy, 4th edition, TMH.
2. Object Oriented Programming in C++ -Robert Lafore, edition, Galgotia publications.
3. The Complete Reference C++, Herbert Schildt, 4th Edition, TMH.

Reference Books

1. Let’s C++ by Y. Kanetkar, BPB publications.
2. Object Oriented Programming in C++ -Robert Lafore, edition, Galgotia publications.
3. Object-Oriented Programming with C++, SouravSahay, Oxford University Press, 2006

List of Practical
1. Write a C++ program to accept and display student details like student name, roll number, class, and phone number and address using member function and class name as student.
2. Write a C++ program for book details using structure variable.
3. Write a C++ program to calculate the area of triangle and rectangle using friend function.
4. Write a C++ program to generate the weather report using constructor.
5. Write a C++ program to add and subtract two complex number using operators overloading with constructor (default and parameterized).
6. Write a C++ program to find volume of cube, cylinder using virtual function.
7. Write a C++ program for employee salary details using inheritance.
8. Write a C++ program using multiple inheritance to create student bio-data using following classes i) Personal record ii)Academic record Assume appropriate data members and member function to accept required data & print bio-data.
9. Write a in C++ using function template to read two matrices of integer data type and perform addition operations on these matrices and display it.
10. Implement various file handling operations using UI application.

BITL205 DATA COMMUNICATION

Teaching Scheme	Credit	Examination Scheme
TH: 04 Hours/Week	04	TAE: 20 Marks CAE: 20 Marks ESE: 60 Marks

Prerequisite (if any): Basic Electronics Engineering

Course Objectives

1. To introduce basics of data communication and techniques used to transfer data.
2. Identify various types of transmission media and interfaces in network.
3. Introduce various analog and digital services for data communication.
4. Understand various multiplexing techniques.
5. Understand advanced techniques such as Data encoding and Compression

Course Outcome: On completion of the course, student will be able to

1. Explain the basic concepts of data communication
2. Identify & categorize various types of transmission medias.
3. Describe various analog & digital services of data communication.

4. Design & evaluate data communication problem using recent techniques

Course Contents	Hrs
Unit–I: SIGNALS	**8**
ANALOG AND DIGITAL: Analog and digital data, Analog and digital signals; PERIODIC AND APERIODIC SIGNALS, TIME AND FREQUENCY DOMAINS; COMPOSITE SIGNALS: Frequency spectrum and Bandwidth; DIGITAL SIGNALS: Decomposition of digital signal; TRANSMISSION MODES: Serial and Parallel transmission, Asynchronous and Synchronous Transmission, Simplex, Half-Duplex and Full-Duplex communication	
Unit–II: DIGITAL COMMUNICATION	**8**
Basic communication system, Bit rate/baud rate, Sampling Rate, How many Bits per Sample? , Shannon theorem, ANALOG-TO-DIGITAL CONVERSION: Pulse Code Modulation (PCM), DPCM,ADPCM, DM,ADM DIGITAL-TO-DIGITAL CONVERSION: Unipolar, Polar, Bipolar; Block encoding, Scrambling	
Unit–III: INTERFACES AND MODEMS	**8**
DIGITAL DATA TRANSMISSION: Parallel transmission, Serial Transmission; DTE-DCE INTERFACE: Data Terminal Equipment (DTE), Data Circuit-Terminating Equipment (DEC), Standards, EIA-232 Interface; OTHER INTERFACE STANDARDS: EIA-449, EIA-530.	
UNIT–IV: COMMUNICATION MEDIA	**7**
GUIDED MEDIA: Twisted pair cable, Coaxial cable, Optical Fiber cable; UNGUIDED MEDIA: Radio frequency allocation, Propagation of Radio waves, Terrestrial microwave, Satellite communication, Cellular Telephony; TRANSMISSION IMPAIRMENTS: Attenuation, Distortion, Noise; PERFORMANCE: Throughput, Propagation Speed, Propagation time	
Unit–V: MULTIPLEXING	**7**
FREQUENCY DIVISION MULTIPLEXING (FDM), TIME DIVISION MULTIPLEXING (TDM): Inverse Multiplexing, WAVE-DIVISION MULTIPLEXING,CDMA, HSPA. HSUPA, LTE MULTIPLEXING APPLICATIONS: THE TELEPHONE SYSTEM: Common carrier services and hierarchies, Analog services, Digital Services, FTTC: FTTC in the Telephone Network, FTTC in the Cable TV Network	
Unit–VI: DATA COMPRESSION	**7**
Huffman code, Run-Length Encoding, Relative Encoding, Lempel-Ziv Encoding, Image Compression, JPEG, MPEG, Recent trends and advanced topic on Data Communication	
Text Books	

1. Behrouz A. Forouzan , ‘Data Communications and Networking’, 4th edition, Tata McGraw Hill.
2. Kennedy, ‘Electronic communication Systems’.

Reference Books

1. William A. Shay, ‘Understanding Data Communications and Networks’, 2nd Edition, Vikas Publishing House.
2. Fred Halsall, ‘Data communication’, Pearson Education.
3. http://www.tutorialspoint.com/lte/lte_quick_guide.html.

BHUL201 PRINCIPLES OF MANAGEMENT

Teaching Scheme	Credit	Examination Scheme
TH: 03 Hours/Week	**03**	**TAE: 20 Marks** **CAE: 20 Marks** **ESE: 60 Marks**

Prerequisite (if any): NA

Course Objectives

1. Understand the basic structure and function of Management, planning of management issues
2. To introduce idea of management issues viz. Marketing, Financial, Human Resource and its planning.
3. To understand about the past structure of organization and its Behavior and future improvements.
4. To study information management systems related with policy, implementation, and other applications related to all areas of the organization/(s) enabling decision making smooth and faster.

Course Outcome: On completion of the course, student will be able to

1. Update today’s trend in market.
2. Understand the structure and behaviour of organization.
3. Develop an information management systems related with policy, and applications related to all areas of the organization /(s).
4. Develop decision making processes.
5. Manage the Financial skills, decision making, Economics and Accounting.
6. Describe the role of Human resource management.

Course Contents	Hrs
Unit–I: INTRODUCTION	**5**
Nature and Functions of Management, Management yesterday and today, Planning and Decision making	
Unit–II: MANAGEMENT INFORMATION SYSTEM	**6**
Management Information System: Introduction, Conceptual Foundations,Information System Requirement.	
Unit–III: MARKETING MANAGEMENT AND PLANNING	**7**
Marketing Management: Marketing concept, Indian Marketing Environment, Market segmentation, Market Planning, International Marketing	
UNIT–IV: FINANCIAL MANAGEMENT	**8**
Evolution of financial Management, Financial decisions in a Firm, Goal of Financial Principle of Finance, Risk return trade off, Forms of Business organization, Relationship of Finance to Economics and Accounting, Emerging Role of the Financial Manager in India	
Unit–V: HUMAN RESOURCE MANAGEMENT	**7**
Human Resource Management: Human Resource Planning, Recruitment, Selection, Training and development, Security, Safety and Health	
Unit–VI: Organization Structure and Behavior	**7**
Organization Behavior: Organization Structure and design, Designing Effective Organization, Managing Job Stress, Organization Development	

Text Books

1. P C Tripathi and P N Reddy , 'Principles of management'
2. Davis and H. Olison, 'Management Information System,Gordan', McGraw Hill Pub.
3. WilliamWerther and Keith Davis, ' Human Resources and Personal Management'
4. Prasanna Chandra, "Financial Management", McGraw Hill- Seventh Edition.
5. V S Ramaswamy and S Namakumari, 'Marketing Management'
6. High Arnold and Daniel Feldman, 'Organization Behavior', McGraw Hill

MBL103 GENERAL PROFICIENCY-III : HOBBY CLASSES

Teaching Scheme	Credit	Examination Scheme
TH: 01 Hour/ Week **PR: 02 Hours/Week**	**Audit Course**	

Course Objectives:

1. To nurture one's special capability and interest in activities like sports, drama, singing etc.
2. To help express oneself and be more compatible with outer world in the hobby domain.

3. To enhance creativity & imagination to flow freely.
Course Outcomes:
1. Explore and demonstrate the inherent talents within. **2.** Engage themselves in creative activities during spare time. **3.** Create balance between academic & work life. **4.** Acts as a stress buster in the stressed life. **5.** Develop self-expression and communication skills. **6.** Learn a new skill and increase self-confidence and boosts self esteem.
Course Contents

Topics	**Activities**
Stress management sessions	Yoga, pranayam, meditation, relaxation techniques
Outdoor activities	Nature walks, treks, cycling, horse riding
Painting	Canvas, fabric , Sketching, knife, glass
Music (vocals and instrument)	Singing, Guitar, Synthesizer, Harmonium, Piano, Flute
Dance	Bharatnatyam, Kathak
Indoor sports	Chess, carom, table tennis
Movie club	Motivational movies and documentaries to be shown
Other creative skills	Embroidery , knitting, use of making things from waste materials, photography, puzzle solving

Sr. No	**Hobby Classes**
1	Yoga and Pranayam
2	Horse Riding
3	Dancing
4	Volley Ball
5	Cricket
6	Basket Ball
7	Chess
8	Carom
9	Table Tennis
10	Puzzle Solving

G. H. RAISONI ... MANAGEMENT PUNE

Faculty of Engineering
Savitribai Phule Pune University, Pune

Syllabus

for

Third Year
Bachelor of Computer Engineering
(2015 Course)

(with effect from 2017-18)

Prologue

It is with great pleasure and honor that I share the syllabi for Third Year of Computer Engineering (2015 Course) on behalf of Board of Studies, Computer Engineering. We, members of BOS are giving our best to streamline the processes and curricula design.

While revising syllabus, honest and sincere efforts are put to tune Computer Engineering program syllabus in tandem with the objectives of Higher Education of India, AICTE, UGC and affiliated University (SPPU) by keeping an eye on the technological advancements and industrial requirements globally.

Syllabus revision is materialized with sincere efforts, active participation, expert opinions and suggestions from domain professionals. Sincere efforts have been put by members of BOS, teachers, alumni, industry experts in framing the draft with guidelines and recommendations.

Case Studies are included in almost all courses. Course Instructor is recommended to discuss appropriate related recent technology/upgrade/Case Studies to encourage students to study from course to the scenario and think through the largest issues/ recent trends/ utility/ developing real world/ professional skills.

I am sincerely indebted to all the minds and hands who work adroitly to materialize these tasks. I really appreciate your contribution and suggestions in finalizing the contents.

Thanks

Dr. Varsha H. Patil
Coordinator, Board of Studies (Computer Engineering), SPPU, Pune
Tuesday, March 28, 2017

[This document contents Program Educational Objectives - Program Outcomes - Program Specific Outcomes(page 3), Courses (teaching scheme, examination, marks and credit)(page 4-5), Courses syllabi(page 6-62), all four year courses(page 63), Course-Credit share(page 64)]

Savitribai Phule Pune University, Pune
Bachelor of Computer Engineering

Program Educational Objectives

1. To prepare globally competent graduates having strong fundamentals, domain knowledge, updated with modern technology to provide the effective solutions for engineering problems.
2. To prepare the graduates to work as a committed professional with strong professional ethics and values, sense of responsibilities, understanding of legal, safety, health, societal, cultural and environmental issues.
3. To prepare committed and motivated graduates with research attitude, lifelong learning, investigative approach, and multidisciplinary thinking.
4. To prepare the graduates with strong managerial and communication skills to work effectively as individual as well as in teams.

Program Outcomes

Students are expected to know and be able –

1. To apply knowledge of mathematics, science, engineering fundamentals, problem solving skills, algorithmic analysis and mathematical modeling to the solution of complex engineering problems.
2. To analyze the problem by finding its domain and applying domain specific skills
3. To understand the design issues of the product/software and develop effective solutions with appropriate consideration for public health and safety, cultural, societal, and environmental considerations.
4. To find solutions of complex problems by conducting investigations applying suitable techniques.
5. To adapt the usage of modern tools and recent software.
6. To contribute towards the society by understanding the impact of Engineering on global aspect.
7. To understand environment issues and design a sustainable system.
8. To understand and follow professional ethics.
9. To function effectively as an individual and as member or leader in diverse teams and interdisciplinary settings.
10. To demonstrate effective communication at various levels.
11. To apply the knowledge of Computer Engineering for development of projects, and its finance and management.
12. To keep in touch with current technologies and inculcate the practice of lifelong learning.

Program Specific Outcomes (PSO)

A graduate of the Computer Engineering Program will demonstrate-

PSO1: Professional Skills-The ability to understand, analyze and develop computer programs in the areas related to algorithms, system software, multimedia, web design, big data analytics, and networking for efficient design of computer-based systems of varying.

PSO2: Problem-Solving Skills- The ability to apply standard practices and strategies in software project development using open-ended programming environments to deliver a quality product for business success.

PSO3: Successful Career and Entrepreneurship- The ability to employ modern computer languages, environments, and platforms in creating innovative career paths to be an entrepreneur, and a zest for higher studies.

Savitribai Phule University of Pune
Third Year Computer Engineering (2015 Course)
(with effect from 2017-18)

Semester I

Course Code	Course	Teaching Scheme Hours / Week			Examination Scheme and Marks						Credit	
		Theory	Tutorial	Practical	In-Sem	End-Sem	TW	PR	OR	Total	TH/ TUT	PR
310241	Theory of Computation	03	--	--	30	70	--	--	--	100	03	--
310242	Database Management Systems (DBMS)	03	--	--	30	70	--	--	--	100	03	--
310243	Software Engineering & Project Management	03	--	--	30	70	--	--	--	100	03	--
310244	Information Systems & Engineering Economics	03	--	--	30	70	--	--	--	100	03	--
310245	Computer Networks (CN)	04	--	--	30	70	--	--	--	100	04	--
310246	Skills Development Lab	--	02	04	--	--	50	--	50	100	02	02
310247	DBMS Lab	--	--	04	--	--	25	50	--	75	--	02
310248	CN Lab	--	--	02	--	--	25	50	--	75	--	01
Total Credit											18	05
Total		16	02	10	150	350	100	100	50	750	23	
310249	Audit Course 3										Grade	

310249-Audit Course 3 (AC3) Options:

AC3-I: Cyber Security

AC3-II: Professional Ethics and Etiquettes

AC3-III: Emotional Intelligence

AC3-IV: MOOC- Learn New Skills

AC3-V: Foreign Language (Japanese- Module 3)

Abbreviations:

TW: Term Work **TH:** Theory **OR:** Oral **TUT**: Tutorial **PR**: Practical **Sem:** Semester

Savitribai Phule University of Pune
Third Year Computer Engineering (2015 Course)
(with effect from 2017-18)

Semester II

Course Code	Course	Teaching Scheme Hours / Week			Examination Scheme and Marks						Credit	
		Theory	Tutorial	Practical	In-Sem	End-Sem	TW	PR	OR	Total	TH/ TUT	PR
310250	Design & Analysis of Algorithms	04	--	--	30	70	--	--	--	100	04	
310251	Systems Programming & Operating System (SP & OS)	04	--	--	30	70	--	--	--	100	04	--
310252	Embedded Systems & Internet of Things (ES & IoT)	04	--	--	30	70	--	--	--	100	04	--
310253	Software Modeling and Design	03	--	--	30	70	--	--	--	100	03	--
310254	Web Technology	03	--	--	30	70	--	--	--	100	03	--
310255	Seminar & Technical Communication	--	01	--	--	--	50	--	--	50	01	--
310256	Web Technology Lab	--	--	02	--	--	25	50	--	75	--	01
310257	SP & OS Lab	--	--	04	--	--	25	50	--	75	--	02
310258	ES & IoT Lab	--	--	02	--	--	50	--	--	50	--	01
										Total Credit	19	04
	Total	18	01	08	150	350	150	100	--	750	23	
310259	Audit Course 4										Grade	

310259-Audit Course 4(AC4) Options:

AC4-I: Digital and Social Media Marketing **AC4-II:** Green Computing
AC4-III: Sustainable Energy Systems **AC4-IV:** Leadership and Personality Development
AC4-V: Foreign Language (Japanese- Module 4)

Abbreviations:

TW: Term Work **TH:** Theory **OR:** Oral **TUT**: Tutorial **PR**: Practical **Sem**: Semester

SEMESTER I

Savitribai Phule Pune University
Third Year of Computer Engineering (2015 Course)
310241: Theory of Computation

Teaching Scheme:	Credit	Examination Scheme:
TH: 03 Hours/Week	03	In-Sem (Paper): 30 Marks End-Sem (Paper): 70 Marks

Prerequisite Courses: Discrete Mathematics (210241), Principles of Programming Languages (210254)

Course Objectives:

- To Study abstract computing models
- To learn Grammar and Turing Machine
- To learn about the theory of computability and complexity.

Course Outcomes:

On completion of the course, student will be able to–

- design deterministic Turing machine for all inputs and all outputs
- subdivide problem space based on input subdivision using constraints
- apply linguistic theory

Course Contents

Unit I	Formal Language Theory and Finite Automata	08 Hours

Introduction to Formal language, introduction to language translation logic, Essentials of translation, Alphabets and languages, Finite representation of language, Finite Automata (FA): An Informal Picture of FA, Finite State Machine (FSM), Language accepted by FA, Definition of Regular Language, Deterministic and Nondeterministic FA(DFA and NFA), epsilon- NFA, FA with output: Moore and Mealy machines -Definition, models, inter-conversion.

Case Study: FSM for vending machine, spell checker

Unit II	Regular Expressions (RE)	07 Hours

Introduction, Operators of RE, Building RE, Precedence of operators, Algebraic laws for RE, Conversions: NFA to DFA, RE to DFA Conversions: RE to DFA, DFA to RE Conversions: State/loop elimination, Arden's theorem Properties of Regular Languages: Pumping Lemma for Regular languages, Closure and Decision properties.

Case Study: RE in text search and replace

Unit III	Context Free Grammars (CFG) and Languages	08 Hours

Introduction, Regular Grammar, **Context Free Grammar**- Definition, Derivation, Language of grammar, sentential form, parse tree, inference, derivation, parse trees, ambiguity in grammar and Language- ambiguous Grammar, **Simplification of CFG:** Eliminating unit productions, useless production, useless symbols, and Є-productions, **Normal Forms-** Chomsky normal form, Greibach normal form, Closure properties of CFL, Decision properties of CFL, Chomsky Hierarchy, **Application of CFG:** Parser, Markup languages, XML and Document Type Definitions.

Case Study- CFG for Palindromes, Parenthesis Match,

Unit IV	Turing Machines (TM)	08 Hours

Turing Machine Model, Representation of Turing Machines, Language Acceptability by Turing Machines, Design of TM, Description of TM, Techniques for TM Construction, Variants of Turing Machines, The Model of Linear Bounded Automata , TM & Type 0 grammars, TM's Halting Problem.

Unit V	**Pushdown Automata(PDA)**	**07 Hours**

Basic Definitions, Equivalence of Acceptance by Finite State & Empty stack, PDA & Context Free Language, Equivalence of PDA and CFG, Parsing & PDA: Top-Down Parsing, Top-down Parsing Using Deterministic PDA, Bottom-up Parsing, Closure properties and Deterministic PDA.

Unit VI	**Undecidability & Intractable Problems**	**07 Hours**

A Language that is not recursively enumerable, An un-decidable problem that is RE, Post Correspondence Problem, The Classes P and NP : Problems Solvable in Polynomial Time, An Example: Kruskal's Algorithm, Nondeterministic Polynomial Time, An NP Example: The Traveling Salesman Problem, Polynomial-Time Reductions NP Complete Problems, An NP-Complete Problem: The Satisfiability Problem, Tractable and Intractable, Representing Satisfiability, Instances, NP Completeness of the SAT Problem, A Restricted Satisfiability Problem: Normal Forms for Boolean Expressions, Converting Expressions to CNF, The Problem of Independent Sets, The Node-Cover Problem.

Books:

Text:

1. John E. Hopcroft, Rajeev Motwani, Jeffrey D.Ullman, "Introduction to Automata Theory Languages and Computation", Addison-Wesley, ISBN 0-201-44124-1.
2. H.L. Lewis, Christos H. Papadimitriou, "Elements of the Theory of Computation", Prentice Hall, ISBN-10: 0132624788; ISBN-13: 978-0132624787

References:

1. John Martin, "Introduction to Languages and The Theory of Computation", 2nd Edition, Mc Graw Hill Education, ISBN-13: 978-1-25-900558-9, ISBN-10: 1-25-900558-5
2. Sanjeev Arora and Boaz Barak, "Computational Complexity: A Modern Approach", Cambridge University Pre ss, ISBN:0521424267 9780521424264
3. Daniel Cohen, "Introduction to Computer Theory", Wiley & Sons, ISBN 9788126513345
4. J. Carroll & D Long, "Theory of Finite Automata", Prentice Hall, ISBN 0-13-913708-4
5. Kavi Mahesh, "Theory of Computation : A Problem-Solving Approach", Wiley India, ISBN10 8126533110
6. Michael Sipser, "Introduction to the Theory of Computation", Cengage Learning, ISBN-13: 9781133187813
7. Vivek Kulkarni "Theory of Computation", Oxford University Press, ISBN 0-19-808458

Savitribai Phule Pune University
Third Year of Computer Engineering (2015 Course)
310242 : Database Management Systems

Teaching Scheme:	Credit	Examination Scheme:
TH: 03 Hours/Week	03	In-Sem (Paper): 30 Marks End-Sem (paper): 70 Marks

Prerequisites Courses : Discrete Mathematics (210241), Data Structures (210243 & 210252)

Companion Course: Database Management System Lab (310247)

Course Objectives :

- To understand the fundamental concepts of database management. These concepts include aspects of database design, database languages, and database-system implementation
- To provide a strong formal foundation in database concepts, technology and practice
- To give systematic database design approaches covering conceptual design, logical design and an overview of physical design
- Be familiar with the basic issues of transaction processing and concurrency control
- To learn and understand various Database Architectures and Applications
- To learn a powerful, flexible and scalable general purpose database to handle big data

Course Outcomes :

On completion of the course, student will be able to–

- Design E-R Model for given requirements and convert the same into database tables.
- Use database techniques such as SQL & PL/SQL.
- Use modern database techniques such as NOSQL.
- Explain transaction Management in relational database System.
- Describe different database architecture and analyses the use of appropriate architecture in real time environment.
- Use advanced database Programming concepts

Course Contents

Unit I	Introduction	07 Hours

Introduction to Database Management Systems, Purpose of Database Systems, Database-System Applications, View of Data, Database Languages, Database System Structure, Data Models, Database Design and ER Model: Entity, Attributes, Relationships, Constraints, Keys, Design Process, Entity Relationship Model, ER Diagram, Design Issues, Extended E-R Features, converting E-R & EER diagram into tables.

Unit II	SQL AND PL/SQL	07 Hours

SQL: Characteristics and advantages, SQL Data Types and Literals, DDL, DML, DCL, TCL, SQL Operators, Tables: Creating, Modifying, Deleting, Views: Creating, Dropping, Updating using Views, Indexes, SQL DML Queries: SELECT Query and clauses, Set Operations, Predicates and Joins, Set membership, Tuple Variables, Set comparison, Ordering of Tuples, Aggregate Functions, Nested Queries, Database Modification using SQL Insert, Update and Delete Queries. **PL/SQL:** concept of Stored Procedures & Functions, Cursors, Triggers, Assertions, roles and privileges , Embedded SQL, Dynamic SQL.

Unit III	Relational Database Design	08 Hours

Relational Model: Basic concepts, Attributes and Domains, CODD's Rules, Relational Integrity: Domain, Referential Integrities, Enterprise Constraints, Database Design: Features of Good Relational Designs, Normalization, Atomic Domains and First Normal Form, Decomposition using Functional Dependencies, Algorithms for Decomposition, 2NF, 3NF, BCNF, Modeling Temporal Data.

Unit IV	**Database Transactions and Query Processing**	**08 Hours**

Basic concept of a Transaction, Transaction Management, Properties of Transactions, Concept of Schedule, Serial Schedule, Serializability: Conflict and View, Cascaded Aborts, Recoverable and Non-recoverable Schedules, Concurrency Control: Need, Locking Methods, Deadlocks, Time-stamping Methods, Recovery methods : Shadow-Paging and Log-Based Recovery, Checkpoints, Query Processing, Query Optimization, Performance Tuning.

Unit V	**Parallel and Distributed Databases**	**07 Hours**

Introduction to Database Architectures: Multi-user DBMS Architectures, Case study- Oracle Architecture. **Parallel Databases:** Speedup and Scale up, Architectures of Parallel Databases.
Distributed Databases: Architecture of Distributed Databases, Distributed Database Design, Distributed Data Storage, Distributed Transaction: Basics, Failure modes, Commit Protocols, Concurrency Control in Distributed Database.

Unit VI	**NoSQL Database**	**08 Hours**

Introduction to NoSQL Database, Types and examples of NoSQL Database- Key value store, document store, graph, Performance, Structured verses unstructured data, Distributed Database Model, CAP theorem and BASE Properties, Comparative study of SQL and NoSQL, NoSQL Data Models, Case Study-unstructured data from social media. Introduction to Big Data, HADOOP: HDFS, MapReduce.

Books:

Text:

1. Silberschatz A., Korth H., Sudarshan S., "Database System Concepts", McGraw Hill Publishers, ISBN 0-07-120413-X, 6th edition
2. Connally T, Begg C., "Database Systems", Pearson Education, ISBN 81-7808-861-4
3. Pramod J. Sadalage and Martin Fowler, "NoSQL Distilled", Addison Wesley, ISBN-10: 0321826620, ISBN-13: 978-0321826626

References:

1. C J Date, "An Introduction to Database Systems", Addison-Wesley, ISBN: 0201144719
2. S.K.Singh, "Database Systems : Concepts, Design and Application", Pearson, Education, ISBN 978-81-317-6092-5
3. Kristina Chodorow, Michael Dirolf, "MangoDB: The Definitive Guide" ,O'Reilly Publications, ISBN: 978-1-449-34468-9.
4. Adam Fowler, "NoSQL For Dummies", John Wiley & Sons, ISBN-1118905628
5. Kevin Roebuck, "Storing and Managing Big Data - NoSQL, HADOOP and More", Emereopty Limited, ISBN: 1743045743, 9781743045749
6. Joy A. Kreibich, "Using SQLite", O'REILLY, ISBN: 13:978-93-5110-934-1
7. Garrett Grolemund, "Hands-on Programming with R", O'REILLY, ISBN : 13:978-93-5110-728-6

Savitribai Phule Pune University
Third Year of Computer Engineering (2015 Course)
310243: Software Engineering and Project Management

Teaching Scheme:	Credit	Examination Scheme:
TH: 03 Hours/Week	03	In-Sem (Paper): 30 Marks End-Sem (Paper): 70 Marks

Prerequisite Courses: Fundamentals of Programming Languages (110003, 110011)

Course Objectives:

- To learn and understand the principles of Software Engineering
- To be acquainted with methods of capturing, specifying, visualizing and analyzing software requirements.
- To apply Design and Testing principles to S/W project development.
- To understand project management through life cycle of the project.
- To understand software quality attributes.

Course Outcomes:

On completion of the course, student will be able to–

- Decide on a process model for a developing a software project
- Classify software applications and Identify unique features of various domains
- Design test cases of a software system.
- Understand basics of IT Project management.
- Plan, schedule and execute a project considering the risk management.
- Apply quality attributes in software development life cycle.

Course Contents

Unit I	Introduction to Software Engineering, Software Process Models	07 Hours

Software Engineering Fundamentals: Nature of Software, Software Engineering Principles, The Software Process, Software Myths. **Process Models :**A Generic Process Model, Prescriptive Process Models: The Waterfall, Incremental Process(RAD), Evolutionary Process, Unified Process, Concurrent. **Advanced Process Models & Tools:** Agile software development: Agile methods, Plan-driven and agile development, Extreme programming Practices, Testing in XP, Pair programming. Introduction to agile tools: JIRA, Kanban,

Case Studies: An information system (mental health-care system), wilderness weather system

Unit II	Software Requirements Engineering& Analysis	08 Hours

Requirements Engineering: User and system requirements, Functional and non-functional requirements, Types & Metrics, A spiral view of the requirements engineering process. **Software Requirements Specification (SRS):** The software requirements Specification document, The structure of SRS, Ways of writing a SRS, structured & tabular SRS for an insulin pump case study, **Requirements elicitation & Analysis:** Process, Requirements validation, Requirements management. **Case Studies:** The information system.

Case study - Mental health care patient management system (MHC-PMS).

Unit III	Design Engineering	08 Hours

Design Process & quality, Design Concepts, The design Model, Pattern-based Software Design. **Architectural Design :**Design Decisions, Views, Patterns, Application Architectures, **Modeling Component level Design:** component, Designing class based components, conducting component-level design, **User Interface Design:** The golden rules, Interface Design steps & Analysis, Design Evaluation, **Case Study:** Web App Interface Design

Unit IV	Project Management: Process, Metrics, Estimations & Risks	08 Hours

Project Management Concepts: The Management Spectrum, People, Product, Process, Project, The W5HH Principle, Metrics in the Process and Project Domains, Software Measurement : size & function oriented metrics(FP & LOC), Metrics for Project and Software Quality, **Project Estimation :**Observations on Estimation, Project Planning Process, Software Scope and feasibility, Resources: Human Resources, Reusable software, Environmental Resources. Software Project Estimation, Decomposition Techniques, Empirical Estimation Models: Structure, COCOMO II, Estimation of Object-oriented Projects, Specialized Estimation **Case Study:** Software Tools for Estimation, **Project Scheduling:** Basic Concepts, Defining a Task Set for the Software Project, Defining Task Network, Scheduling with time-line charts, Schedule tracking Tools:- Microsoft Project, Daily Activity Reporting & Tracking (DART)

Unit V	Project Management: Risk Management, Configuration Management, Maintenance & Reengineering	07 Hours

Project Risk Management : Risk Analysis & Management: Reactive versus Proactive Risk Strategies, Software Risks, Risk Identification, Risk Projection, Risk Refinement, Risk Mitigation, Risks Monitoring and Management, The RMMM plan for case study project

Software Configuration Management : The SCM repository, SCM process, Configuration management for WebApps, **Case study:** CVS and Subversion Tools, Visual Source Safe from Microsoft & Clear Case. **Maintenance & Reengineering:** Software Maintenance, Software Supportability, Reengineering, Business Process Reengineering, Software Reengineering, Reverse Engineering, Restructuring, Forward Engineering

Unit VI	Software Testing	07 Hours

Introduction to Software Testing, Principles of Testing, Testing Life Cycle, Phases of Testing, Types of Testing, Verification & Validation, Defect Management, Defect Life Cycle, Bug Reporting, GUI Testing, Test Management and Automation.

Books:

Text:

1. Roger Pressman, "Software Engineering: A Practitioner's Approach", McGraw Hill, ISBN 0–07–337597–7
2. Ian Sommerville, " Software Engineering", Addison and Wesley, ISBN 0-13-703515-2

References:

1. Carlo Ghezzi, "Fundamentals of Software Engineering", Prentice Hall India, ISBN-10: 0133056996
2. Rajib Mall, "Fundamentals of Software Engineering", Prentice Hall India, ISBN-13: 978-8120348981
3. Pankaj Jalote, "An Integrated Approach to Software Engineering", Springer, ISBN 13: 9788173192715.
4. S K Chang, "Handbook of Software Engineering and Knowledge Engineering", World Scientific, Vol I, II, ISBN: 978-981-02-4973-1
5. Tom Halt, "Handbook of Software Engineering", Clanye International, ISBN-10: 1632402939

Savitribai Phule Pune University
Third Year of Computer Engineering (2015 Course)
310244: Information Systems and Engineering Economics

Teaching Scheme:	Credit	Examination Scheme:
TH: 03 Hours/Week	03	In-Sem (Paper): 30 Marks End-Sem (Paper): 70 Marks

Course Objectives:

- To prepare the students to various forms of the Information Systems and its application in organizations.
- To expose the students to the managerial issues relating to information systems and help them identify and evaluate various options in Information Systems.
- To Prepare engineering students to analyze cost / revenue data and should be able to do economic analyses in the decision making process to justify or reject alternatives / projects on an economic basis for an organization.

Course Outcomes:

On completion of the course, student will be able to–

- Understand the need, usage and importance of an Information System to an organization.
- Understand the activities that are undertaken while managing, designing, planning, implementation, and deployment of computerized information system in an organization.
- Further the student would be aware of various Information System solutions like ERP, CRM, Data warehouses and the issues in successful implementation of these technology solutions in any organizations
- Outline the past history, present position and expected performance of a company engaged in engineering practice or in the computer industry.
- Perform and evaluate present worth, future worth and annual worth analyses on one of more economic alternatives.
- Be able to carry out and evaluate benefit/cost, life cycle and breakeven analyses on one or more economic alternatives.

Course Contents

Unit I	Basic of Management Theory & Practices	07 Hours

Role of Information Systems in Organizations, The Information System Manager and his challenges, Concepts of Information Systems, Information Systems and Management Strategy
Case Studies - Information Systems in the Indian Railways, Information Systems in an e-Commerce Organization.

Unit II	Management Information System (MIS)	08 Hours

Managing Information Systems, Ethical and Social Issues, Information Technology Infrastructure and Choices, Information Systems Security and Control,
Case Studies -Information Technology Infrastructure in a Bank, Information Technology Infrastructure in a manufacturing / process industry.

Unit III	Leveraging Information Systems	07 Hours
Information Systems Development and Project Management, Managing Data Resources, Business Process Integration and Enterprise Systems, ICT for Development and E-Governance, Case Studies - in-house or cloud based ERP implementation, UIDAI Unique Identification Authority of India.		
Unit IV	**Money and Economic Value**	**08 Hours**
Engineering Economic Decisions, Time Value of Money, Understanding Money Management, Case Studies- Economic decisions done in Multi-national companies.		
Unit V	**Economics and Management**	**07 Hours**
Equivalence Calculations under Inflation, Present-Worth Analysis, Annual-Equivalence Analysis. Case Studies -comparative analysis of software enterprises from relevant domains.		
Unit VI	**Understanding Cash Flow and Taxes**	**08 Hours**
Accounting for Depreciation and Income Taxes, Project Cash-Flow Analysis, Understanding Financial Statements, Case Studies - cash flow analysis done in start-up companies.		

Books:

Text:

1. Rahul De, “MIS: Management Information Systems in Business, Government and Society”, Wiley India, ISBN: 13: 978-81-265-2019-0.
2. Chan S. Park , "Fundamentals of Engineering Economics”, 3rd Edition, Pearson Education, ISBN 13: 978-02-737-7291-0

References:

1. Turban and Wali, “Information Technology on Management”, Willey India, ISBN:9788126558711
2. William G. Sullivan, Elin M. Wicks, C. Patrick Koelling, Engineering Economy, Pearson Education, ISBN13: 978-01-334-3927-4

Savitribai Phule Pune University
Third Year of Computer Engineering (2015 Course)
310245: Computer Networks

Teaching Scheme:	Credit	Examination Scheme:
TH: 04 Hours/Week	04	In-Sem (Paper): 30 Marks End-Sem (Paper): 70 Marks

Prerequisite Courses: Computer Organization and Architecture (210244)

Companion Course: Computer Network Lab (310248)

Course Objectives:

- To understand the fundamental concepts of networking standards, protocols and technologies.
- To learn different techniques for framing, error control, flow control and routing.
- To learn role of protocols at various layers in the protocol stacks.
- To learn network programming.
- To develop an understanding of modern network architectures from a design and performance perspective

Course Outcomes:

On completion of the course, student will be able to–

- Analyze the requirements for a given organizational structure to select the most appropriate networking architecture, topologies, transmission mediums, and technologies
- Demonstrate design issues, flow control and error control
- Analyze data flow between TCP/IP model using Application, Transport and Network Layer Protocols.
- Illustrate applications of Computer Network capabilities, selection and usage for various sectors of user community.
- Illustrate Client-Server architectures and prototypes by the means of correct standards and technology.
- Demonstrate different routing and switching algorithms

Course Contents

Unit I	Physical Layer	09 Hours

Introduction of LAN; MAN; WAN; PAN, Ad-hoc Network, Network Architectures: Client-Server; Peer To Peer; Distributed and SDN, OSI Model, TCP/IP Model, Topologies: Star and Hierarchical; Design issues for Layers, Transmission Mediums: CAT5, 5e, 6, OFC and Radio Spectrum, Network Devices: Bridge, Switch, Router, Brouter and Access Point, Manchester and Differential Manchester Encodings; IEEE802.11: Frequency Hopping (FHSS) and Direct Sequence (DSSS)

Unit II	Logical Link Control	09 Hours

Design Issues: Services to Network Layer, Framing, Error Control and Flow Control. Error Control: Parity Bits, Hamming Codes (11/12-bits) and CRC. Flow Control Protocols: Unrestricted Simplex, Stop and Wait, Sliding Window Protocol, WAN Connectivity : PPP and HDLC

Unit III	Medium Access Control	09 Hours

Channel allocation: Static and Dynamic, Multiple Access Protocols: Pure and Slotted ALOHA, CSMA, WDMA, IEEE 802.3 Standards and Frame Formats, CSMA/CD, Binary Exponential Back -off algorithm, Fast Ethernet, Gigabit Ethernet, IEEE 802.11a/b/g/n and IEEE 802.15 and IEEE 802.16 Standards, Frame formats, CSMA/CA.		
Unit IV	**Network Layer**	**09 Hours**
Switching techniques, IP Protocol, IPv4 and IPv6 addressing schemes, Subnetting, NAT, CIDR, ICMP, Routing Protocols: Distance Vector, Link State, Path Vector, Routing in Internet: RIP ,OSPF, BGP, Congestion control and QoS, , MPLS, Mobile IP, Routing in MANET : AODV, DSR		
Unit V	**Transport Layer**	**09 Hours**
Services, Berkley Sockets, Addressing, Connection establishment, Connection release, Flow control and buffering, Multiplexing, TCP, TCP Timer management, TCP Congestion Control, Real Time Transport protocol(RTP), Stream Control Transmission Protocol (SCTP), Quality of Service (QoS), Differentiated services, TCP and UDP for Wireless.		
Unit VI	**Application Layer**	**09 Hours**
Domain Name System (DNS), Hyper Text Transfer Protocol (HTTP), Email: SMTP, MIME, POP3, Webmail, FTP, TELNET, Dynamic Host Control Protocol (DHCP), Simple Network Management Protocol (SNMP).		
Books:		

Text:

1. Andrew S. Tenenbaum, "Computer Networks", PHI, ISBN 81-203-2175-8.
2. Fourauzan B., "Data Communications and Networking", 5th Edition, Tata McGraw- Hill, Publications, ISBN: 0 – 07 – 058408 – 7

References:

1. Kurose, Ross "Computer Networking a Top Down Approach Featuring the Internet", Pearson, ISBN-10: 0132856204
2. Matthew S. G, "802.11 Wireless Networks", O'Reilly publications, ISBN: 81-7656-992-5
3. C. Siva Ram Murthy and B. S. Manoj, "Ad Hoc Wireless Networks: Architectures and Protocols" Prentice Hall, ISBN-10: 8131706885; ISBN-13: 978-8131706886
4. Holger Karl and Andreas Willing, "Protocols and Architectures for Wireless Sensor Networks", Wiley India , ISBN: 9788126533695
5. Eldad Perahia, Robert Stacey, "Next Generation Wireless LANs", Cambridge, ISBN-10: 1107016762; ISBN-13: 978-1107016767
6. Efraim Turban, Linda Volonino, Gregory R. Wood "Computer Networking a Top Down Approach Featuring the Internet", 10th Edition, Wiley; ISBN13: 978-1-118-96126-1

Savitribai Phule Pune University
Third Year of Computer Engineering (2015 Course)
310246: Skill Development Lab

Teaching Scheme:	Credit (04)		Examination Scheme:
TUT: 02 Hour/Week	Tutorial	PR	TW: 50 Marks
PR: 04 Hours/Week	02	02	OR: 50 Marks

Prerequisite Courses: Fundamentals of Programming Languages (110003 and 110011), Principles of Programming Languages (210254), Data Structures and Algorithms (210243), Object Oriented Programming(210245)

Course Objectives:

- To adapt the usage of modern tools and recent software.
- To evaluate problems and analyze data using current technologies
- To learn the process of creation of data-driven web applications using current technologies
- To understand how to incorporate best practices for building enterprise applications
- To learn how to employ Integrated Development Environment(IDE) for implementing and testing of software solution
- To construct software solutions by evaluating alternate architectural patterns.

Course Outcomes:

On completion of the course, student will be able to–

- Evaluate problems and analyze data using current technologies in a wide variety of business and organizational contexts.
- Create data-driven web applications
- Incorporate best practices for building applications
- Employ Integrated Development Environment(IDE) for implementing and testing of software solution
- Construct software solutions by evaluating alternate architectural patterns.

Guidelines for Instructor's Manual

The instructor’s manual is to be developed as a hands-on resource and reference. The instructor's manual need to include prologue (about University/program/ institute/ department/foreword/ preface etc), University syllabus, conduction & Assessment guidelines, topics under consideration-concept, objectives, outcomes, set of typical applications/assignments/ guidelines, and references.

Guidelines for Student Journal

The laboratory assignments are to be submitted by student in the form of journal. Journal consists of prologue, Certificate, table of contents, and **handwritten write-up** of each assignment (Title, Objectives, Problem Statement, Outcomes, software & Hardware requirements, Date of Completion, Assessment grade/marks and assessor's sign, Theory-Concept in brief, features of tool/framework/language used, Design, test cases, conclusion. **Program codes with sample output of all performed assignments are to be submitted as softcopy.**

As a conscious effort and little contribution towards Green IT and environment awareness, attaching printed papers as part of write-ups and program listing to journal may be avoided. Use of DVD containing students programs maintained by lab In-charge is highly encouraged. For reference one or two journals may be maintained with program prints at Laboratory.

Guidelines for Assessment

Continuous assessment of laboratory work is done based on overall performance and lab assignments performance of student. Each lab assignment assessment will assign grade/marks based on parameters with appropriate weightage. Suggested parameters for overall assessment as well as each lab assignment assessment include- timely completion, performance, innovation, efficient codes, punctuality and neatness.

Guidelines for Oral Examination

It is recommended to conduct examination based on Mini-Project demonstration and related skill learned. Team of 3 to 4 students may work on mini-project. During the assessment, the expert evaluator should give the maximum weightage to the satisfactory implementation and software engineering approach followed. The supplementary and relevant questions may be asked at the time of evaluation to test the student's for advanced learning, understanding, effective and efficient implementation and demonstration skills. So encouraging efforts, transparent evaluation and fair approach of the evaluator will not create any uncertainty or doubt in the minds of the students. So adhering to these principles will consummate our team efforts to the promising start of the student's academics.

Guidelines for Laboratory Conduction

The instructor is expected to frame the assignments by understanding the prerequisites, technological aspects, utility and recent trends related to the topic. The assignment framing policy need to address the average students and inclusive of an element to attract and promote the intelligent students. The instructor may set multiple sets of assignments and distribute among batches of students. It is appreciated if the assignments are based on real world problems/applications. Encourage students for appropriate use of Hungarian notation, proper indentation and comments. Use of open source software is to be encouraged.

In addition to these, instructor may assign one real life application in the form of a mini-project based on the concepts learned. Instructor may also set one assignment or mini-project that is suitable to respective branch beyond the scope of syllabus.

For this laboratory total five Skill Development Modules plus one Aptitude Development Module are provided as below:

SD Module-I: Advanced JAVA and Mobile Application Development
SD Module-II: PYTHON and DATA Science with R
SD Module-III: Advanced JAVA and GROOVY on GRAILS
SD Module-IV: SCHEME and SCALA and GROOVY on GRAILS
SD Module-V: Advanced JAVA and Data Science with R
SD Module VI: Aptitude Development (To be EXCLUDED for Oral Exam)

Instructions:
Each college has to select at least one module out of five modules provided. College can select more than one module too! Set of suggested assignments is provided. Each student must perform 7 to 8 assignments and at least one mini-project provided in each module excluding Module VI. Instructor should frame set of mini projects or guide students to frame the problem statement of mini-project by sticking to technologies in respected module.
Term Work will be based on assignments be carried out by students and Oral **Examination will be based on Mini-Project demonstration and related skill learned ONLY.**
Operating System recommended :- 64-bit Open source Linux or its derivative
Programming tools recommended: - Open Source C,C++, JAVA, PYTHON, G++/GCC, R, Grails, Groovy, Android Studio for Linux.

Course Contents

SD Module-I	Advanced JAVA and Mobile Application Development	
	Theory Content for Lab	

ADVANCED JAVA

Data Structures in Java: Enumeration, BitSet, Vector, Stack, Dictionary, Hash table, Properties. **Generics and Collection Framework:** Generic Methods and Generic Classes. Interfaces (Set, List, Queue, and Dequeue) and classes (ArrayList, Vector, LinkedList, PriorityQueue, HashSet, LinkedHashSet, and TreeSet). **Serialization and Networking:** Serializing an Object and Deserializing an Object, Socket Programming. **Database Connectivity and Multithreading:** SQL, JDBC, Thread life cycle, Thread methods, Thread Pools, Executor Service. **GUI in JAVA:** AWT, Applet, Swing.

MOBILE APPLICATION DEVELOPMENT

Introduction to Android: Android Platform Architecture, Basic components of android, Features of ART and Delvik Virtual Machine, Activity Life Cycle, Intents and Intent Filters, Resources, System Permissions, Android Application Structure, Device screen size compatibility, Android Emulator
User Interface components: Layouts, Recycler View, List View, Grid View and Web view, Input Controls: Buttons, Checkboxes, Radio Buttons, Toggle Buttons, Spinners**,** Input Events, Menus, Toast, Dialogs, Styles and Themes, **Multimedia, Animation and Graphics:** Playing Audio, Playing Video, Rotate Animation, FadeIn/FadeOut Animation, Zoom Animation, Scale Animation, 2D and 3D Graphics. **Data Storage:** Shared Preferences, Internal Storage, External Storage, SQLite Databases, Content provider. and Remote Databases, **Advanced Components of Android:** Web App**,** JSON Parsing, Google Map, GPS, Sensors, Bluetooth/Wi-Fi Connectivity

Books:

Text:

1. Herbert Schildt, “Java: The Complete Reference”, TMG Publication, ISBN 9780070636774
2. Thomas Powell, “Java generics and collections”, O'Reilly Media, ISBN: 0596527756
3. Neil Smyth, “Android Studio 2 Development Essentials”, Payload Media, ISBN: 1532853319
4. John Horton, “Android Programming for Beginners”, ISBN 10:1785883267

Reference:

1. Sharanam Shah and Vaishali Shah , “JAVA EE 7 for Beginners”, SPD, ISBN: 13:978-93-5110-349-3
2. Reto Meier, “Professional Android 4 Application Development”, Wrox, ISBN-10: 1118102274; ISBN-13: 978-1118102275
3. Greg Nudelman, “Android Design Patterns :Interaction Design Solutions for Developers”, ISBN-10: 1118394151; ISBN-13: 978-1118394151
4. Sharanam Shah, Vaishali Shah,” Core Java 8 for beginners”, THE TEAM, ISBN: 13:978-93-5213-080-1

Suggested List of Laboratory Assignments for Advanced JAVA

1.	Design a system with the help of advance data structures in Java and enhance the system using collections and generics.
2.	Enhance the above system with the help of socket programming use client server architecture.
3.	Enhance above system by using JDBC, Multithreading, concurrency, synchronous and asynchronous callbacks, ThreadPools using ExecutorService.
4.	Transform the above system from command line system to GUI based application

Suggested List of Laboratory Assignments for Mobile Application Development

1.	Download Install and Configure Android Studio on Linux/windows platform.
2.	Design a mobile app for media player.
3.	Design a mobile app to store data using internal or external storage.
4.	Design a mobile app using Google Map and GPS to trace the location.

Suggested Mini Project on Advanced JAVA and Mobile Application Development

Design and develop a mobile app for novice trekkers by recording the paths from regular trekkers by using, Material Design Pattern for UI, Storage [SQLite database/File/Shared Preference/cloud], Internet connection /Wi-Fi/Bluetooth, GPS and Google Map.

SD Module-II	PYTHON and DATA Science with R	
	Theory Content for Lab	

PYTHON

Python Basics: Data types, Statements and Expressions, Operators and Math's, Conditionals, Loops, Strings, List , Tuples , Set Operation, Dictionary (Dict), Date and Times.
Functions, Packages and Classes: Lambda function, Regular expression, Packages, Files, Exception Handling, Classes ,Objects, Method ,class and instance variable, constructor, destructor, inheritance.
Numpy and Matplotlib : Array operations, Numpy Side Effects, 2D Numpy Arrays , Numpy Basic Statistics, Universal Function, Matplotlib: Introduction, Simple plots, Line API, Legend API, Figures, Subplots, Axes and Ticks.
Pandas: Look Ups, Selections and Indexing, Filling Methods, Series operation, Handling NaN values, Mapping, Data Frames, Reading Files, Plotting, Joins, Correlation, Histograms, Rolling calculation, Date Time indexing, Grouping, Aggregate Functions, pandas.IO. Data, Panel.

DATA SCIENCE WITH R

Introduction to Data Science- What is Data Science? Current landscape of perspectives, Skill sets needed, The Data Science Process life cycle, Role of Data Scientist. Data pre-processing. ETL – extract, transform, and load.
Introduction to R-What is R? Installation of R. Basic features of R. R Objects. Creating Vectors and Matrices. Getting Data in and out of R. Using different packages related to data science. Managing Data frames and Functions.
Descriptive Statistics using R - Discrete and continuous random variables, densities and distributions .Data Summarization: Measures of Central Tendency, Measures of Dispersion (quartiles, five number summary, variance, standard deviation), Measures of shape (skewness, kurtosis), Measures of association (covariance, correlation), Outliers. Using R for descriptive statistics and data visualization using ggplot2 package.
Predictive Analysis using Machine Learning Techniques using R: Machine learning - what, how, where. Supervised, unsupervised and semi-supervised learning. Training, validation, testing, generalization, over fitting. Building a Regression model using R. Features and feature engineering. Using Decision trees, Linear classifiers, Naïve Bayes, Nearest neighbor methods in R packages.

Books:

Text:

1. Zed A. Shaw, "Learn PYTHON The Hard Way", Pearson, ISBN: 978-93-325-8210-1
2. Kenneth A Lambert and B L Juneja, "Fundamentals of PYTHON", CENGAGE Learning, ISBN:978-81-315-2903-4
3. Peng, Roger D and Elizabeth Matsui, "The Art of Data Science." A Guide for Anyone Who Works with Data. Skybrude Consulting 200 (2015): 162.
4. Evans, James R., and Carl H. Lindner, "Business analytics: the next frontier for decision sciences." Decision Line 43.2 (2012): 4-6.

Reference:

1. Allen B Downey, "Think PYTHON", O'Rielly, ISBN: 13:978-93-5023-863-9, 4th Indian Reprint 2015
2. Jiawei Han and Micheline Kamber, Morgan Kaufman, "Learning R, Richard Cotton", O'Reilly, ISBN: 13:978-93-5110-286-1, First Edition, Fourth Indian Reprint 2015

Suggested List of Laboratory Assignments on PYTHON

1.	Getting Started with Python (Example Word count exercise)
2.	Build the Hangman Game using Python.

3.	Write python code that loads any dataset (example Game_medal.csv), and plot the graph.
4.	Write python code that loads any dataset (example Game_medal.csv), and does some basic data cleaning. Add component on data set.

Suggested List of Laboratory Assignments on DATA Science with R

1.	Getting Started with R installation, R objects and basic statistics.
2.	Using R for data preprocessing, exploratory analysis, visualization.
3.	Using R for correlation and regression analysis.
4.	Data analysis case study using R for readily available data set using any one machine learning algorithm

Suggested Mini Project on PYTHON and DATA Science with R

1. Implementing a simple Recommender System based on user buying pattern.
2. Twitter Sentiment Analysis in Python
3. Applying linear regression model to a real world problem.

SD Module-III Advanced JAVA and GROOVY on GRAILS

Theory Content for Lab

ADVANCED JAVA

Data Structures in Java: Enumeration, BitSet, Vector, Stack, Dictionary, Hash table, Properties. **Generics and Collection Framework:** Generic Methods and Generic Classes. Interfaces (Set, List, Queue, and Dequeue) and classes (ArrayList, Vector, LinkedList, PriorityQueue, HashSet, LinkedHashSet, and TreeSet). **Serialization and Networking:** Serializing an Object and Deserializing an Object, Socket Programming. **Database Connectivity and Multithreading:** SQL, JDBC, Thread life cycle, Thread methods, Thread Pools, Executor Service. **GUI in JAVA:** AWT, Applet, Swing.

GROOVY on GRAIL

Introduction to Grails: Object Relational Mapping (GORM), Basic CRUD, Scaffolding JSON, REST API, DataSources and Environments.
Web Layer: Model, View**, Controllers** (MVC), Redirects and Chaining, Data Binding, Groovy Server Pages, URL Mappings, Plug-in, Grails and Hibernate.

Books:

Text:

1. Herbert Schildt, "Java: The Complete Reference", TMG Publication, ISBN 9780070636774
2. Thomas Powell, "Java Generics and collections", O'Reilly Media, ISBN: 0596527756.
3. Christopher M. Judd, Joseph Faisal Nusairat, and James Shingler, "Beginning Groovy and Grails From Novice to Professional", Apress, ISBN-13: 978-1-4302-1045-0

Reference:

1. Sharanam Shah and Vaishali Shah, "JAVA EE 7 for Beginners", SPD, ISBN: 13:978-93-5110-349-3
2. Official Website http://docs.grails.org/latest/

Suggested List of Laboratory Assignments for Advanced JAVA

1.	Design a system with the help of advance data structures in Java and enhance the system using collections and generics.
2.	Enhance the above system with the help of socket programming use client server architecture.
3.	Enhance above system by using JDBC, Multithreading, concurrency, synchronous and asynchronous callbacks, Thread Pools using Executor Service.
4.	Transform the above system from command line system to GUI based application

Suggested List of Laboratory Assignments on GROOVY on GRAILS	
1.	Download Install and Configure IDE with Grails Plug-in on Windows/Linux platform.
2.	Design a simple web application using Scaffolding data source for CRUD operations
3.	Design a simple web application using MySQL for CRUD operations

Suggested Mini Project on Advanced JAVA and GROOVY on GRAILS

Design a **dynamic** web application system(Ex, Employee Payroll System, Student Result System)

SD Module-IV **SCHEME and SCALA and GROOVY on GRAILS**

Theory Content for Lab

SCHEME and SCALA

SCHEME: lambda calculus, Atoms, Lists, lambda expressions. Functions as first class objects. Control structures, Recursion and continuations, operations on objects, basic input output, Exceptions and conditions, lazy evaluation and streams.
SCALA: Classes and Objects, Data Types, Control structures, composition and inheritance. Packages. Pattern matching. Collections API. Working with XML. Actors and concurrency. GUI programming in SCALA.

GROOVY on GRAILS

Introduction to Grails: Object Relational Mapping (GORM), Basic CRUD, Scaffolding JSON, REST API, DataSources and Environments
Web Layer: Model ,View **,**Controllers (MVC), Redirects and Chaining, Data Binding, Groovy Server Pages, URL Mappings, Plug-in, Grails and Hibernate

Books:

Text:

1. R Kent Dybvig, "the Scheme Programming Language", MIT Press, ISBN 978-0-262-51298-5.
2. Martin Odersky, Lex Spoon, and Bill Venners, "Programming in SCALA", Artima. ISBN :-13: 978-0-9815316-1-8.
3. Beginning Groovy and Grails From Novice to Professional, Christopher M. Judd, Joseph Faisal Nusairat, and James Shingler, Apress, ISBN-13: 978-1-4302-1045-0

Reference:

1. Cay S Horstmann, "Scala for the Impatient", Pearson, ISBN: 978-81-317-9605-4,
2. Scala Cookbook, Alvin Alexander, O'Reilly, SPD,ISBN: 978-93-5110-263-2
3. Jason Swartz, "Learning Scala", O'REILLY, ISBN: 13:978-93-5213-256-0
4. Official Website http://www.groovy-lang.org/download.html
5. Official Website https://en.wikipedia.org/wiki/Scheme_(programming_language)
6. Official Website https://www.scala-lang.org/
7. Official Website https://grails.org/

Suggested List of Laboratory Assignments on SCHEME and SCALA	
1.	Create a recursive function in Scheme that displays the sum of n odd numbers starting from 1.
2.	Write a program to find sum and product of all the elements of a list in scheme without using built in functions.
3.	Write a SCALA Program to perform following operations on Strings: 1. Create a String Object. 2. Check String is palindrome or not. 3. Check length of String 4. Replace all 'a' in a string with 'A'
4.	Develop a SCALA pattern matching programming which matches a given Person object and displays whether he/she is Eligible for Election or not. Use name, age and eligibility as class members.

Suggested List of Laboratory Assignments on GROOVY on GRAILS

1.	Download Install and Configure IDE with Grails Plugins on Windows/Linux platform.
2.	Design a simple web application using Scaffolding data source for CRUD operations
3.	Design a simple web application using MySQL for CRUD operations

Suggested Mini Project on SCHEME and SCALA and GROOVY on GRAILS

Design a dynamic web application system Use Front End: Groovy on Grails, Back End: Scheme and Scala (Ex, Employee Payroll System, Student Result System)

SD Module-V Advanced JAVA and Data Science with R

Theory Content for Lab

ADVANCED JAVA

Data Structures in Java: Enumeration, BitSet, Vector, Stack, Dictionary, Hash table, Properties.
Generics and Collection Framework: Generic Methods and Generic Classes. Interfaces (Set, List, Queue, and Dequeue) and classes (ArrayList, Vector, LinkedList, PriorityQueue, HashSet, LinkedHashSet, and TreeSet). **Serialization and Networking:** Serializing an Object and Deserializing an Object, Socket Programming. **Database Connectivity and Multithreading:** SQL, JDBC, Thread life cycle, Thread methods, Thread Pools, Executor Service. **GUI in JAVA:** AWT, Applet, Swing.

DATA SCIENCE WITH R

Introduction to Data Science- What is Data Science? Current landscape of perspectives, Skill sets needed, The Data Science Process life cycle, Role of Data Scientist. Data pre-processing. ETL – extract, transform, and load.
Introduction to R-What is R? Installation of R. Basic features of R. R Objects. Creating Vectors and Matrices. Getting Data in and out of R. Using different packages related to data science. Managing Data frames and Functions.
Descriptive Statistics using R - Discrete and continuous random variables, densities and distributions .Data Summarization: Measures of Central Tendency, Measures of Dispersion (quartiles, five number summary, variance, standard deviation), Measures of shape (skewness, kurtosis), Measures of association (covariance, correlation), Outliers. Using R for descriptive statistics and data visualization using ggplot2 package.
Predictive Analysis using Machine Learning Techniques using R: Machine learning - what, how, where. Supervised, unsupervised and semi-supervised learning. Training, validation, testing, generalization, over fitting. Building a Regression model using R. Features and feature engineering. Using Decision trees, Linear classifiers, Naïve Bayes, Nearest neighbor methods in R packages.

Books:

Text:

1. Herbert Schildt, “Java: The Complete Reference” ,TMG Publication, ISBN 9780070636774
2. Thomas Powell, “Java generics and collections”, O'Reilly Media, ISBN: 0596527756, 2006.
3. Peng, Roger D., and Elizabeth Matsui. "The Art of Data Science." A Guide for Anyone Who Works with Data. Skybrude Consulting 200 (2015): 162.
4. Evans, James R., and Carl H. Lindner. "Business analytics: the next frontier for decision sciences." Decision Line 43.2 (2012): 4-6.

Reference:

1. JAVA EE 7 for Beginners, Sharanam Shah and Vaishali Shah, SPD, ISBN: 13:978-93-5110-349-3
2. Data Mining: Concepts and Techniques, Jiawei Han and Micheline Kamber, Morgan Kaufman, ISBN 978-81-312-0535-8
3. Learning R, Richard Cotton, O’Reilly, ISBN: 13:978-93-5110-286-1

Suggested List of Laboratory Assignments for Advanced JAVA

1.	Design a system with the help of advance data structures in Java and enhance the system using

	collections and generics.
2.	Enhance the above system with the help of socket programming use client server architecture.
3.	Enhance above system by using JDBC, Multithreading, concurrency, synchronous and asynchronous callbacks, Thread Pools using Executor Service.
4.	Transform the above system from command line system to GUI based application
Suggested List of Laboratory Assignments on Data Science with R	
1.	Getting Started with R installation, R objects and basic statistics.
2.	Use R for data preprocessing, exploratory analysis, visualization.
3.	Use R for correlation and regression analysis.
4.	Data analysis case study using R for readily available data set using any one machine learning algorithm

Suggested Mini Project on Advanced JAVA and Data Science with R

1. Implementing a simple Recommender System based on user buying pattern.
2. Applying linear regression model to a real world problem.

SD Module-VI Aptitude Development

Quantitative Aptitude, Logical Reasoning and Verbal Ability

An aptitude is a component of a competence to do a certain kind of work at a certain level. Outstanding aptitude can be considered "talent". An aptitude may be physical or mental. Aptitude is inborn potential to do certain kinds of work whether developed or undeveloped. Ability is developed knowledge, understanding, learned or acquired abilities (skills) or attitude. The innate nature of aptitude is in contrast to skills and achievement, which represent knowledge or ability that is gained through learning. (Ref: https://en.wikipedia.org/wiki/Aptitude).

Aptitude and ability tests are designed to assess your logical reasoning or thinking performance. The statistics reveal that 70 percent of world's recruitment companies use aptitude test as a part of their recruitment procedure. These types of tests often permit potential companies to learn more about candidate's personality and abilities.

It is well said that aptitude isn't really something one can easily improve, but surely practice can help to improve. Solving number of high level of questions will surely help to succeed while subsequent practices of solving same. Each attempt should aim to attain a level of efficiency. Practice of solving hundreds of similar questions helps to choose right approach to solve.

It is recommended to conduct few expert talks and conduct practice tests for students for minimum 15 minutes per week in current semester and continue in semester VI, VII and VIII.

Text:

1. R.S Aggarwal, "Quantitative Aptitude", S Chand Publisher, ISBN- 9788121924986
2. Aptipedia- Aptitude Encyclopedia, Wiley, ISBN:978-81-265-6223-7
3. Shakuntala Devi, "Puzzles to Puzzle You" and "More Puzzles to Puzzle You", Orient Paperbacks, 2005. ISBN, 8122200141, 9788122200140

Savitribai Phule Pune University
Third Year of Computer Engineering (2015 Course)
310247: Database Management System Lab

Teaching Scheme:	Credit	Examination Scheme:
Practical : 04 Hours/Week	02	Practical: 50 Marks Term Work: 25 Marks

Companion Course: Database Management System (310242)

Course Objectives:
- To develop basic, intermediate and advanced Database programming skills
- To develop basic Database administration skills
- To percept transaction processing

Course Outcomes:

On completion of the course, student will be able to–
- Develop the ability to handle databases of varying complexities
- Use advanced database Programming concepts

Guidelines for Instructor's Manual

The instructor's manual is to be developed as a hands-on resource and reference. The instructor's manual need to include prologue (about University/program/ institute/ department/foreword/ preface etc), University syllabus, conduction & Assessment guidelines, topics under consideration-concept, objectives, outcomes, set of typical applications/assignments/ guidelines, and references.

Guidelines for Student Journal

The laboratory assignments are to be submitted by student in the form of journal. Journal consists of prologue, Certificate, table of contents, and **handwritten write-up** of each assignment (Title, Objectives, Problem Statement, Outcomes, software & Hardware requirements, Date of Completion, Assessment grade/marks and assessor's sign, Theory- Concept in brief, Database design, test cases, conclusion/analysis. **Program codes with sample output of all performed assignments are to be submitted as softcopy.**

As a conscious effort and little contribution towards Green IT and environment awareness, attaching printed papers as part of write-ups and program listing to journal may be avoided. Use of DVD containing students programs maintained by lab In-charge is highly encouraged. For reference one or two journals may be maintained with program prints at Laboratory

Guidelines for Assessment

Continuous assessment of laboratory work is done based on overall performance and lab assignments performance of student. Each lab assignment assessment will assign grade/marks based on parameters with appropriate weightage. Suggested parameters for overall assessment as well as each lab assignment assessment include- timely completion, performance, innovation, efficient codes, punctuality and neatness.

Guidelines for Practical Examination

Both internal and external examiners should jointly set problem statements. During practical assessment, the expert evaluator should give the maximum weightage to the satisfactory implementation of the problem statement. The supplementary and relevant questions may be asked at the time of evaluation to test the student's for advanced learning, understanding of the fundamentals, effective and efficient implementation. So encouraging efforts, transparent evaluation and fair approach of the evaluator will not create any uncertainty or doubt in the minds of the students. So adhering to these principles will consummate our team efforts to the promising start of the student's academics.

Guidelines for Laboratory Conduction

The instructor is expected to frame the assignments by understanding the prerequisites, technological aspects, utility and recent trends related to the topic. The assignment framing policy need to address the average students and inclusive of an element to attract and promote the intelligent students. The instructor may set multiple sets of assignments and distribute among batches of students. It is appreciated if the assignments are based on real world problems/applications. Encourage students for appropriate use of Hungarian notation, proper indentation and comments. Use of open source software is to be encouraged.

In addition to these, instructor may assign one real life application in the form of a mini-project based on the concepts learned. Instructor may also set one assignment or mini-project that is suitable to respective branch beyond the scope of syllabus.

Set of suggested assignment list is provided in groups- A and B. Each student must perform at least 13 assignments (8-Mandotory plus 4 from remaining 8 assignments) from group A , 5 from group B and 2 mini projects from Group C

Operating System recommended :- 64-bit Open source Linux or its derivative

Programming tools recommended: SQL, PL/SQL, Front End: Java/Perl/PHP/Python/Ruby/.net, Backend : Monod/MYSQL/Oracle, Database Connectivity : ODBC/JDBC

Books:

References:

1. Ivan Bayross, "SQL, PL/SQL: The Programming Language of Oracle", BPB Publication, ISBN-10: 8176560723; ISBN-13: 978-8176560726

2. Kristina Chodorow, Michael Dirolf, "MangoDB: The Definitive Guide", O'Reilly Publications, ISBN: 9781449381561

3. Import, Tidy, Transform," R for Data Science", O'REILLY, ISBN: 13:978-93-5213-497-7

4. http://www.tutorialspoint.com/json/ & http://docs.mongodb.org/manual/

Suggested List of Laboratory Assignments

Group A- Database Programming Languages – SQL, PL/SQL

1.	Study of Open Source Relational Databases : MySQL
2.	Design and Develop SQL DDL statements which demonstrate the use of SQL objects such as Table, View, Index, Sequence, Synonym
3.	Design at least 10 SQL queries for suitable database application using SQL DML statements: Insert, Select, Update, Delete with operators, functions, and set operator.
4.	Design at least 10 SQL queries for suitable database application using SQL DML statements: all types of Join, Sub-Query and View.
5.	Unnamed PL/SQL code block: Use of Control structure and Exception handling is mandatory. Write a PL/SQL block of code for the following requirements:- Schema: 1. Borrower(Rollin, Name, DateofIssue, NameofBook, Status) 2. Fine(Roll_no,Date,Amt) • Accept roll_no & name of book from user. • Check the number of days (from date of issue), if days are between 15 to 30 then fine amount will be Rs 5per day. • If no. of days>30, per day fine will be Rs 50 per day & for days less than 30, Rs. 5 per day. • After submitting the book, status will change from I to R. • If condition of fine is true, then details will be stored into fine table. **Frame the problem statement for writing PL/SQL block inline with above statement.**
6.	Cursors: (All types: Implicit, Explicit, Cursor FOR Loop, Parameterized Cursor) Write a PL/SQL block of code using parameterized Cursor, that will merge the data available in the newly created table N_RollCall with the data available in the table O_RollCall. If the data in the first table already exist in the second table then that data should be skipped. **Frame the separate problem statement for writing PL/SQL block to implement all types**

	of Cursors inline with above statement. The problem statement should clearly state the requirements.
7.	PL/SQL Stored Procedure and Stored Function. Write a Stored Procedure namely proc_Grade for the categorization of student. If marks scored by students in examination is <=1500 and marks>=990 then student will be placed in distinction category if marks scored are between 989 and900 category is first class, if marks 899 and 825 category is Higher Second Class Write a PL/SQL block for using procedure created with above requirement. Stud_Marks(name, total_marks) Result(Roll,Name, Class) **Frame the separate problem statement for writing PL/SQL Stored Procedure and function, inline with above statement. The problem statement should clearly state the requirements.**
8.	Database Trigger (All Types: Row level and Statement level triggers, Before and After Triggers). Write a database trigger on Library table. The System should keep track of the records that are being updated or deleted. The old value of updated or deleted records should be added in Library_Audit table. **Frame the problem statement for writing Database Triggers of all types, in-line with above statement. The problem statement should clearly state the requirements.**
	Group B Large Scale Databases
1.	Study of Open Source NOSQL Database: MongoDB (Installation, Basic CRUD operations, Execution)
2.	Design and Develop MongoDB Queries using CRUD operations. (Use CRUD operations, SAVE method, logical operators)
3.	Implement aggregation and indexing with suitable example using MongoDB.
4.	Implement Map reduces operation with suitable example using MongoDB.
5.	Design and Implement any 5 query using MongoDB
6.	Create simple objects and array objects using JSON
7.	Encode and Decode JSON Objects using Java/Perl/PHP/Python/Ruby
	Group C Mini Project : Database Project Life Cycle
1.	Write a program to implement MogoDB database connectivity with PHP/ python/Java Implement Database navigation operations (add, delete, edit etc.) using ODBC/JDBC.
2.	Implement MYSQL/Oracle database connectivity with PHP/ python/Java Implement Database navigation operations (add, delete, edit,) using ODBC/JDBC.
3.	Using the database concepts covered in Part-I & Part-II & connectivity concepts covered in Part C, students in group are expected to design and develop database application with following details: **Requirement Gathering and Scope finalization** **Database Analysis and Design:** • Design Entity Relationship Model, Relational Model, Database Normalization **Implementation :** • Front End : Java/Perl/PHP/Python/Ruby/.net • Backend : MongoDB/MYSQL/Oracle • Database Connectivity : ODBC/JDBC **Testing : Data Validation** Group of students should submit the Project Report which will be consist of documentation related to different phases of Software Development Life Cycle: Title of the Project, Abstract, Introduction, scope, Requirements, Data Modeling features, Data Dictionary, Relational Database Design, Database Normalization, Graphical User Interface, Source Code, Testing document, Conclusion. Instructor should maintain progress report of mini project throughout the semester from project group and assign marks as a part of the term work

Savitribai Phule Pune University
Third Year of Computer Engineering (2015 Course)
310248: Computer Networks Lab

Teaching Scheme:	Credit	Examination Scheme:
PR: 02 Hours/Week	01	TW: 25 Marks PR: 50 Marks

Companion Course: 310245 Computer Networks (CN)

Course Objectives:

- To establish communication among the computing nodes in P2P and Client-Server architecture
- Configure the computing nodes with understanding of protocols and technologies.
- Use different communicating modes and standards for communication
- Use modern tools for network traffic analysis
- To learn network programming.

Course Outcomes:

On completion of the course, student will be able to–

- Demonstrate LAN and WAN protocol behavior using Modern Tools.
- Analyze data flow between peer to peer in an IP network using Application, Transport and Network Layer Protocols.
- Demonstrate basic configuration of switches and routers.
- Develop Client-Server architectures and prototypes by the means of correct standards and technology.

Guidelines for Instructor's Manual

The instructor’s manual is to be developed as a hands-on resource and reference. The instructor's manual need to include prologue (about University/program/ institute/ department/foreword/ preface etc), University syllabus, conduction & Assessment guidelines, topics under consideration-concept, objectives, outcomes, set of typical applications/assignments/ guidelines, and references.

Guidelines for Student Journal

The laboratory assignments are to be submitted by student in the form of journal. Journal consists of prologue, Certificate, table of contents, and **handwritten write-up** of each assignment (Title, Objectives, Problem Statement, Outcomes, software & Hardware requirements, Date of Completion, Assessment grade/marks and assessor's sign, Theory- Concept in brief, algorithm, flowchart, test cases, conclusion/analysis. **Program codes with sample output of all performed assignments are to be submitted as softcopy.**

As a conscious effort and little contribution towards Green IT and environment awareness, attaching printed papers as part of write-ups and program listing to journal may be avoided. Use of DVD containing students programs maintained by lab In-charge is highly encouraged. For reference one or two journals may be maintained with program prints at Laboratory.

Guidelines for Assessment

Continuous assessment of laboratory work is done based on overall performance and lab assignments performance of student. Each lab assignment assessment will assign grade/marks based on parameters with appropriate weightage. Suggested parameters for overall assessment as well as each lab assignment assessment include- timely completion, performance, innovation, efficient codes, punctuality and neatness.

Guidelines for Practical Examination

Both internal and external examiners should jointly set problem statements. During practical assessment, the expert evaluator should give the maximum weightage to the satisfactory implementation of the problem statement. The supplementary and relevant questions may be asked at the time of evaluation to test the student's for advanced learning, understanding of the fundamentals, effective and efficient implementation. So encouraging efforts, transparent evaluation and fair approach of the evaluator will not create any uncertainty or doubt in the minds of the students. So adhering to these principles will consummate our team efforts to the promising start of the student's academics.

Guidelines for Laboratory Conduction

The instructor is expected to frame the assignments by understanding the prerequisites, technological aspects, utility and recent trends related to the topic. The assignment framing policy need to address the average students and inclusive of an element to attract and promote the intelligent students. The instructor may set multiple sets of assignments and distribute among batches of students. It is appreciated if the assignments are based on real world problems/applications. Encourage students for appropriate use of Hungarian notation, proper indentation and comments. Use of open source software is to be encouraged.

In addition to these, instructor may assign one real life application in the form of a mini-project based on the concepts learned. Instructor may also set one assignment or mini-project that is suitable to respective branch beyond the scope of syllabus.

Set of suggested assignment list is provided in groups- A and B. Each student must perform at least 8 assignments (4-Mandotory plus 4 from remaining 8 assignments) from group A and 4 from group B (2-Mandotory plus 2 from remaining 5 assignments).

Operating System recommended :- 64-bit Open source Linux or its derivative

Programming tools recommended: - Open Source C,C++, JAVA, PYTHON,

Programming tool like G++/GCC, Wireshark, Etheral and Packet Tracer

Books:

References:

1. Thomas D. Nadean and Ken Gray, "Software Defined Networks", O'REILLY, ISBN: 13:978-93-5110-264-9
2. Robert Faludi, "Building Wireless Sensor Networks", O'REILLY, ISBN: 13:978-93-5023-289-7

Suggested List of Laboratory Assignments

Group A

All assignments should be implemented using Open Source Linux flavors, Open Source Tools: Wireshark and Packet Tracer and C/C++, JAVA, PYTHON.

1.	**Lab Assignment on Unit I: (Mandatory Assignment)** **Part A:** Setup a wired LAN using Layer 2 Switch and then IP switch of minimum four computers. It includes preparation of cable, testing of cable using line tester, configuration machine using IP addresses, testing using PING utility and demonstrate the PING packets captured traces using Wireshark Packet Analyzer Tool. **Part B:** Extend the same Assignment for Wireless using Access Point
2.	**Lab Assignment on Unit II: (Use C/C++)** Write a Program with following four options to transfer- a. Characters separated by space b. One Strings at a time b. One Sentence at a time c. file between two RS 232D or USB ports using C/C++. (To demonstrate Framing, Flow control, Error control).

3.	**Lab Assignment on Unit II: (Use C/C++)** Write a program for error detection and correction for 7/8 bits ASCII codes using Hamming Codes or CRC. Demonstrate the packets captured traces using Wireshark Packet Analyzer Tool for peer to peer mode.(50% students will perform Hamming Code and others will perform CRC)
4.	**Lab Assignment on Unit II: (Use JAVA/PYTHON)** Write a program to simulate Go back N and Selective Repeat Modes of Sliding Window Protocol in peer to peer mode and demonstrate the packets captured traces using Wireshark Packet Analyzer Tool for peer to peer mode.
5.	**Lab Assignment on Unit IV: (Use JAVA/PYTHON)** Write a program to demonstrate subletting and find the subnet masks.
6.	**Lab Assignment on Unit IV: (Use JAVA/PYTHON)** Write a program to simulate the behavior of link state routing protocol to find suitable path for transmission.
7.	**Lab Assignment on Unit V: (Mandatory Assignment) (Use C/C++)** Write a program using TCP socket for wired network for following a. Say Hello to Each other (For all students) b. File transfer (For all students) c. Calculator (Arithmetic) (50% students) d. Calculator (Trigonometry) (50% students) Demonstrate the packets captured traces using Wireshark Packet Analyzer Tool for peer to peer mode.
8.	**Lab Assignment on Unit V: (Mandatory Assignment) (Use C/C++)** Write a program using UDP Sockets to enable file transfer (Script, Text, Audio and Video one file each) between two machines. Demonstrate the packets captured traces using Wireshark Packet Analyzer Tool for peer to peer mode.
9.	**Lab Assignment on Unit V: (Mandatory Assignment) (Use C/C++)** Write a program to analyze following packet formats captured through Wireshark for wired network. 1. Ethernet 2. IP 3.TCP 4. UDP
10.	Write a program to simulate the behavior of Slow Start and AIMD (Additive Increase and Multiplicative Decrease) congestion control protocols. **(Use JAVA/PYTHON)**
11.	**Lab Assignment on Unit VI: (Use JAVA/PYTHON)** Write a program for DNS lookup. Given an IP address input, it should return URL and vice-versa.
12.	**Lab Assignment on Unit VI:** Installing and configure DHCP server and write a program to install the software on remote machine.
Group B	
1.	**Lab Assignment on Unit II: (Use JAVA/PYTHON)** Write a Program to transfer- By using Bluetooth **a.** Characters separated by space **b.** One Strings at a time **c.** One Sentence at a time d. File
2.	**Lab Assignment on Unit IV: (Use JAVA/PYTHON)** Study of any network simulation tools - To create a network with three nodes and establish a TCP connection between node 0 and node 1 such that node 0 will send TCP packet to node 2 via node 1
3.	**Lab Assignment on Unit V: (Use JAVA/PYTHON)** Write a program using TCP sockets for wired network to implement a. Peer to Peer Chat b. Multiuser Chat

	Demonstrate the packets captured traces using Wireshark Packet Analyzer Tool for peer to peer mode.
4.	**Lab Assignment on Unit V: (Use JAVA/PYTHON)** Write a program using UDP sockets for wired network to implement a. Peer to Peer Chat b. Multiuser Chat Demonstrate the packets captured traces using Wireshark Packet Analyzer Tool for peer to peer mode.
5.	**Lab Assignment on Unit V: (Use JAVA/PYTHON)** Write a program to prepare TCP and UDP packets using header files and send the packets to destination machine in peer to peer mode. Demonstrate the packets captured traces using Wireshark Packet Analyzer Tool for peer to peer mode.
6.	**Lab Assignment on Unit IV and Unit V: (Mandatory Assignment)** Use network simulator NS2 to implement: a. Monitoring traffic for the given topology b. Analysis of CSMA and Ethernet protocols c. Network Routing: Shortest path routing, AODV. d. Analysis of congestion control (TCP and UDP).
7.	**Lab Assignment on Unit IV: (Mandatory Assignment)** Configure RIP/OSPF/BGP using packet Tracer.

Savitribai Phule Pune University
Third Year of Computer Engineering (2015 Course)
310249: Audit Course 3

In addition to credits, it is recommended that there should be audit course in preferably in each semester from second year to supplement their knowledge and skills. Student will be awarded the bachelor‘s degree if he/she earns 190 credits and clears all the audit courses specified in the syllabus. The student will be awarded grade as AP on successful completion of audit course. The student may opt for one of the audit courses per semester, starting in second year first semester. Though not mandatory, such a selection of the audit courses helps the learner to explore the subject of interest in greater detail resulting in achieving the very objective of audit course's inclusion. List of options offered is provided. Each student has to choose one audit course from the list per semester. Evaluation of audit course will be done at institute level itself. Method of conduction and method of assessment for audit courses are suggested.

Criteria:

The student registered for audit course shall be awarded the grade AP (Audit Course Pass) and shall be included such AP grade in the Semester grade report for that course, provided student has the minimum attendance as prescribed by the Savitribai Phule Pune University and satisfactory in-semester performance and secured a passing grade in that audit course. No grade points are associated with this 'AP' grade and performance in these courses is not accounted in the calculation of the performance indices SGPA and CGPA. Evaluation of audit course will be done at institute level itself. (Ref- http://www.unipune.ac.in/Syllabi_PDF/revised-2015/engineering/UG_RULE_REGULATIONS_FOR_CREDIT_SYSTEM-2015_18June.pdf)

Guidelines for Conduction and Assessment (Any one or more of following but not limited to)

- Lectures/ Guest Lectures
- Visits (Social/Field) and reports
- Demonstrations
- Surveys
- Mini Project
- Hands on experience on specific focused topic

Guidelines for Assessment (Any one or more of following but not limited to)

- Written Test
- Demonstrations/ Practical Test
- Presentations
- IPR/Publication
- Report

Audit Course 3 Options

AC3- I	Cyber Security
AC3-II	Professional Ethics and Etiquettes
AC3-III	Emotional Intelligence
AC3-IV	MOOC-Learn New Skills
AC3-V	Foreign Language (one of Japanese/ Spanish/French/German). Course contents for **Japanese (Module 3) are provided. For other languages institute may design suitably.**

Note: It is permitted to opt one of the audit courses listed at SPPU website too, if not opted earlier
http://collegecirculars.unipune.ac.in/sites/documents/Syllabus%202017/Forms/AllItems.aspx

Savitribai Phule Pune University, Pune
Third Year of Computer Engineering (2015 Course)
310249: Audit Course 3
AC3 – I: Cyber Security

Effective information security at the enterprise level requires participation, planning, and practice. It is an ongoing effort that requires management and staff to work together from the same script. Fortunately, the information security community has developed a variety of resources, methods, and best practices to help modern enterprises address the challenge. Unfortunately, employing these tools demands a high degree of commitment, understanding, and skill attributes that must be sustained through constant awareness and training.

Course Objectives:

- To assess the current security landscape, including the nature of the threat, the general status of common vulnerabilities, and the likely consequences of security failures;
- To critique and assess the strengths and weaknesses of general cyber security models, including the CIA triad
- To appraise the interrelationships among elements that comprise a modern security system, including hardware, software, policies, and people;
- To assess how all domains of security interact to achieve effective system-wide security at the enterprise level.

Course Outcome:

On completion of the course, learner will be able to–

- Compare the interrelationships among security roles and responsibilities in a modern information-driven enterprise—to include interrelationships across security do mains (IT, physical, classification, personnel, and so on)
- Assess the role of strategy and policy in determining the success of information security;
- Estimate the possible consequences of misaligning enterprise strategy, security policy, and security plans;

Course Contents:

1. **Cyber Security Basics:** Introduction, Elements of Information security, Security Policy, Techniques, Operational Model of Network Security, Terminologies in Network Security
2. **Introduction to Cryptography:** Introduction, Encryption Methods: Symmetric, Asymmetric, Public Key and Management, Authentication methods, Digital Signatures
3. **Security requirements:** Electronic Mail Security: Pretty Good Privacy, MIME, S/MIME, And Comparison. WEB Security, Secure Electronic Transaction(SET).
4. **Intrusion and Firewall:** Introduction to threats, Intrusion detection, IDS: Need, Methods, Types of IDS, Password Management, Limitations and Challenges, Firewall Introduction, Characteristics and types, Benefits and limitations. Firewall architecture, Trusted Systems, Access Control
5. **Security perspective of Hacking and its counter majors :** Introduction to Hacking, Counter majors: General Strategies

Books:

1. William Stallings, “Cryptography and Network Security”, Pearson, ISBN:978-93-325-1877-3
2. Oded Goldreich, “Foundations of Cryptography: Basic Tools”, Cambridge University Press, ISBN-10: 0521035368; ISBN-13: 978-0521035361
3. Jonathan Katz and Yehuda Lindell, “Introduction to Modern Cryptography”, CRC Book

Savitribai Phule Pune University, Pune
Third Year of Computer Engineering (2015 Course)
310249: Audit Course 3
AC3 – II: Professional Ethics and Etiquettes

Professional ethics is the underlying concept behind the successful accomplishment of any act of a professional towards achieving the individual and societal goals. These goals should ultimately result in morally, legally, ethically and even culturally acceptable good things for all. Engineers being special group of professionals need to be more conscious of their acts since their duties, rights and responsibilities permeate into the society and the surroundings. To practice professional ethics, understanding of values and concepts are essential.

Course Objectives:

- To create awareness on professional ethics and Human Values.
- To provide basic familiarity about Engineers as responsible Experimenters, Research Ethics, Codes of Ethics, Industrial Standards.
- To inculcate knowledge and exposure on Safety and Risk.
- To expose students to right attitudinal and behavioral aspects

Course Outcome:

On completion of the course, learner will be able to–

- understand the basic perception of profession, professional ethics, various moral issues & uses of ethical theories
- Understand various social issues, industrial standards, code of ethics and role of professional ethics in engineering field.
- Follow Ethics as an engineering professional and adopt good standards & norms of engineering practice.
- apply ethical principles to resolve situations that arise in their professional lives

Course Contents:

1. **Human Values And Engineering Ethics:** Morals, values and Ethics, Integrity, Work ethic, Civic virtue , Valuing time, Cooperation**,** Commitment, Empathy, Self-confidence , stress management, Senses of Engineering Ethics, Kohlberg‟s theory, Gilligan‟s theory, Models of professional roles, Uses of Ethical Theories.
2. **Research Ethics and Codes of Ethics:** Industrial standardization, ethical code and its importance, ethical accountability, law in engineering, engineering as social experimentation.
3. **Safety, Responsibilities And Rights:** Safety and Risk, Assessment of Safety and Risk, Risk Benefit Analysis and Reducing Risk collegiality, Collective Bargaining , Confidentiality , Conflicts of Interest, Professional Rights, Employee Rights, Intellectual Property Rights (IPR), Discrimination, Utilitarianism
4. **Professional Etiquette:** Etiquette at Meetings, Public Relations Office(PRO)'s Etiquettes, Technology Etiquette Phone Etiquette, Email Etiquette, Social Media Etiquette, Video Conferencing Etiquette, Interview Etiquette, Dressing Etiquettes : for Interview, offices and social functions, Ethical Values: Importance of Work Ethics.

Books:

1. Caroline Whitbeck, "Ethics in Engineering Practice and Research", Cambridge Press, ISBN:978-1-107-66847-8
2. Prabhuddha Ganguli: ―Intellectual Property Rights‖ Tata Mc-Graw –Hill, New Delhi, ISBN-10:0070077177
3. Professional Ethics and Etiquette (Mastering Career Skills), Checkmark, ISBN-10: 0816071179
4. A Alavudeen, "Professional Ethics And Human Values" Firewall, ISBN13 : 8131803066

Savitribai Phule Pune University, Pune
Third Year of Computer Engineering (2015 Course)
310249: Audit Course 3
AC3 – III: Emotional Intelligence

This Emotional Intelligence (EI) training course will focus on the five core competencies of emotional intelligence: self-awareness, self-regulation, motivation, empathy and interpersonal skills. Participants will learn to develop and implement these to enhance their relationships in work and life by increasing their understanding of social and emotional behaviors, and learning how to adapt and manage their responses to particular situations. Various models of emotional intelligence will be covered.

Course Objectives:

- To develop an awareness of EI models
- To recognize the benefits of EI
- To understand how you use emotion to facilitate thought and behavior
- To know and utilize the difference between reaction and considered response

Course Outcomes:

On completion of the course, learner will be able to–

- Expand your knowledge of emotional patterns in yourself and others
- Discover how you can manage your emotions, and positively influence yourself and others
- Build more effective relationships with people at work and at home
- Positively influence and motivate colleagues, team members, managers
- Increase your leadership effectiveness by creating an atmosphere that engages others
- Apply EI behaviors and supports high performance

Course Contents:

1. **Introduction to Emotional Intelligence (EI) :** Emotional Intelligence and various EI models, The EQ competencies of self-awareness, self-regulation, motivation, empathy, and interpersonal skills, Understand EQ and its importance in life and the workplace
2. **Know and manage your emotions:** emotions, The different levels of emotional awareness, Increase your emotional knowledge of yourself, Recognize ‘negative’ and ‘positive’ emotions. The relationship between emotions, thought and behavior, Discover the importance of values, The impact of not managing and processing ‘negative’ emotions, Techniques to manage your emotions in challenging situations
3. **Recognize emotions in others :** The universality of emotional expression, Learn tools to enhance your ability to recognize and appropriately respond to others' emotions, Perceiving emotions accurately in others to build empathy
4. **Relate to others**: Applying EI in the workplace, the role of empathy and trust in relationships, Increase your ability to create effective working relationships with others (peers, subordinates, managers, clients, Find out how to deal with conflict, Tools to lead, motivate others and create a high performing team.

Books:

1. Daniel Goleman,” Emotional Intelligence – Why It Matters More Than IQ,” , Bantam Books, ISBN-10: 055338371X13: 978-0553383713
2. Steven Stein , “The EQ Edge” , Jossey-Bass, ISBN : 978-0-470-68161-9
3. Drew Bird , “The Leader’s Guide to Emotional Intelligence” , ISBN: 9781535176002

Savitribai Phule Pune University, Pune
Third Year of Computer Engineering (2015 Course)
310249: Audit Course 3
AC3 – IV: MOOC-learn New Skill

Course Objectives:

- To promote interactive user forums to support community interactions among students, professors, and experts
- To promote learn additional skills anytime and anywhere
- To enhance teaching and learning on campus and online

Course Outcome:

On completion of the course, learner will acquire additional knowledge and skill.

About Course:

MOOCs (Massive Open Online Courses) provide affordable and flexible way to learn new skills, pursue lifelong interests and deliver quality educational experiences at scale. Whether you're interested in learning for yourself, advancing your career or leveraging online courses to educate your workforce, SWYAM, NPTEL, edx or similar ones can help.

World's largest SWAYAM MOOCs, a new paradigm of education for anyone, anywhere, anytime, as per your convenience, aimed to provide digital education free of cost and to facilitate hosting of all the interactive courses prepared by the best more than 1000 specially chosen faculty and teachers in the country. SWAYAM MOOCs enhances active learning for improving lifelong learning skills by providing easy access to global resources.

SWAYAM is a programme initiated by Government of India and designed to achieve the three cardinal principles of Education Policy viz., access, equity and quality. The objective of this effort is to take the best teaching learning resources to all, including the most disadvantaged. SWAYAM seeks to bridge the digital divide for students who have hitherto remained untouched by the digital revolution and have not been able to join the mainstream of the knowledge economy.

This is done through an indigenous developed IT platform that facilitates hosting of all the courses, taught in classrooms from 9th class till post-graduation to be accessed by anyone, anywhere at any time. All the courses are interactive, prepared by the best teachers in the country and are available, free of cost to the residents in India. More than 1,000 specially chosen faculty and teachers from across the Country have participated in preparing these courses.
The courses hosted on SWAYAM is generally in 4 quadrants – (1) video lecture, (2) specially prepared reading material that can be downloaded/printed (3) self-assessment tests through tests and quizzes and (4) an online discussion forum for clearing the doubts. Steps have been taken to enrich the learning experience by using audio-video and multi-media and state of the art pedagogy / technology. In order to ensure best quality content are produced and delivered, seven National Coordinators have been appointed: These are NPTEL for engineering and UGC for post-graduation education.

Guidelines:

Instructor is requested to promote students to opt for courses with proper mentoring. The departments will take care of providing necessary infrastructural facilities and other facilities for the learners.

References:

1. https://swayam.gov.in/
2. https://onlinecourses.nptel.ac.in/
3. https://www.edx.org

Savitribai Phule Pune University, Pune
Third Year of Computer Engineering (2015 Course)
310249: Audit Course 3
AC3 – V: Foreign Language(Japanese Module 3)

Prerequisite Courses: Audit Course AC1-V(210250), AC2-V(210258)

About Course:

With changing times, the competitiveness has gotten into the nerves and ‗Being the Best' at all times is only the proof of it. Nonetheless, ‗being the best' differs significantly from Communicating the best'. The best can merely be communicated whilst using the best suited Language!

Japanese is the new trend of 21st century. Not only youngsters but even the professionals seek value in it. It is the engineer's companion in current times with an assertion of a thriving future. Pune has indisputably grown to become a major center of Japanese Education in India while increasing the precedence for Japanese connoisseurs.

Japanese certainly serves a great platform to unlock a notoriously tough market & find a booming career. While the companies prefer candidates having the knowledge of the language, it can additionally help connect better with the native people thus prospering in their professional journey. Learning Japanese gives an extra edge to the ‗resume' since the recruiters consciously make note of the fact it requires real perseverance and self-discipline to tackle one of the most complex languages.

It would be easy for all time to quit the impossible; however it takes immense courage to reiterate the desired outcomes, recognize that improvement is an ongoing process and ultimately soldier on it. The need of an hour is to introduce Japanese language with utmost professionalism to create awareness about the bright prospects and to enhance the proficiency and commitment. It will then prove to be the ultimate path to the quest for professional excellence!

Course Objectives:

- To meet the needs of ever growing industry with respect to language support.
- To get introduced to Japanese society and culture through language.

Course Outcome:

On completion of the course, learner will be able to–

- Have ability of basic communication.
- Have the knowledge of Japanese script.
- Get introduced to reading, writing and listening skills for language Japanese.
- Develop interest to pursue professional Japanese Language course

Course Contents:

1. Introduction to Kanji Script, Describing one's daily routine. To ask what someone does. Expressions of Giving & Receiving.
2. Adjectives (Types of adjectives), Asking impression or an opinion about a thing / person / place that the listener, has experienced, visited, or met, Describing things / person / places with the help of the adjectives.
3. Expressions of Like & Dislikes. Expressing one's ability, hobby, Comparison between objects, persons & cities, which resulted from a certain action in the past.

References:

1. Minna No Nihongo, ―Japanese for Everyone‖, Elementary Main Text book 1-1 (Indian Edition), Goyal Publishers & Distributors Pvt. Ltd.

2. http://www.tcs.com (http://www.tcs.com/news_events/press_releases/Pages/TCS-Inaugurates-Japan-centric-Delivery-Center-Pune.aspx

SEMESTER II

Savitribai Phule Pune University
Third Year of Computer Engineering (2015 Course)
310250: Design and Analysis of Algorithms

Teaching Scheme:	Credit	Examination Scheme:
TH: 04 Hours/Week	04	In-Sem (Paper): 30 Marks End-Sem (Paper): 70 Marks

Prerequisite Courses: Discrete Mathematics (210241), Data Structures (210243, 210252), Theory of Computation (310241)

Course Objectives:

- To develop problem solving abilities using mathematical theories
- To analyze the performance of algorithms
- To study algorithmic design strategies

Course Outcomes:

On completion of the course, student will be able to–

- Formulate the problem
- Analyze the asymptotic performance of algorithms
- Decide and apply algorithmic strategies to solve given problem
- Find optimal solution by applying various methods

Course Contents

Unit I	Fundamentals	09 Hours

The Role of Algorithms in Computing - What are algorithms, Algorithms as technology, Evolution of Algorithms, Design of Algorithm, Need of Correctness of Algorithm, Confirming correctness of Algorithm – sample examples, Iterative algorithm design issues.

Unit II	Models and Design	09 Hours

Functional Model – Features, Recursive processes, Scope rules, Tail recursion, Checking correctness of Iterative process. Imperative Model – Basics, Specifications and Prototyping, Stepwise Refinement, Proof Rules – Basics, For loops, Goto and Exit loops, Functions and Procedures, Problem Solving using Greedy strategy - Knapsack problem, Huffman code generation algorithm.

Unit III	Abstract Algorithms	09 Hours

Dynamic Programming, Divide and Conquer, Greedy strategy, Branch-n-Bound, Natural Algorithms –Evolutionary Algorithms and Evolutionary Computing, Introduction to Genetic Algorithm, Simulated Annealing, Artificial Neural Network and Tabu Search.

Unit IV	Complexity Theory	09 Hours

Complexity theory – Counting Dominant operators, Growth rate, upper bounds, asymptotic growth, O, Ω, Θ, o and ω notations, polynomial and non-polynomial problems, deterministic and non-deterministic algorithms, P-class problems, NP-class of problems, Polynomial problem reduction NP complete problems- vertex cover and 3-SAT and NP hard problem - Hamiltonian cycle.

Unit V	Amortized Analysis	09 Hours

Amortized Analysis – Binary, Binomial and Fibonacci heaps, Dijkstra's Shortest path algorithm, Splay Trees, Time-Space tradeoff, Introduction to Tractable and Non-tractable Problems, Introduction to Randomized and Approximate algorithms, Embedded Algorithms: Embedded system scheduling (power optimized scheduling algorithm), sorting algorithm for embedded systems.

Unit VI	Multithreaded and Distributed Algorithms	09 Hours

Multithreaded Algorithms - Introduction, Performance measures, Analyzing multithreaded algorithms, Parallel loops, Race conditions.

Problem Solving using Multithreaded Algorithms - Multithreaded matrix multiplication, Multithreaded merge sort.

Distributed Algorithms - Introduction, Distributed breadth first search, Distributed Minimum Spanning Tree.

String Matching- Introduction, The Naive string matching algorithm, The Rabin-Karp algorithm

Books:

Text:

1. Parag Himanshu Dave, Himanshu Bhalchandra Dave, "Design And Analysis of Algorithms", Pearson Education, ISBN 81-7758-595-9
2. Gilles Brassard, Paul Bratley, "Fundamentals of Algorithmics", PHI, ISBN 978-81-203-1131-2

References:

1. Michael T. Goodrich, Roberto Tamassia , "Algorithm Design: Foundations, Analysis and Internet Examples", Wiley, ISBN 978-81-265-0986-7
2. Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest and Clifford Stein, "Introduction to Algorithms", MIT Press; ISBN 978-0-262-03384-8
3. Horowitz and Sahani, "Fundamentals of Computer Algorithms", University Press, ISBN: 978 81 7371 6126, 81 7371 61262
4. Rajeev Motwani and Prabhakar Raghavan, "Randomized Algorithms", Cambridge University Press, ISBN: 978-0-521-61390-3
5. Dan Gusfield, "Algorithms on Strings, Trees and Sequences", Cambridge University Press,ISBN:0-521-67035-7

Savitribai Phule Pune University
Third Year of Computer Engineering (2015 Course)
310251: Systems Programming and Operating System

Teaching Scheme:	Credit	Examination Scheme:
TH: 04 Hours/Week	04	In-Sem (Paper): 30 Marks End-Sem (Paper): 70 Marks

Prerequisite Courses: **Fundamentals of Programming Languages(110011,110003), Data Structures (210243,210252)**

Companion Course: **Systems Programming and Operating System Lab (310257)**

Course Objectives:

- To understand basics of System Programming.
- To learn and understand data structures used in design of system software.
- To learn and understand basics of compilers and tools.
- To understand functions of operating system.
- To learn and understand process, resource and memory management.

Course Outcomes:

On completion of the course, student will be able to–

- Analyze and synthesize system software
- Use tools like LEX & YACC.
- Implement operating system functions.

Course Contents

Unit I	Introduction	09 Hours

Introduction: Components of System Software: Text editors, Loaders, Assemblers, Macro processors, Compilers, Debuggers. Machine Structure, Machine language and Assembly Language. Assemblers: General design procedure, design of two pass assembler

Unit II	Macro Processor, Linker and Loader	09 Hours

Macro Processor: Macro instructions, Features of macro facility, Design of two-pass, single pass and nested macro processor. Loaders: Loader schemes: Compile and go, General Loader Scheme, Absolute loaders, subroutine linkages, relocating loaders, direct linking loaders, overlay structure. Design of an absolute loader, Design of direct linking loader. Linkers: Relocation and linking concepts, Design of linker, self relocating programs, Static and dynamic link libraries, use of call back functions. Case Study: Loading phases using Java.

Unit III	Language Translator	09 Hours

Role of lexical analysis -parsing & Token, patterns and Lexemes & Lexical Errors, regular definitions for the language constructs & strings, sequences, Comments & Transition diagram for recognition of tokens, reserved words and identifiers, examples Introduction to Compilers and Interpreters: General Model of Complier, Program interpretation, Comparison of compiler and Interpreter, Use of Interpreter and components of Interpreter. Case Study: Overview of LEX and YACC specification and features.

Unit IV	Operating Systems	09 Hours

Operating Systems: Introduction to different types of operating Real Time Operating Systems, System Components, OS services, System structure- Layered Approach.
Process Management: Process Concept- Process states, Process control block, Threads, Process Scheduling: Types of process schedulers, Types of scheduling: Preemptive, Non preemptive. Scheduling algorithms: FCFS, SJF, RR, Priority,
Deadlocks: Methods of handling deadlocks, Deadlock prevention, avoidance and detection, Recovery from deadlocks.
Case Study: Process Management in multi-cores OS.

Unit V	**Memory Management**	**09 Hours**

Memory management: Review of Programming Model of Intel 80386, Contiguous and non-contiguous, Swapping, Paging, Segmentation, Segmentation with Paging. Virtual Memory: Background, Demand paging, Page replacement scheme- FIFO, LRU, Optimal, Thrashing.
Case Study: Memory Management in multi-cores OS.

Unit VI	**I/O Management**	**09 Hours**

I/O Management: I/O Devices, Organization of I/O function, I/O Buffering, Disk Scheduling-Disk Scheduling policies like FIFO, LIFO, STTF, SCAN, C-SCAN.
File Management: Concept, Access methods, Directory Structure, Protection, File System implementation, Directory Implementation, Allocation methods, Free Space management.
Case Study: I/O and File Management in multi-cores OS
Case Study: Light weight and heavy weight OS: Linux, Tizen

Books:

Text:

1. John Donovan, “System Programming”, McGraw Hill, ISBN 978-0--07-460482-3.
2. Silberschatz, Galvin, Gagne, "Operating System Principles", 9th Edition, Wiley, ISBN 978-1-118-06333-0

References:

1. Dhamdhere D., "Systems Programming and Operating Systems", McGraw Hill, ISBN 0 - 07 - 463579 – 4
2. Randal Bryant and David O'Hallaron, “Computer Systems: A Programmer's Perspective” , Pearson, ISBN 10: 0-13-610804-0
3. Stallings W., "Operating Systems", 6th Edition, Prentice Hall, ISBN-978-81-317-2528-3.
4. John. R. Levine, Tony Mason and Doug Brown, “Lex and Yacc”, O'Reilly, 1998, ISBN: 1-56592-000-7

Savitribai Phule Pune University
Third Year of Computer Engineering (2015 Course)
310252: Embedded Systems and Internet of Things

Teaching Scheme:	Credit	Examination Scheme:
TH: 04 Hours/Week	04	In-Sem (Paper): 30 Marks End-Sem (paper): 70 Marks

Prerequisite Course: **Computer Networks (310245)**

Companion Course: **Embedded Systems and IoT Lab (310258)**

Course Objectives:

- To understand fundamentals of IoT and embedded system including essence, basic design strategy and process modeling.
- To introduce students a set of advanced topics in embedded IoT and lead them to understand research in network.
- To develop comprehensive approach towards building small low cost embedded IoT system.
- To understand fundamentals of security in IoT,
- To learn to implement secure infrastructure for IoT
- To learn real world application scenarios of IoT along with its societal and economic impact using case studies

Course Outcomes:

On completion of the course, student will be able to–

- Implement an architectural design for IoT for specified requirement
- Solve the given societal challenge using IoT
- Choose between available technologies and devices for stated IoT challenge

Course Contents

Unit I	Introduction to Embedded System and Internet of Things	09 Hours

Embedded Systems: Application Domain and Characteristic of Embedded System, Real time systems and Real time scheduling, Processor basics and System-On-Chip, Introduction to ARM processor and its architecture. **IoT:** Definition and characteristics of IoT, Internet of Things: Vision, Emerging Trends, Economic Significance, Technical Building Blocks, Physical design of IoT, Things of IoT, IoT Protocols, Logical design of IoT, IoT functional blocks, IoT communication models, IoT Communication APIs, IoT enabling technologies, IoT levels and deployment templates, IoT Issues and Challenges, Applications

Unit II	Embedded IoT Platform Design Methodology	09 Hours

Purpose and requirement specification, Process specification, Domain model specification, information model specification, Service specifications, IoT level specification, Functional view specification, Operational view specification, Device and component integration, Application development

Unit III	Pillars of Embedded IoT and Physical Devices	09 Hours

Horizontal, verticals and four pillars of IoT, M2M: The internet of devices, RFID: The internet of objects, WSN: The internet of transducer, SCADA: The internet of controllers, DCM: Device, Connect and Manage, Device: Things that talk, Connect: Pervasive Network, Mangae: To create business values. IoT Physical Devices and Endpoints: Basic building blocks of and IoT device, Exemplary device: Raspberry Pi, Raspberry Pi interfaces, Programming Raspberry Pi with Python, Beagle board and Other IoT Devices.

Unit IV	IoT Protocols and Security	09 Hours
Protocol Standardization for IoT, Efforts, M2M and WSN Protocols, SCADA and RFID Protocols, Issues with IoT Standardization, Unified Data Standards, Protocols – IEEE 802.15.4, BACNet Protocol, Modbus, KNX, Zigbee Architecture, Network layer, APS layer. IoT Security: Vulnerabilities of IoT, Security Requirements, Challenges for Secure IoT, Threat Modeling, Key elements of IoT Security: Identity establishment, Access control, Data and message security, Non-repudiation and availability, Security model for IoT.		
Unit V	**Web of Things and Cloud of Things**	**09 Hours**
Web of Things versus Internet of Things, Two Pillars of the Web, Architecture Standardization for WoT, Platform Middleware for WoT, Unified Multitier WoT Architecture, WoT Portals and Business Intelligence. Cloud of Things: Grid/SOA and Cloud Computing, Cloud Middleware, Cloud Standards – Cloud Providers and Systems, Mobile Cloud Computing, The Cloud of Things Architecture.		
Unit VI	**IoT Physical Servers, Cloud Offerings and IoT Case Studies**	**09 Hours**
Introduction to Cloud Storage Models, Communication API, WAMP: AutoBahn for IoT, Xively Cloud for IoT, Python Web Application Framework: Djanjo, Amzon Web Services for IoT, SkyNet IoT Messaging Platform. Case Studies: Home Intrusion Detection, Weather Monitoring System, Air Pollution Monitoring, Smart Irrigation.		

Books:

Text:

1. Arshdeep Bahga, Vijay Madisetti, “Internet of Things – A hands-on approach”, Universities Press, ISBN: 0: 0996025510, 13: 978-0996025515

2. Honbo Zhou, “The Internet of Things in the Cloud: A Middleware Perspective”, CRC Press, 2012. ISBN : 9781439892992

3. Dieter Uckelmann, Mark Harrison, Florian Michahelles, “Architecting the Internet of Things”, Springer, 2011. ISBN: 978-3-642-19156-5

4. Lyla B. Das, “Embedded Systems: An Integrated Approach” Pearson , ISBN: 9332511675, 9789332511675.

References:

1. David Easley and Jon Kleinberg, “Networks, Crowds, and Markets: Reasoning About a Highly Connected World”, Cambridge University Press, 2010, ISBN:10: 0521195330

2. Olivier Hersent, Omar Elloumi and David Boswarthick, “The Internet of Things: Applications to the Smart Grid and Building Automation”, Wiley, 2012, 9781119958345

3. Olivier Hersent, David Boswarthick, Omar Elloumi , “The Internet of Things – Key applications and Protocols”, Wiley, 2012, ISBN:978-1-119-99435-0

4. Barrie Sosinsky, “Cloud Computing Bible”, Wiley-India, 2010.ISBN : 978-0-470-90356-8

5. Adrian McEwen, Hakim Cassimally, “Designing the Internet of Things”, Wiley, 2014, ISBN: 978-1-118-43063-7

6. Christopher Hallinan, “Embedded Linux Primer”, Prentice Hall, ISBN:13: 978-0-13-167984-9

Savitribai Phule Pune University
Third Year of Computer Engineering (2015 Course)
310253: Software Modeling and Design

Teaching Scheme: TH: 03 Hours/Week	Credits 03	Examination Scheme: In-Sem (Paper): 30 Marks End-Sem (Paper): 70 Marks

Prerequisite Course: Software Engineering and Project Management (310243)

Course Objectives:

- To understand and apply Object Oriented(OO) concept for designing OO based model/application
- To transform Requirement document to Appropriate design
- To understand different architectural designs and to transform them into proper model
- To choose and use modern design tools for project development and implementation.
- To choose and use appropriate test tool for testing web-based/desktop application

Course Outcomes:

On completion of the course, student will be able to–

- Analyze the problem statement (SRS) and choose proper design technique for designing web-based/ desktop application
- Design and analyze an application using UML modeling as fundamental tool
- Apply design patterns to understand reusability in OO design
- Decide and apply appropriate modern tool for designing and modeling
- Decide and apply appropriate modern testing tool for testing web-based/desktop application

Course Contents

Unit I	Introduction	07 Hours

Introduction to software design, design methods- procedural / structural and object oriented, Requirement Vs Analysis Vs Architecture Vs Design Vs Development 4+1 Architecture, case study of transferring requirement to design, UP, COMET use case based software life cycle, Introduction to UML -Basic building blocks, Reusability, Use case modeling, Use case template

Case study – Transferring requirements into design using advanced tool

Unit II	Static Modelling	08 Hours

Analysis Vs Design, Class diagram- Analysis - Object & classes finding analysis & Design- design classes, refining analysis relationships, Inheritance & polymorphism, Object diagram, Component diagram- Interfaces & components, deployment diagram, Package diagram

Unit III	Dynamic Modelling	07 Hours

Interaction & Interaction overview diagram, sequence diagram, Timing diagram, Communication diagram, Advanced state machine diagram, Activity diagram

Unit IV	Architecture Design	08 Hours

Introduction to Architectural design, overview of software architecture, Object oriented software architecture, Client server Architecture, Service oriented Architecture, Component based Architecture, Real time software Architecture

Unit V	Design patterns	07 Hours

Introduction to Creational design pattern – singleton, Factory ,Structural design pattern- Proxy design pattern, Adapter design pattern, Behavioral – Iterator design pattern, Observer design pattern

Unit VI	**Testing**	**08 Hours**

Introduction to testing, Error, Faults, Failures, verification and validation, Whit Box Testing, Black Box Testing, Unit testing, Integration testing, GUI testing, User acceptance Validation testing, integration testing, scenario testing, performance testing. Test cases and test plan. Case studies expected for developing usability test plans and test cases.

Note: Instructor should frame appropriate case studies/ mini-project (different case study for a group of 6-8 students) on unit-I to unit-V. The case study framed for unit-I may be continued/carry forward for next units if necessary. The same case studies/mini-projects should be tested using appropriate testing tool (preferably open source like Selenium). Draw UML diagrams for mini project.

Books:

Text Books:

1. Jim Arlow, Ila Neustadt, "UML 2 and the unified process –practical object-oriented analysis and design" Addison Wesley, Second edition, ISBN 978-0201770605
2. Hassan Gomaa, "Software Modeling and Design- UML, Use cases, Patterns and Software Architectures" Cambridge University Press, 2011, ISBN 978-0-521-76414-8
3. Srinivasan Desikan, Gopalaswamy Ramesh, "Software testing- Principles and practices" Prentice Hall, 2007, ISBN 9788177581218

References Books:

1. Eric J. Braude, "Software Design: from Programming to Architecture", J. Wiley, 2004, ISBN 978-0-471-20459-6
2. Gardy Booch, James Rambaugh, Ivar Jacobson, "The unified modeling language user guide" , Pearson Education, Second edition, 2008, ISBN 0-321-24562-8

Savitribai Phule Pune University
Third Year of Computer Engineering (2015 Course)
310254: Web Technology

Teaching Scheme:	Credit	Examination Scheme:
TH: 03 Hours/Week	03	In-Sem (Paper): 30 Marks End-Sem (Paper): 70 Marks

Prerequisite Courses: Computer Network (310245) , Database Management Systems (310242)

Companion Course: Web Technology Lab (310256)

Course Objectives:

- To understand the principles and methodologies of web based applications development process
- To understand current client side and server side web technologies
- To understand current client side and server side frameworks
- To understand web services and content management

Course Outcomes:

On completion of the course, student will be able to–

- analyze given assignment to select sustainable web development and design methodology
- develop web based application using suitable client side and server side web technologies
- develop solution to complex problems using appropriate method, technologies, frameworks, web services and content management

Course Contents

Unit I	Web Development Process, Front End Tools	07 Hours

Introduction to web technology, internet and www, Web site planning and design issues, HTML: structure of html document , HTML elements: headings, paragraphs, line break, colors & fonts, links, frames, lists, tables, images and forms, Difference between HTML and HTML5. CSS: Introduction to Style Sheet, Inserting CSS in an HTML page, CSS selectors, XML: Introduction to XML, XML key component, Transforming XML into XSLT, DTD: Schema, elements, attributes, Introduction to JSON.

Unit II	Client Side Technologies	08 Hours

JavaScript: Overview of JavaScript, using JS in an HTML (Embedded, External), Data types, Control Structures, Arrays, Functions and Scopes, Objects in JS, DOM: DOM levels, DOM Objects and their properties and methods, Manipulating DOM, JQuery: Introduction to JQuery, Loading JQuery, Selecting elements, changing styles, creating elements, appending elements, removing elements, handling events.

Unit III	Server Side Technologies	08 Hours

Introduction to Server Side technology and TOMCAT, Servlet: Introduction to Servlet, need and advantages, Servlet Lifecycle, Creating and testing of sample Servlet, session management. JSP: Introduction to JSP, advantages of JSP over Servlet , elements of JSP page: directives, comments, scripting elements, actions and templates, JDBC Connectivity with JSP.

Unit IV	Server Side Technologies	07 Hours

PHP: Introduction to PHP, Features, sample code, PHP script working, PHP syntax, conditions & Loops, Functions, String manipulation, Arrays & Functions, Form handling, Cookies & Sessions, using MySQL with PHP, WAP & WML, AJAX: Introduction, Working of AJAX, AJAX processing steps, coding AJAX script.

Unit V	Client and Server Side Frameworks	07 Hours
Angular JS : Overview, MVC architecture, directives, expression, controllers, filters, tables, modules, forms, includes, views, scopes, services, dependency injection, custom directives, Internationalization, Introduction to NodeJS. Struts: Overview, architecture, configuration, actions, interceptors, result types, validations, localization, exception handling, annotations.		
Unit VI	**Web Services**	**08 Hours**
Web Services: Overview, types of WS, difference between SOAP and REST, EJB: types of EJB, benefits, Architecture, EJB technology, JNDI lookup, Introduction to Content Management System(CMS) ,Wordpress / Joomala, Advanced Technology: Bootstrap, JSF, Spring.		

Books:

Text:

1. Achyut Godbole & Atul Kahate, "Web Technologies: TCP/IP to Internet Application Architectures", McGraw Hill Education publications, ISBN, 007047298X, 9780070472983
2. Ralph Moseley & M. T. Savaliya, "Developing Web Applications", Wiley publications, ISBN 13 : 9788126538676

References:

1. Adam Bretz & Colin J Ihrig, "Full Stack Javascript Development with MEAN", SPD, ISBN-13: 978-0992461256
2. Giulio Zambon, " Beginning JSP, JSF and Tomcat", Apress Publication, ISBN-10: 1430246235; ISBN-13: 978-1430246237
3. Jeremy McPeak& Paul Wilton," Beginning JavaScript", Wrox Publication, ISBN-13: 978-0470525937
4. Black Book, "Struts 2", Dreamtech Press, ISBN 13, : 9788177228700
5. Black Book, " JDBC 4.2, Servlet 3.1 & JSP 2.3", Dreamtech Press, ISBN-13: 978-8177228700
6. Sandeep Panda, "Angular JS: Novice To Ninja", SPD, First Edition 2014, ISBN-13: 978-0992279455
7. B. V. Kumar, S. Sangeetha, S. V. Subrahmanya,, "J2EE Architecture, an illustrative gateway to enterprise solutions", Tata McGraw Hill Publishing Company. ISBN: 9780070621633
8. Brian Fling, "Mobile Design and Development", O'REILLY, ISBN: 13:978-81-8404-817-9
9. Robin Nixon, "Learning PHP, Mysql and Javascript with JQuery, CSS & HTML5", O'REILLY, ISBN: 13:978-93-5213-015-3
10. Allan Cole, Raeiva Jackson Armitage Brandon R. Jones Jeffrey Way, "Build Your Own Wicked Wordpress Themes", SPD, ISBN: 978-93-5213-154-9
11. Ed Burnette, "Hello , Android Introducing Google' Mobile Development Platform", SPD, ISBN: 13:978-93-5213-085-6

Savitribai Phule Pune University
Third Year of Computer Engineering (2015 Course)
310255: Seminar and Technical Communication

Teaching Scheme:	Credit	Examination Scheme:
TUT: 01 Hour/Week	01	TW: 50 Marks

Course Objectives:

- To explore the basic principles of communication (verbal and non-verbal) and active, empathetic listening, speaking and writing techniques.
- To expose the student to new technologies, researches, products, algorithms, services

Course Outcomes:

On completion of the course, student will–

- be able to be familiar with basic technical writing concepts and terms, such as audience analysis, jargon, format, visuals, and presentation.
- be able to improve skills to read, understand, and interpret material on technology.
- improve communication and writing skills

Guidelines:

- Each student will select a topic in the area of Computer Engineering and Technology preferably keeping track with recent technological trends and development beyond scope of syllabus avoiding repetition in consecutive years.
- The topic must be selected in consultation with the institute guide.
- Each student will make a seminar presentation using audio/visual aids for a duration of 20-25 minutes and submit the seminar report prepared in Latex only.
- Active participation at classmate seminars is essential.
- BoS has circulated the Seminar Log book and it is recommended to use it.

Guidelines for Assessment:

Panel of staff members along with a guide would be assessing the seminar work based on these parameters-Topic, Contents and Presentation, regularity, Punctuality and Timely Completion, Question and Answers, Report, Paper presentation/Publication, Attendance and Active Participation.

Recommended Format of the Seminar Report:

- Title Page with Title of the topic, Name of the candidate with Exam Seat Number / Roll Number, Name of the Guide, Name of the Department, Institution and Year & University
- Seminar Approval Sheet/Certificate
- Abstract and Keywords
- Acknowledgements
- Table of Contents, List of Figures, List of Tables and Nomenclature
- Chapters Covering topic of discussion- Introduction with section including organization of the report, Literature Survey/Details of design/technology/Analytical and/or experimental work, if any/ …..,Discussions and Conclusions ,Bibliography/References
- Plagiarism Check report
- Report Documentation page

References:

1. Rebecca Stott, Cordelia Bryan, Tory Young, "Speaking Your Mind: Oral Presentation and Seminar Skills (Speak-Write Series)", Longman, ISBN-13: 978-0582382435
2. Johnson-Sheehan, Richard, "Technical Communication", Longman. ISBN 0-321-11764-6
3. Vikas Shirodka, "Fundamental skills for building Professionals", SPD, ISBN 978-93-5213-146-5

Savitribai Phule Pune University
Third Year of Computer Engineering (2015 Course)
310256: Web Technology Lab

Teaching Scheme:	Credit	Examination Scheme:
PR: 02 Hours/Week	01	TW: 25 Marks PR: 50 Marks

Companion Course: Web Technology (310254)

Course Objectives:

- To use current client side and server side web technologies
- To implement communication among the computing nodes using current client side and server side technologies
- To design and implement web services with content management

Course Outcomes:

On completion of the course, student will be able to–

- develop web based application using suitable client side and server side web technologies
- develop solution to complex problems using appropriate method, technologies, frameworks, web services and content management

Guidelines for Instructor's Manual

The instructor's manual is to be developed as a hands-on resource and reference. The instructor's manual need to include prologue (about University/program/ institute/ department/foreword/ preface etc), University syllabus, conduction & Assessment guidelines, topics under consideration-concept, objectives, outcomes, set of typical applications/assignments/ guidelines, and references.

Guidelines for Student Journal

The laboratory assignments are to be submitted by student in the form of journal. Journal consists of prologue, Certificate, table of contents, and **handwritten write-up** of each assignment (Title, Objectives, Problem Statement, Outcomes, software & Hardware requirements, Date of Completion, Assessment grade/marks and assessor's sign, Theory- Concept/technology/tool in brief, design, test cases, conclusion/analysis. **Program codes with sample output of all performed assignments are to be submitted as softcopy.**

As a conscious effort and little contribution towards Green IT and environment awareness, attaching printed papers as part of write-ups and program listing to journal may be avoided. Use of DVD containing students programs maintained by lab In-charge is highly encouraged. For reference one or two journals may be maintained with program prints at Laboratory.

Guidelines for Assessment

Continuous assessment of laboratory work is done based on overall performance and lab assignments performance of student. Each lab assignment assessment will assign grade/marks based on parameters with appropriate weightage. Suggested parameters for overall assessment as well as each lab assignment assessment include- timely completion, performance, innovation, efficient codes, punctuality and neatness.

Guidelines for Practical Examination

Both internal and external examiners should jointly set problem statements. During practical assessment, the expert evaluator should give the maximum weightage to the satisfactory implementation of the problem statement. The supplementary and relevant questions may be asked at the time of evaluation to test the student's for advanced learning, understanding of the fundamentals, effective and efficient implementation. So encouraging efforts, transparent evaluation and fair approach of the evaluator will not create any uncertainty or doubt in the minds of the students. So adhering to these principles will consummate our team efforts to the promising start of the student's academics.

Guidelines for Laboratory Conduction

The instructor is expected to frame the assignments by understanding the prerequisites, technological aspects, utility and recent trends related to the topic. The assignment framing policy need to address the average students and inclusive of an element to attract and promote the intelligent students. The instructor may set multiple sets of assignments and distribute among batches of students. It is appreciated if the assignments are based on real world problems/applications. Encourage students for appropriate use of Hungarian notation, proper indentation and comments. Use of open source software is to be encouraged. In addition to these, instructor may assign one real life application in the form of a mini-project based on the concepts learned. Instructor may also set one assignment or mini-project that is suitable to respective branch beyond the scope of syllabus.

Suggested List of Laboratory Assignments

1.	**Lab Assignment on Unit I:** **Assignment 1a:** Installation and Configuration of Web Application Servers Tomcat, Apache, WebSphere, JBoss, GlassFish. **Assignment 1b:** Design and develop any suitable web application using HTML, CSS and XML in consultation of course instructor.
2.	**Lab Assignment on Unit II:** **Assignment 2:** Perform validation of all fields in **assignment no.1** by using Java script/JQuery.
3.	**Lab Assignment on Unit III:** **Assignment 3:** Add dynamic web application essence in **assignment no. 2** using Servlet, JSP and backend.
4.	**Lab Assignment on Unit IV:** **Assignment 4:** Add dynamic web application essence in **assignment no. 2** using PHP, MySQL database connectivity and AJAX controls.
5.	**Lab Assignment on Unit V:** **Assignment 5:** Re-Design, develop and deploy **assignment no. 3 of unit –III** using Strut Re-Design, develop and deploy **assignment no. 4 of unit –IV** using Angular JS
6.	**Lab Assignment on Unit VI:** **Assignment 6:** Design, Develop and Deploy separate web application using EJB/CMS/JSF/Spring/Bootstrap.
7.	**Assignment on Software Modeling and Design**

Reference Books:

1. Aleksa V and James Goodwill, “Apache Tomcat 7”, Apress, 2011, ISBN: 10: 1430237236
2. Bryan Basham, Kathy Sierra, Bert Bates, “JSP: Passing the Sun Certified Web Component Developer Exam”, O'Reilly Media ISBN: 978-0-596-51668-0
3. Chirag Rathod, Jonathan Wetherbee, Peter Zadrozny, and Raghu R. Kodali, “Beginning EJB 3: Java EE 7 Edition”, Apress, 2013, ISBN : 9781430246923
4. Richard Monson-Haefel, “J2EE Web Services”, Addison-Wesley Professional, First Edition, 2004, ISBN: 10: 0321146182
5. Chuck Cavaness, “Programming Jakarta Struts”, O’relly Media, second edition 2004, ISBN: 978-0-596-00651-8;
6. Michael Morrison, Lynn Beighley, “Head First PHP & MySQL: A Brain-Friendly Guide”, O’relly Media, second edition 2008, ISBN :13: 9788184046588
7. Dan Rahmel, “Advanced Joomla!”, Apress, First Edition, 2013, ISBN: 13: 9781430216285
8. Iwein Fuld, Marius Bogoevici, Mark Fisher, Jonas Partner”, Spring Integration in Action”, Manning, 2012, ISBN : 13: 9781935182436.

Savitribai Phule Pune University
Third Year of Computer Engineering (2015 Course)
310257: System Programming & Operating System Lab

Teaching Scheme:	Credit	Examination Scheme:
PR: 04 Hours/Week	02	TW: 25 Marks PR: 50 Marks

Companion Course: Systems Programming and Operating System (310251)

Course Objectives:

- To implement basic language translator by using various needed data structures
- To implement basic Macroprocessor
- To design and implement Dynamic Link Libraries
- To implement scheduling schemes

Course Outcomes:

On completion of the course, student will be able to–

- Understand the internals of language translators
- Handle tools like LEX & YACC.
- Understand the Operating System internals and functionalities with implementation point of view

Guidelines for Instructor's Manual

The instructor's manual is to be developed as a hands-on resource and reference. The instructor's manual need to include prologue (about University/program/ institute/ department/foreword/ preface etc), University syllabus, conduction & Assessment guidelines, topics under consideration-concept, objectives, outcomes, set of typical applications/assignments/ guidelines, and references.

Guidelines for Student Journal

The laboratory assignments are to be submitted by student in the form of journal. Journal consists of prologue, Certificate, table of contents, and **handwritten write-up** of each assignment (Title, Objectives, Problem Statement, Outcomes, software & Hardware requirements, Date of Completion, Assessment grade/marks and assessor's sign, Theory- Concept in brief, algorithm, flowchart, Design, test cases, conclusion/analysis. **Program codes with sample output of all performed assignments are to be submitted as softcopy.**

As a conscious effort and little contribution towards Green IT and environment awareness, attaching printed papers as part of write-ups and program listing to journal may be avoided. Use of DVD containing students programs maintained by lab In-charge is highly encouraged. For reference one or two journals may be maintained with program prints at Laboratory.

Guidelines for Assessment

Continuous assessment of laboratory work is done based on overall performance and lab assignments performance of student. Each lab assignment assessment will assign grade/marks based on parameters with appropriate weightage. Suggested parameters for overall assessment as well as each lab assignment assessment include- timely completion, performance, innovation, efficient codes, punctuality and neatness.

Guidelines for Practical Examination

Both internal and external examiners should jointly set problem statements. During practical assessment, the expert evaluator should give the maximum weightage to the satisfactory implementation of the problem statement. The supplementary and relevant questions may be asked at the time of evaluation to test the student's for advanced learning, understanding of the fundamentals, effective and efficient implementation.

So encouraging efforts, transparent evaluation and fair approach of the evaluator will not create any uncertainty or doubt in the minds of the students. So adhering to these principles will consummate our team efforts to the promising start of the student's academics.

Guidelines for Laboratory Conduction

The instructor is expected to frame the assignments by understanding the prerequisites, technological aspects, utility and recent trends related to the topic. The assignment framing policy need to address the average students and inclusive of an element to attract and promote the intelligent students. The instructor may set multiple sets of assignments and distribute among batches of students. It is appreciated if the assignments are based on real world problems/applications. Encourage students for appropriate use of Hungarian notation, proper indentation and comments. Use of open source software is to be encouraged. In addition to these, instructor may assign one real life application in the form of a mini-project based on the concepts learned.

Set of suggested assignment list is provided in groups- A, B, C, D (All Compulsory)
Operating System recommended :- 64-bit Open source Linux or its derivative
Programming tools recommended: - Eclipse IDE

Books:

1. Paul Gries Jennifer Campbll, Jason Montojo, "Practical Programming Second Edition", SPD, ISBN: 978-93-5110-469-8

Suggested List of Laboratory Assignments

Group A

1.	Design suitable data structures and implement pass-I of a two-pass assembler for pseudo-machine in Java using object oriented feature. Implementation should consist of a few instructions from each category and few assembler directives.
2.	Implement Pass-II of two pass assembler for pseudo-machine in Java using object oriented features. The output of assignment-1 (intermediate file and symbol table) should be input for this assignment.
3.	Design suitable data structures and implement pass-I of a two-pass macro-processor using OOP features in Java
4.	Write a Java program for pass-II of a two-pass macro-processor. The output of assignment-3 (MNT, MDT and file without any macro definitions) should be input for this assignment.

Group B

1.	Write a program to create Dynamic Link Library for any mathematical operation and write an application program to test it. (Java Native Interface / Use VB or VC++).
2.	Write a program using Lex specifications to implement lexical analysis phase of compiler to generate tokens of subset of 'Java' program.
3.	Write a program using Lex specifications to implement lexical analysis phase of compiler to count no. of words, lines and characters of given input file.
4.	Write a program using YACC specifications to implement syntax analysis phase of compiler to validate type and syntax of variable declaration in Java.
5.	Write a program using YACC specifications to implement syntax analysis phase of compiler to recognize simple and compound sentences given in input file.

Group C

1.	Write a Java program (using OOP features) to implement following scheduling algorithms: FCFS , SJF (Preemptive), Priority (Non-Preemptive) and Round Robin (Preemptive)
2.	Write a Java program to implement Banker's Algorithm
3.	Implement UNIX system calls like ps, fork, join, exec family, and wait for process management (use shell script/ Java/ C programming).
4.	Study assignment on process scheduling algorithms in Android and Tizen.

Group D

	Write a Java Program (using OOP features) to implement paging simulation using 1. Least Recently Used (LRU) 2. Optimal algorithm

Savitribai Phule Pune University
Third Year of Computer Engineering (2015 Course)
310258: Embedded Systems & Internet of Things Lab

Teaching Scheme:	Credit	Examination Scheme:
PR: 02 Hours/Week	01	TW: 50 Marks

Companion Course-Embedded Systems & Internet of Things (310252)

Course Objectives:

- To understand functionalities of various single board embedded platforms fundamentals
- To develop comprehensive approach towards building small low cost embedded IoT system.
- To understand different sensory inputs.

Course Outcomes:

On completion of the course, student will be able to–

- Design the minimum system for sensor based application
- Solve the problems related to the primitive needs using IoT
- Develop full fledged IoT application for distributed environment

Guidelines for Instructor's Manual

The instructor's manual is to be developed as a hands-on resource and reference. The instructor's manual need to include prologue (about University/program/ institute/ department/foreword/ preface etc), University syllabus, conduction & Assessment guidelines, topics under consideration-concept, objectives, outcomes, set of typical applications/assignments/ guidelines, and references.

Guidelines for Student Journal

The laboratory assignments are to be submitted by student in the form of journal. Journal consists of prologue, Certificate, table of contents, and **handwritten write-up** of each assignment (Title, Objectives, Problem Statement, Outcomes, software & Hardware requirements, Date of Completion, Assessment grade/marks and assessor's sign, Theory- Concept in brief, algorithm, flowchart, test cases, conclusion/analysis. **Program codes with sample output of all performed assignments are to be submitted as softcopy.**

As a conscious effort and little contribution towards Green IT and environment awareness, attaching printed papers as part of write-ups and program listing to journal may be avoided. Use of DVD containing students programs maintained by lab In-charge is highly encouraged. For reference one or two journals may be maintained with program prints at Laboratory.

Guidelines for Assessment

Continuous assessment of laboratory work is to be done based on overall performance and lab assignments performance of student. Each lab assignment assessment will assign grade/marks based on parameters with appropriate weightage. Suggested parameters for overall assessment as well as each lab assignment assessment include- timely completion, performance, innovation, efficient codes, punctuality and neatness.

Guidelines for Practical Examination

Both internal and external examiners should jointly set problem statements. During practical assessment, the expert evaluator should give the maximum weightage to the satisfactory implementation of the problem statement. The supplementary and relevant questions may be asked at the time of evaluation to test the student's for advanced learning, understanding of the fundamentals, effective and efficient implementation. So encouraging efforts, transparent evaluation and fair approach of the evaluator will not create any uncertainty or doubt in the minds of the students. So adhering to these principles will consummate our team efforts to the promising start of the student's academics.

Guidelines for Laboratory Conduction

The instructor is expected to frame the assignments by understanding the prerequisites, technological aspects, utility and recent trends related to the topic. The assignment framing policy need to address the average students and inclusive of an element to attract and promote the intelligent students. The instructor may set multiple sets of assignments and distribute among batches of students. It is appreciated if the assignments are based on real world problems/applications.

In addition to these, instructor may assign one real life application in the form of a mini-project based on the concepts learned. Instructor may also set one assignment or mini-project that is suitable to respective branch beyond the scope of syllabus.

Set of suggested assignment list is provided in groups- A, B, C, D, and E. Each student must perform at least 11 assignments as at least 3 from group A, 3 from group B, 2 from group C, 2 from group D and 1 from group E. **UML diagrams are to be drawn for group E assignment**.

References:

1. Nitesh Dhanjani, “Abusing the Internet of Things”, O'REILLY, ISBN: 13:978-93-5313-217-1
2. Cuno Pfister, “Getting Started with the Internet of Things”, O'REILLY, ISBN: 13:978-93-53023-413-6
3. Massimo Banzi and Michael Shiloh, “Getting Started with Arduino”, MAKER MEDIA, ISBN: 13:978-93-5110-907-5
4. Don Wilcher, “BASIC Arduino Projects”, MAKER MEDIA, ISBN: 13:978-93-5110-503-9
5. Cefn Hoile, Clare Bowman, Sjoerd Dirk Meijer, Brian Corteil, Lauren Orsini, “Raspberry Pi and AVR Projects”, MAKER MEDIA, ISBN: 13:978-93-5110-914-3
6. Wolfrom Donot, “A Raspberry Pi Controlled Robot”, MAKER MEDIA, ISBN: 13:978-93-5110-913-6
7. Kimmo Karvinen and Tero Karvinen, “Arduino Bots and Gadgets”, O'REILLY, ISBN: 13:978-93-5023-374-0
8. Derek Molley, “Exploring Beaglebone”, Willey, ISBN: 978-1-118-935125
9. Matt Richardson and Shawn Wallace, “Getting with Raspberry Pi”, MAKER MEDIA, ISBN: 978-93-5213-450-2
10. Dr. Simon Monk, “Raspberry PiCook-Book”, O'REILLY, ISBN: 978-93-5213-389-5

Suggested List of Laboratory Assignments

Group A

1.	Study of Raspberry-Pi, Beagle board, Arduino and other micro controller (History & Elevation)
2.	Study of different operating systems for Raspberry-Pi /Beagle board. Understanding the process of OS installation on Raspberry-Pi /Beagle board
3.	Study of Connectivity and configuration of Raspberry-Pi /Beagle board circuit with basic peripherals, LEDS. Understanding GPIO and its use in program.
4.	Understanding the connectivity of Raspberry-Pi /Beagle board circuit with temperature sensor. Write an application to read the environment temperature. If temperature crosses a threshold value, the application indicated user using LEDSs

Group B

5.	Understanding the connectivity of Raspberry-Pi /Beagle board circuit with IR sensor. Write an application to detect obstacle and notify user using LEDs.
6.	Understanding and connectivity of Raspberry-Pi /Beagle board with camera. Write an application to capture and store the image.
7.	Understanding and connectivity of Raspberry-Pi /Beagle board with a Zigbee module. Write a network application for communication between two devices using Zigbee.
8.	Study of different CPU frequency governors. Write an application to change CPU frequency of Raspberry-Pi /Beagle board

Group C	
9.	Write an application using Raspberry-Pi /Beagle board to control the operation of stepper motor.
10.	Write an application using Raspberry-Pi /Beagle board to control the operation of a hardware simulated traffic signal.
11.	Write an application using Raspberry-Pi /Beagle board to control the operation of a hardware simulated lift elevator
Group D	
12.	Write a server application to be deployed on Raspberry-Pi /Beagle board. Write client applications to get services from the server application.
13.	Create a small dashboard application to be deployed on cloud. Different publisher devices can publish their information and interested application can subscribe.
14.	Create a simple web interface for Raspberry-Pi/Beagle board to control the connected LEDs remotely through the interface.
Group E	
15.	Develop a Real time application like smart home with following requirements: When user enters into house the required appliances like fan, light should be switched ON. Appliances should also get controlled remotely by a suitable web interface. The objective of this application is student should construct complete Smart application in group.
16.	Develop a Real time application like a smart home with following requirements: If anyone comes at door the camera module automatically captures his image send it to the email account of user or send notification to the user. Door will open only after user's approval.

Savitribai Phule Pune University
Third Year of Computer Engineering (2015 Course)
310259: Audit Course 4

In addition to credits, it is recommended that there should be audit course in preferably in each semester from second year to supplement their knowledge and skills. Student will be awarded the bachelor degree if he/she earns 190 credits and clears all the audit courses specified in the syllabus. The student will be awarded grade as AP on successful completion of audit course. The student may opt for one of the audit courses per semester, starting in second year first semester. Though not mandatory, such a selection of the audit courses helps the learner to explore the subject of interest in greater detail resulting in achieving the very objective of audit course's inclusion. List of options offered is provided. Each student has to choose one audit course from the list per semester. Evaluation of audit course will be done at institute level itself. Method of conduction and method of assessment for audit courses are as suggested.

Criteria:

The student registered for audit course shall be awarded the grade AP (Audit Course Pass) and shall be included such AP grade in the Semester grade report for that course, provided student has the minimum attendance as prescribed by the Savitribai Phule Pune University and satisfactory in-semester performance and secured a passing grade in that audit course. No grade points are associated with this 'AP' grade and performance in these courses is not accounted in the calculation of the performance indices SGPA and CGPA. Evaluation of audit course will be done at institute level itself. (Ref- http://www.unipune.ac.in/Syllabi_PDF/revised-2015/engineering/UG_RULE_REGULATIONS_FOR_CREDIT_SYSTEM-2015_18June.pdf)

Guidelines for Conduction and Assessment (Any one or more of following but not limited to)

- Lectures/ Guest Lectures
- Visits (Social/Field) and reports
- Demonstrations
- Surveys
- Mini Project
- Hands on experience on specific focused topic

Guidelines for Assessment (Any one or more of following but not limited to)

- Written Test
- Demonstrations/ Practical Test
- Presentations
- IPR/Publication
- Report

Audit Course 3 Options

AC4- I	Digital and Social Media Marketing
AC4-II	Green Computing
AC4-III	Sustainable Energy Systems
AC4-IV	Leadership and Personality Development
AC4-V	Foreign Language (one of Japanese/ Spanish/French/German). Course contents for **Japanese (Module 4) are provided. For other languages institute may design suitably.**

Note: It is permitted to opt one of the audit courses listed at SPPU website too, if not opted earlier

http://collegecirculars.unipune.ac.in/sites/documents/Syllabus%202017/Forms/AllItems.aspx

Savitribai Phule Pune University, Pune
Third Year of Computer Engineering (2015 Course)
310259: Audit Course 4
AC4 – I: Digital & Social Media Marketing

The importance of social media's role in modern marketing efforts can no longer be ignored. It's an integral component in almost all successful marketing strategies. With this increasing emphasis on integrated social media strategies, there is an Irrefutable need for marketing professionals and organizations to have end- to- end social media expertise. Through case studies, interactive sessions, and class exercises, students will learn best practices and develop the skills to connect business objectives with social media strategy, platforms and tactics. Topics will include choosing appropriate platforms, creating effective and engaging social media content, content management, social listening and creating a social media policy

Course Objectives:

- Identify best practices for Social Media Marketing, including platform level best practices.
- Connect business objectives to appropriate Social Media tactics.
- Create strong content that engages their target audience with their marketing message.

Course Outcome:

On completion of the course, learner will be able to–

- Create editorial calendars to manage content distribution.
- Use Social Listening tools to create timely, relevant content.
- Create Social Media policies that combine business objectives with appropriate use of social media channels and content.

Course Contents:

1. Introductions and review class objectives, Discuss class goals and individual goals, Fill out questionnaire, Introduction to Blogging, Create a blog post for your project. Include headline, imagery, links and post.
2. Introduction to Facebook and channel advertising and campaigns, Introduction to Twitter and channel advertising and campaigns, Creative Campaign examples across social channels
3. Introduction to both Google+ and LinkedIn. Provide an overview on LinkedIn advertising, Create Google+ and LinkedIn outlines for your project and include: types of posts and an example post for each platform.
4. Introduction to both Instagram and Pinterest as well as channel advertising and campaigns, Create Instagram and Pinterest outlines for your project and include: types of posts and an example post for each platform, review a content calendar, Lay out your own content calendar.

References:

1. Vandana Ahuja, Digital Marketing, Oxford Press, ISBN: 9780199455447,
2. Wiley, Jeanniey Mullen, David Daniels, David Gilmour " Email Marketing: An Hour a Day", ISBN: 978-0-470-38673-6
3. David Scott, "The New Rules of Marketing and PR", Wiley India, ISBN: 978-1-119-07048-1

Savitribai Phule Pune University, Pune
Third Year of Computer Engineering (2015 Course)
310259: Audit Course 4
AC4 – II: Green Computing

Green computing is the study and practice of using computing resources efficiently. Green computing or green IT, refers to environmentally sustainable computing or IT. The goals of green computing are similar to green chemistry; reduce the use of hazardous materials, Maximize energy efficiency during the product's lifetime, and promote the recyclability or biodegradability of defunct products and factory waste.

Course Objectives:

- To acquire knowledge to adopt green computing practices to minimize negative impacts on the environment.
- To examine technology tools that can reduce paper waste and carbon footprint by user.
- To understand how to minimize equipment disposal requirements.
- To gain skill in energy saving practices in their use of hardware

Course Outcome:

On completion of the course, learner will be able to–

- Understand the concept of green IT and relate it to sustainable development.
- Apply the green computing practices to save energy.
- Discuss how the choice of hardware and software can facilitate a more sustainable operation,
- Use methods and tools to measure energy consumption

Course Contents:

1. **Fundamentals of Green IT:** Green IT Fundamentals: Business, IT, and the Environment – Green computing: carbon foot Print - Measuring, Details, reasons to bother,Plan for the Future, Cost Savings: Hardware, Power.
2. **Green Assets and Power Problems:** Green Assets: Buildings, Data Centers, Networks, and Devices, Green Information Systems : Design andDevelopment Models, Monitoring Power Usage, Servers, Low-Cost Options, Reducing Power Use, Data De-Duplication, Low-Power Computers and peripheral devices
3. **Greening Information Systems:** Initial Improvement Calculations, Selecting Metrics, Tracking Progress, Change Business Processes, Customer Interaction, Paper Reduction, Green Supply Chain, Improve Technology Infrastructure, Reduce PCs and Servers, Shared Services, Hardware Costs, Cooling
4. **Green Grid Framework:** Virtualizing of IT systems – Role of electric utilities, Telecommuting, teleconferencing and teleporting – Materials recycling – Best ways for Green PC – Green Data center Case Studies – Applying Green IT Strategies and Applications to a Home Hospital, Packaging Industry and Telecom Sector

References:

1. Woody Leonhard, Katherrine Murray, “Green Home computing for dummies”, August2009, ISBN: 978-0-470-46745-9
2. Alvin Galea, Michael Schaefer, Mike Ebbers, “Green Data Center: steps for theJourney”,Shoff/IBM rebook, 2011. ISBN: 10: 1-933742-05-4; 13: 978-1-933742-05-2
3. John Lamb, “The Greening of IT”, Pearson Education, 2009, ISBN 10: 0137150830
4. Jason Harris, “Green Computing and Green IT- Best Practices on regulations & industry”,Lulu.com, 2008, ISBN: 1558604898
5. Bud E. Smith, “Green Computing Tools and Techniques for Saving Energy, Money and Resources”, CRC Press, 2014, 9781466503403

Savitribai Phule Pune University, Pune
Third Year of Computer Engineering (2015 Course)
310259: Audit Course 4
AC4 – III: Sustainable Energy Systems

Course Objectives:

- To understand the impact of engineering solutions on a global, economic, environmental, and societal context.
- To design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability.

Course Outcome:

On completion of the course, learner will be able to–

- Demonstrate an overview of the main sources of renewable energy.
- Understand benefits of renewable and sustainable energy systems.

Course Contents:

1. Introduction and Energy Fundamentals, Sustainable Energy Systems: Issues for the 21st century, the critical challenges for a sustainable energy future, Sustainable energy systems: definitions, indicators, Physics of Energy: Laws of Thermodynamics Energy Forms and Conversion, First and Second Laws and Efficiencies Devices: Heat Engines, Refrigerators and Heat Pumps Instantaneous and Average Power.
2. Introduction to Renewable Energy, Wind Energy Wind Turbine Technologies Wind Resources and Modeling Energy Performance and Environmental Impacts Economics and Economic Development Impacts, Photovoltaic: PV and BIPV Technologies Solar Resources and Modeling Energy Performance and Environmental Impacts, Economics and Net Metering
3. Biomass: Electricity Biomass Technologies Introduction Biomass Productivity and Modeling Biopower: MSW, willows/switch grass/ poplar, wood waste, Biomass: Transport Fuels Biofuels, Bioethanol, Biodiesel, Algal, Jatropha Biofuels and Water Land Use Impacts, Food vs Fuel, Renewable Fuels Standards
4. Building Energy Technologies and Policy, Smart buildings, Lighting and LEDs, Heating/cooling, technologies.

References:

1. İbrahim Dinçer, Calin Zamfirescu, “Sustainable Energy Systems and Applications”, Springer; 2012 edition, ISBN-10: 0387958606
2. D. Mukherjee, “Fundamentals of Renewable Energy Systems”, Atlantic, ISBN: 10: 8122415407
3. John R. Barker and Marc H. Ross Am. J. Phys ,“An introduction to global warming”, ISBN: 0-632-03779-2

Savitribai Phule Pune University, Pune
Third Year of Computer Engineering (2015 Course)
310259: Audit Course 4
AC4 – IV: Leadership and Personality Development

Personality is considered as one of the integral part of an individual's existence. Where a student is concerned, paying close attention to **Personality** which is extremely important to enhance holistic development of students and improve their employability skills

Course Objectives:

- To develop inter personal skills and be an effective goal oriented team player.
- To develop professionals with idealistic, practical and moral values.
- To develop communication and problem solving skills.
- To re-engineer attitude and understand its influence on behavior

Course Outcome:

On completion of the course, learner will be able to–

- Enhance holistic development of students and improve employability skills

Course Contents:

1. **Introduction to Personality and working towards developing it:** Definition & Basics of personality, Analyzing strengths & weaknesses, Corporate theories on personality Development, Increasing Vocabulary, Body Language, gestures, Preparation of Self Introduction
2. **Communication skill and handling attitude:** Communication Skills, Listening, Communication Barriers, Overcoming these Barriers, Building Self Esteem and Self Confidence, Working on attitudes: aggressive, assertive, and submissive
3. **Leadership Techniques in Personality development:** Introduction to Leadership, Leadership Styles, Group Dynamics, Team Building
4. **Stress and time management skills:** Interpersonal Relationships, Analysis of Ego States, transactions & Life positions, Stress Management: Causes, Impact & Managing Stress, Introduction to conflict management, Time Management: Concept of time management, Steps towards better time management

References:

1. SOFT SKILLS, " Career Development Centre", Green Pearl Publications
2. Covey Sean," Seven Habits of Highly Effective Teens", New York, Fireside Publishers, 1998, ISBN: 978-1476764665
3. Carnegie Dale, " How to win Friends and Influence People", New York: Simon & Schuster, 1998, ISBN: 1-4391-6734-6
4. Thomas A Harris, I am ok, You are ok , New YorkHarper and Row, 1972, ISBN 13: 978-0060724276ISBN:
5. Daniel Coleman, Emotional Intelligence, Bantam Book, 2006, ISBN: 055380491X, 9780553804911
6. Shiv Khera, "You Can Win", A&C Black, ISBN: 9780230331198.

Savitribai Phule Pune University, Pune
Third Year of Computer Engineering (2015 Course)
310259: Audit Course 4
AC4 – V: Foreign Language(Japanese Module 4)

Prerequisite Courses: **Audit Course AC1-V(210250), AC2-V(210258), AC3-V(310249)**

About Course:

With changing times, the competitiveness has gotten into the nerves and Being the Best‘ at all times is only the proof of it. Nonetheless, being the best differs significantly from Communicating the best. The best can merely be communicated whilst using the best suitable Language!

Foreign languages like Japanese is the new trend of 21st century. Not only youngsters but even the professionals seek value in it. It is the engineer‘s companion in current times with an assertion of a thriving future. Metro cities like Pune has indisputably grown to become a major center of Japanese Education in India while increasing the precedence for Japanese connoisseurs.

Japanese certainly serves a great platform to unlock a notoriously tough market & find a booming career. While the companies prefer candidates having the knowledge of the language, it can additionally help connect better with the native people thus prospering in their professional journey. Learning Japanese gives an extra edge to the resume since the recruiters consciously make note of the fact it requires real perseverance and self-discipline to tackle one of the most complex languages.

It would be easy for all time to quit the impossible; however it takes immense courage to reiterate the desired outcomes, recognize that improvement is an ongoing process and ultimately soldier on it. The need of an hour is to introduce Japanese language with utmost professionalism to create awareness about the bright prospects and to enhance the proficiency and commitment. It will then prove to be the ultimate path to the quest for professional excellence!

Course Objectives:

- To meet the needs of ever growing industry with respect to language support.
- To get introduced to Japanese society and culture through language.

Course Outcome:

On completion of the course, learner will be able to–

- Possess ability of basic communication.
- Possess the knowledge of Japanese script.
- Get introduced to reading, writing and listening skills for language Japanese.
- Develop interest to pursue professional Japanese Language course

Course Contents:

1. Stating existence or a presence of thing (s), person (s), Relative positions, Counters
2. Expressing one's Desire & wants, Verb groups, Asking, Instructing a person to do something
3. Indicating an action or motion is in progress, Describing habitual action, describing a certain continuing state which resulted from a certain action in the past. Express permission & prohibition

References:

1. Minna No Nihongo, "Japanese for Everyone", Elementary Main Text book 1-1 (Indian Edition), Goyal Publishers & Distributors Pvt. Ltd.
2. http://www.tcs.com (http://www.tcs.com/news_events/press_releases/Pages/TCS-Inaugurates-Japan-centric-Delivery-Center-Pune.aspx

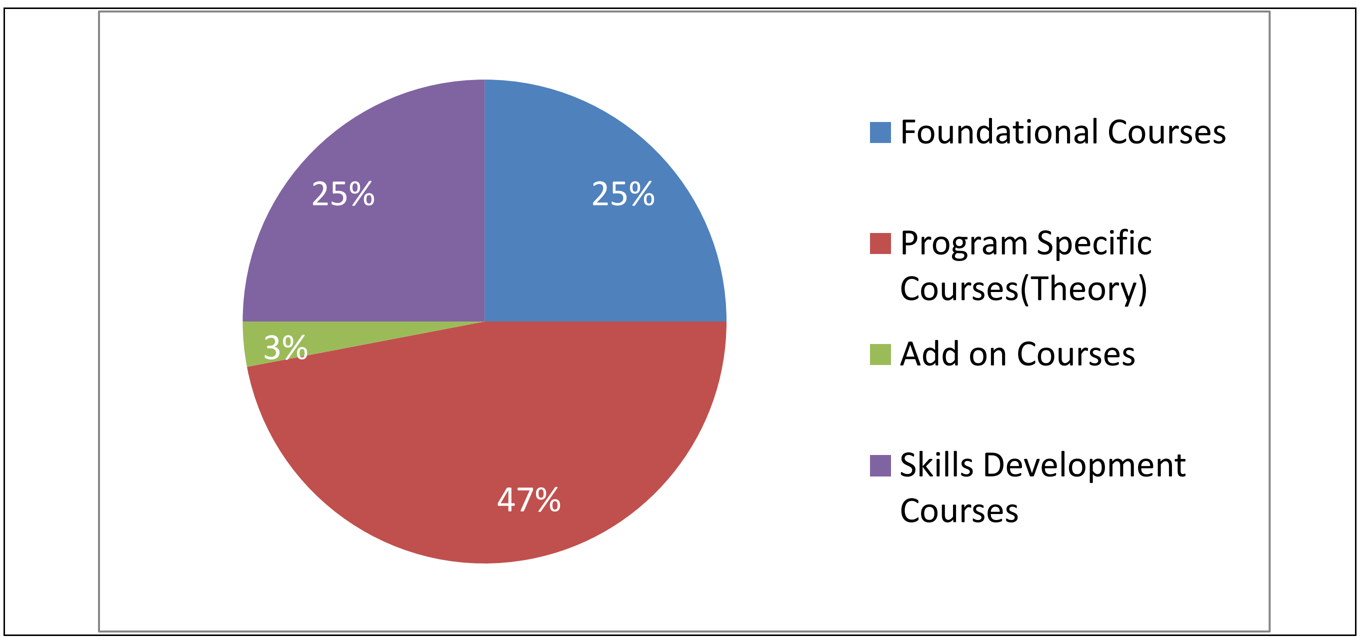
Savitribai Phule Pune University
Bachelor of Computer Engineering (Course 2015)
Total Credits- 190

First Year 50 Credit	Second Year 50 Credit	Third Year 46 Credit	Fourth Year (Proposed) 44 Credit
		Semester I	
FPL I	Discrete Mathematics	Theory of Computation	Parallel Architectures and Concurrent Computing
Engineering Maths I	Digital Electronics and Logic Design	Database Management Systems (DBMS)	Data Analytics
Engineering Physics	Data Structures and Algorithms	Software Engineering & Project Management	Software Testing & Quality Assurance
Basic Electrical Engineering	Computer Organization and Architecture	Information Systems & Engineering Economics	Elective I – • Digital Signal Processing • Advanced Databases, • Artificial Intelligence, • Wireless Sensor Networks
Engineering Graphics I	Object Oriented Programming(OOP)	Computer Networks (CN)	Elective II- • Cloud Computing, • Soft Computing • Software Architecture & Design • Operation Research
Basic Civil and Environmental Engineering	OOP Lab	Skill Development Lab	Lab I
Workshop Practice	Digital Electronics Lab	DBMS Lab	Lab II
Engineering Physics Lab	Data Structures Lab	CN Lab	Project Stage I
---	Soft Skills Lab	Audit Course 3	Audit Course 5
---	Audit Course 1	-----	------
		Semester II	
FPL II	Engineering Mathematics III	Design & Analysis of Algorithms	Distributed Systems
Engineering Maths II	Computer Graphics	Systems Programming & Operating System (SP& OS)	Information Security
Engineering Chemistry	Advanced Data Structures	Embedded Systems & Internet of Things (ES & IoT)	**Elective-III :** • Data Mining & Data Warehouse • Mobile Communication, • Image Processing • Human Computer Interface
Basic Electronics Engineering	Microprocessor	Software Modeling and Design	**Elective-IV :** • Principles of Compiler Design • Embedded & Real Time OS, • Pervasive and Ubiquitous Computing • Open Elective
Basic Mechanical Engineering	Principles of Programming Languages	Web Technology (WT)	Lab III
Engineering Mechanics	Computer Graphics Lab	Seminar & Technical Communication	Lab IV
Engg Graphics II	Advanced Data Structures Lab	Web Technology Lab	Project Work
Engg Chemistry Lab	Microprocessor Lab	ES & IoT Lab	Audit Course 6
-----	Audit Course 2	SP & OS Lab	---=-
----	------	Audit Course 4	-------

Savitribai Phule Pune University
Computer Engineering (2015 Course)
Courses-Credit Share

Sr. No	Category	Comprised of (Total Credit)	% of Credit Share
1	Foundational Courses (47 Credit)	• Mathematics (18) • Engineering Sciences (10) • Fundamentals of Core Engineering Domain (19)	25%
2	Program Specific Courses (Theory) (90 Credit)	Core (40) Advanced (38) Elective + Open Elective (12)	47%
3	Add on Courses (Audit +Credit Courses) (05 Credit)	• Social Awareness • Environmental • Personal Development • Economics (04) • Soft Skills (01)	3%
4	Skills Development Courses (48 Credit)	• Project (major) (08) • Seminar (01) • Labs + Mini-Project (39)	25%

Courses Credit Share



Syllabus
Savitribai Phule Pune University
Faculty of Engineering
B.E. Computer Engineering
(Course 2012)
(w.e.f June 2015)

Board of Studies Computer Engineering

June 2015

Preamble

It is my pleasure to present this B.E. Computer Engineering Syllabus. The syllabus is a blend of concepts and advances using high end FOSS technologies. One of the objectives of the this syllabus is to cultivate students for using FOSS and contributions in FOSS. The theory subjects are based on the pre-requisites covered in first year to third Year computer engineering. 16 electives are divided into four groups on recent technologies such as cloud computing, mobile computing, web applications and Business Analytic and Intelligence, Cyber Security are provided which shall be useful for student in their professional carrier.
The laboratories for problem solving practices are based on utilization of state-of-the art FOSS software Technologies used by the Industries. The FOSS technologies are available with source code students can experiment the performance improvement and ideation to replace the existing implementation. The Project can be done as conventional practices or as an entrepreneur project to give thrust on generating budding talent as entrepreneur to lead the industrial front of the nation worldwide.

For BoS Computer Engineering
Prof. Sarang Joshi

Program Educational Objectives

- To create competencies and opportunities for Higher Education;
- To create professional manpower skilled for the IT Industry;
- To write laboratory practicals with advanced FOSS Tools;
- To create inter-disciplinary opportunities;
- To create opportunities of developing technical documents and presentation skills.
- to create opportunities of industry-Institute interactions;
- To create opportunities to promote Entrepreneurship and start-ups;
- To nurture and practice professional and social ethics.

Program Objectives

- To expose students to the Systems and Applications Programming, Organizations and Architectures;
- To provide conceptual knowledge in the Computing domain;
- To provide interdisciplinary knowledge;
- To expose students with advanced tools used in industry;
- To develop written and soft-skill competencies;
- To develop team work experience of professionals skills for IT Industry.

Program Outcomes

- To write applications with concepts and skills in the domain subjects;
- To practice skills in programming techniques and open source technologies;
- To practice oral and written skills for technical presentations and documentation using FOSS tools;
- To write and practice IT project as a team-work;
- To practice social and Professional ethical practices;

SAVITRIBAI PHULE PUNE UNIVERSITY
BE (COMPUTER ENGINEERING)- 2012 COURSE STRUCTURE
Term-I

Subject Code	Subject	Teaching Scheme			Examination Scheme				Total Marks
		Lect	Tut	Pract	In Sem Asmnt	PR/ TW	OR/ TW	End Sem Asmnt	
410441	Design & Analysis of Algorithms	03	—	—	30	—	—	70	100
410442	Principles of Modern Compiler Design	04	—	—	30	—	—	70	100
410443	Smart System Design and Applications	03	—	—	30	—	—	70	100
410444	Elective-I	03	—	—	30	—	—	70	100
410445	Elective-II	03	—	—	30	—	—	70	100
410446	Computer laboratory-I	—	—	04	—	50	50	—	100
410447	Computer Laboratory-II	—	—	04	—	50	50	—	100
410448	Project	—	02	—	—	50	—	—	50
	Total	16	02	08	150	150	100	350	750
	Term-II								
410449	Software Design Methodologies & Testing	03	—	—	30	—	—	70	100
410450	High Performance Computing	03	—	—	30	—	—	70	100
410451	Elective-III	03	—	—	30	—	—	70	100
410452	Elective-IV Open Elective	03	—	—	30	—	—	70	100
410453	Computer laboratory-III	—	—	04	—	50	50	—	100
410454	Computer Laboratory-IV	—	—	04	—	50	50	—	100
410455	Project	—	06	—	—	50	100	—	150
	Total	12	06	08	120	150	200	280	750

Electives:

Semester-I		Semester-II	
	ELECTIVE-I		**ELECTIVE-III**
1.	Image Processing	1.	Mobile Computing
2.	Computer Network Design and Modeling	2.	Web Technology
3.	Advanced Computer Programming	3.	Cloud Computing
4.	Data Mining Techniques and Applications	4.	Cyber Security
	ELECTIVE-II		**ELECTIVE-IV (Open Elective)**
1.	Problem Solving with Gamification	1.	Business Analytic and Intelligence
2.	Pervasive Computing	2.	Operations Research for Algorithms in Scientific Applications
3.	Embedded Security	3.	Mobile Applications
4.	Multidisciplinary NLP	4.	Open Elective

Open Elective: The listed open electives or any other Elective that is being taught in the current semester (semester-II) under the faculty of engineering or individual college and Industry can define new elective with complete (6 units) syllabus using defined framework of Elective IV and GET IT APPROVED FROM THE BOARD OF STUDIES (COMPUTER ENGINEERING) AND OTHER NECESSARY STATUTORY SYSTEMS IN THE SAVITRIBAI PHULE PUNE UNIVERSITY BEFORE 30th DECEMBER.

410441 Design and Analysis of Algorithms

Teaching Scheme	**Examination Scheme**
Lectures: 3 Hrs/ Week	In semester Assessment: 30
	End Semester Assessment : 70

Course Objectives:

- To develop problem solving abilities using mathematical theories;
- To apply algorithmic strategies while solving problems;
- To develop time and space efficient algorithms;
- To study algorithmic examples in distributed, concurrent and parallel environments.

Course Outcomes:

- To survey algorithmic strategies give presentations using open source documentation tools like Latex and soft skill methodologies.
- To write mathematical modeling of algorithms for problem solving.
- To develop SRS in the UG projects;
- To solve problems for multi-core or distributed or concurrent/Parallel/Embedded environments;

Unit	Content	Hrs
I	**Problem solving and Algorithmic Analysis** Problem solving principles: Classification of problem, problem solving strategies, classification of time complexities (linear, logarithmic etc) problem subdivision – Divide and Conquer strategy. Asymptotic notations, lower bound and upper bound: Best case, worst case, average case analysis, amortized analysis. Performance analysis of basic programming constructs. Recurrences: Formulation and solving recurrence equations using Master Theorem.	6
II	**Greedy and Dynamic Programming Algorithmic Strategies**	6
	Greedy strategy: Principle, control abstraction, time analysis of control abstraction, knapsack problem, scheduling algorithms-Job scheduling and activity selection problem. **Dynamic Programming:** Principle, control abstraction, time analysis of control abstraction, binomial coefficients, OBST, 0/1 knapsack, Chain Matrix multiplication.	
III	**Backtracking and Branch-*n*-Bound**	8
	Backtracking: Principle, control abstraction, time analysis of control abstraction, 8-queen problem, graph coloring problem, sum of subsets problem. **Branch-*n*-Bound:** Principle, control abstraction, time analysis of control abstraction, strategies – FIFO, LIFO and LC approaches, TSP, knapsack problem.	
IV	**Complexity Theory**	6
	Overview: Turing machine, polynomial and non-polynomial problems, deterministic and non-deterministic algorithms, P class, NP class & NP complete problems- vertex cover and 3-SAT and NP–hard problem – Hamiltonian cycle. The menagerie of complexity classes of Turing degrees. Concept of randomized and approximation algorithms: Solving TSP by approximation algorithm, Randomized sort algorithms and Approximating Max Clique.	
V	**Parallel and Concurrent Algorithms**	6
	Parallel Algorithms: Sequential and parallel computing, RAM & PRAM models, Amdahl's Law, Brent's theorem, parallel algorithm analysis and optimal parallel algorithms, graph problems (shortest paths and Minimum Spanning Tree, Bipartite graphs) **Concurrent Algorithms:** Dining philosophers problem	

VI	**Algorithmic Case-studies**	8
	Distributed Algorithms: Bully algorithm – method for dynamically selecting a coordinator, all pair shortest path (Floyed-Warshall Algorithm), Dijkstra-Scholten algorithm – detection of process termination, Buddy memory algorithm – method to allocate memory. **Embedded Algorithms:** Embedded system scheduling (power optimized scheduling algorithm), sorting algorithm for embedded systems. **Internet of Things and Data Science Algorithms:** Algorithms in IoT: Cryptography Algorithms, Scheduling Algorithms, Data management Algorithms and clustering, context management. Data Science Project Life Cycle(DSPLC), Mathematical Considerations: Mathematical modeling, Optimization Methods, Adaptive and Dynamic Algorithms and Numerical Analysis in IoT **Algorithms in Software Engineering:** String matching algorithm-Boyer-Moore algorithm KMP algorithm.	

Text Books:

Sl. No.	Text Books
1.	Horowitz and Sahani, ”Fundamentals of Computer Algorithms”, 2ND Edition. University Press, ISBN: 978 81 7371 6126, 81 7371 61262.
2.	Gilles Brassard and Paul Bartley, ”Fundamental of Algorithmics”, PHI, New Delhi.
3.	Algorithms, Kenneth Berman and Jerome Paul, Cenage Learning, ISBN-13 978-81-315-0521-2

Reference Books:

Sl. No.	Reference Books
1.	Algorithms and Parallel Computing, Fayez Gebali, Willy, ISBN 978-0-470-90210-3 (Indian Paperback Edition)
2.	Anany Levitin, ”Introduction to the Design and Analysis of Algorithms” Pearson Education
3.	Thomas H Cormen and Charles E.L Leiserson, ”Introduction to Algorithm” PHI
4.	BoS Content: Books, Course Notes, Digital contents, Blogs developed by the BoS for bridging the gaps in the syllabus, problem solving approaches and advances in the course

410442 Principles of Modern Compiler Design

Teaching Scheme
Lectures: 4 Hrs/Week

Examination Scheme
In semester Assessment: 30
End Semester Assessment : 70

Course Prerequisite:

- Fundamentals of Data structures
- Theory of Computation
- Concepts of Operating Systems
- Study of Programming Languages

Course Objectives:

- To write programs with concepts in assembling, parsing and compiling the target code for execution.
- To survey the systems and methods of compilation.
- To practice basic FOSS tools for compiler writing and expose the latest techniques and advances in compiler.
- To verify and use concurrent, embedded and distributed compilation tools and techniques.

Course Outcomes:

- To write symbol tables, different types of grammars to solve problem of parsing.
- To design and write simple compiler using FOSS tools.
- To practice compiler tools in basic, concurrent, distributed and embedded environments.
- To survey and use latest trends and advances in compilers

Unit	Content	Hrs
I	**Notion and Concepts**	6
	Introduction to compilers – Design issues, passes, phases, symbol table Preliminaries – Memory management, Operating system support for compiler, Compiler support for garbage collection Lexical Analysis – Tokens, Regular Expressions, Process of Lexical analysis, Block Schematic, Automatic construction of lexical analyzer using LEX, LEX features and specification	
II	**Parsing**	8
	Syntax Analysis – CFG, top-down and bottom-up parsers, RDP, Predictive parser, SLR, LR(1), LALR parsers, using ambiguous grammar, Error detection and recovery, automatic construction of parsers using YACC, Introduction to Semantic analysis – Need of semantic analysis, type checking and type conversion	
III	**Syntax Translation Schemes**	7
	Syntax Directed Translation and Intermediate Code Generation – Attribute grammar, S and L attributed grammar, bottom up and top down evaluations of S and L attributed grammar, Intermediate code – need, types, Syntax directed translation scheme, Intermediate code generation for - assignment statement, declaration statement, Boolean expression, if-else statement, do -while statement, array assignment.	
IV	**Code Generation and Optimization**	8
	Code Generation and Code Optimization – Issues in code generation, basic blocks, flow graphs, DAG representation of basic blocks, Target machine description, Register allocation and Assignment, Simple code generator, Code generation from labeled tree, Concept of code generator. Need for Optimization, local, global and loop optimization, Optimizing transformations – compile time evaluation, common sub-expression elimination, variable propagation, code movement, strength reduction, dead code elimination, DAG based local optimization, peephole optimization, Introduction to global data flow analysis, Data flow equations and iterative data flow analysis (only introduction expected)	

V	**Functional and Logic Programs**	7
	Language Specific Compilation: Object Oriented languages – source language issues, routines and activation, code generation and control flow Functional languages - introduction to Functional Programs, basic compilation, polymorphic type checking, desugaring , compiling to a register-oriented architectures JavaCC (Chapter 13 of reference book 1)	
VI	**Parallel and Distributed Compilers**	8
	Parallel programming models, Processes and threads, Shared variables Message passing, Parallel Object Oriented languages, Tuple space, Automatic parallelization Introduction to advanced topics – JIT, Dynamic compilation, Interpreters (JVM/Dalvik), Cross compilation using XMLVM, Case studies(self study): GCC, g++, nmake,cmake. NVCC (case study for parallel compilation), LLVM	

Text Books:

Sl.No.	Text Books
1.	A V Aho, R Sethi, J D Ullman, "Compilers: Principles, Techniques, and Tools", Pearson Edition, ISBN 81-7758-590-8
2.	Dick Grune, Bal, Jacobs, Langendoen, Modern Compiler Design, Wiley, ISBN 81-265-0418-8

Reference Books:

Sl.No.	Reference Books
1.	Compiler Construction Using Java, JavaCC and Yacc, Anthony J. Dos Reis, Wiley ISBN 978-0-470-94959-7
2.	K Muneeswaran, "Compiler Design", Oxford University press, ISBN 0-19-806664-3
3.	J R Levin, T Mason, D Brown, "Lex and Yacc", O'Reilly, 2000 ISBN 81-7366-061-X
4.	BoS Content: Books, Course Notes, Digital contents, Blogs developed by the BoS for bridging the gaps in the syllabus, problem solving approaches and advances in the course

410443 Smart System Design and Applications

Teaching Scheme
Lectures: 3 Hrs/Week

Examination Scheme
In semester Assessment: 30
End Semester Assessment : 70

Course Objectives:

- To study multidisciplinary requirements of problem solving;
- To study concepts of Artificial Intelligence;
- To study smart systems programming and application development;
- To study examples in distributed, concurrent and parallel environments.

Course Outcomes:

- To write and survey solution for multidisciplinary case-study using mathematical modeling give presentations using soft skills methodologies;
- To write and survey embedded systems applications using machine learning;
- To solve problems for multi-core or distributed, concurrent and embedded environments;

Unit	Content	Hrs
I	**Introduction to Intelligent Systems**	4
	Introduction, History, Foundations and Mathematical treatments, Problem solving with AI, AI models, Learning aspects in AI, What is an intelligent Agents, Rational agent, Environments types, types of Agents	
II	**Problem-solving and Building Smart Systems**	6
	Problem solving process, Problem analysis and representation, Problem space and search, Toy problems, real world problems, Problem reduction methods, General Search algorithms, Uninformed Search methods, Informed (Heuristic) Search Best-first, Greedy, A* search methods, Heuristic Functions, AO*, Local Search Algorithms and optimization problems, Adversarial search methods, Important concepts of Game theory, Game theory and knowledge structure, Game as a search problem, Alpha-Beta Pruning, Stochastic Games, Constraint Satisfaction Problem, CSP as search problem	
III	**Knowledge, Reasoning, and Planning**	7
	Knowledge based agents, The Wumpus World, Logic, propositional logic, Representation of knowledge using rules, Predicate logic, Unification and lifting, inference in FOL, Forward Chaining, Backward Chaining, Resolution, Logic Programming. Planning problem, Planning, Algorithms for Planning as State-Space Search, Planning Graphs, simple planning agent, planning languages, blocks world problem, goal stack planning, mean end analysis, progression planners, regression planners, partial order planning, planning graphs, hierarchical planning, job shop scheduling problem, Planning and Acting in the Real World, Hierarchical Planning, Multi-agent Planning, Ontological Engineering, Categories and Objects, Events, Mental Events and Mental Objects, Reasoning Systems for Categories, Reasoning with Default Information, The Internet Shopping World	
IV	**Uncertain Knowledge and Decision Theory**	6
	Uncertainty and methods, Basic Probability Notion, Inference Using Full Joint Distributions, Bayesian probability and belief networks, Relational and First-Order Probability Models, Other techniques in uncertainty and reasoning, Inference in Temporal Models, Hidden Markov Models, Kalman Filters, Dynamic Bayesian Networks, Decision network, Semi-constraint influence diagram, Decision making and imperfect information, Combining Beliefs and Desires under Uncertainty, The Basis of Utility Theory, Utility Functions, Multi-attribute Utility Functions, Decision Networks, Decision-Theoretic Expert Systems	

V	**Learning Tools, Techniques and Applications**	7
	Machine Learning Concepts, methods and models, Supervised Learning, unsupervised and semi-supervised, Learning Decision Trees, Evaluating and Choosing the Best Hypothesis, Artificial Neural Networks, Non-parametric Models, Support Vector Machines, Ensemble Learning, empirical learning tasks, Explanation-Based Learning, Inductive Logic Programming, Reinforcement Learning, Active Learning, Learning based on limited information. Building Smart systems using different learning techniques, smart system applications, agent based concurrent engineering	
VI	**Communicating, Perceiving, and Acting**	6
	Language Models, Text Classification, Information Retrieval, Information Extraction, Phrase Structure Grammars, Syntactic Analysis (Parsing), Augmented Grammars and Semantic Interpretation, Machine Translation, Speech Recognition, Image Formation and object recognition, Early Image-Processing Operations, Object Recognition by Appearance, Reconstructing the 3D World, Object Recognition from Structural Information, Using Vision, Robot Hardware, Robotic Perception, Planning to Move, Planning Uncertain Movements, Robotic Software Architectures, Application Domains	

Text Books:

Sl.No.	Text Books
1.	Stuart Russell and Peter Norvig (1995), Artificial Intelligence: A Modern Approach," Third edition, Pearson, 2003.
2.	Shai shalev-shwartz, Shai Ben-David: Understanding Machine Learning from Theory to algorithms, Cambridge University Press, ISBN-978-1-107-51282-5, 2014.

Reference Books:

Sl.No.	Reference Books
1.	Artificial Intelligence by Elaine Rich, Kevin Knight and Nair, TMH
2.	BoS Content: Books, Course Notes, Digital contents, Blogs developed by the BoS for bridging the gaps in the syllabus, problem solving approaches and advances in the course

410444A Elective-I: Image Processing

Teaching Scheme
Lectures: 3 Hrs/Week

Examination Scheme
In semester Assessment: 30
End Semester Assessment : 70

Course Objectives:

- To study image processing concepts;
- To study mathematics and algorithms for image processing;
- To study applications in image processing;
- To study algorithmic examples in distributed, concurrent and parallel environments.

Course Outcomes:

- To survey image processing techniques, FOSS tools and related mathematics.
- To write image processing programs with applying concepts using open source tools;
- To solve Image Processing problems using multi-core or distributed, concurrent/Parallel environments.

Unit	Content	Hrs
I	**Introduction to Image processing**	6
	Introduction, Image sampling and quantization, Resolution, Human visual system, Classification of digital images, Image types(optical and microwave), Elements of an image processing system, Image file formats(tiff, jpeg, ico, ceos, png, raster image format), Introduction to OpenCV tool to Open and display Images using Python or Eclipse C/CPP.	
II	**Image Enhancement** Thresholding, Segmentation, Watershed Segmentation, Edge-based Segmentation, Fuzzy Segmentation Spatial domain techniques – Image Negative, Contrast stretching, gray level slicing, bit plane slicing, histogram and histogram equalization, local enhancement technique, image subtraction and image average, low–pass spatial filters, median filtering, high-pass spatial filter, derivative filters,Frequency domain techniques- Ideal low-pass filter, butterworth low-pass filter, High-pass filter, Homo-morphic filters.	6
III	**Image Analysis**	8
	Image segmentation- Classification of image segmentation techniques: Watershed Segmentation, Edge-based Segmentation, Fuzzy Segmentation, region approach, clustering techniques, thresholding , edge-based, classification of edges and edge detection, watershed transformation Feature Extraction- Boundary representation(Chain code, B-spline representation, fourier descriptor) Region representation(Area, Euler number, Eccentricity, Shape matrix, moment based descriptor), texture based features	
IV	**Image Compression and Object recognition**	8
	Introduction to Image compression and its need, Coding redundancy, classification of compression techniques(Lossy and lossless- JPEG, RLE, Huffman, Shannon fano), scalar and vector quantization Object Recognition – Need, Automated object recognition system, pattern and pattern class, relationship between image processing and object recognition, approaches to object recognition	
V	**Medical Imaging**	6
	Medical Image obtained with ionizing radiation- medical imaging modalites, images from X–rays,Gamma rays, Dose and Risk, Medical Image obtained with non-ionizing radiation: Ultrasound imaging, magnetic resonance imaging, PACS, 3D visualization: Image visualization, Surface and volume rendering, Virtual reality, Dental & Digital X-Ray Processing, RBC Image Processing, 3-D Visualization	

VI	**Remote sensing Imaging**	6
	Definition of Remote sensing, Remote sensing process, Photogrammetry, Electromagnetic spectrum, Interaction with atmosphere,Recording of energy by sensor, Transmission, Reception and Processing, Atmospheric sensors, Active remote sensors, Passive microwave remote sensing, Satellite Images,Visual Image Interpretation: Introduction, Remote sensing data products, Image interpretation, Elements of visual image interpretation, Interpretation keys, Thermal and Radar image interpretation, Pre-processing,Application of Remote Processing.	

Text Books:

Sl.No.	Text Books
1.	Fundamentals of Digital Image Processing, Anil K. Jain, PHI, ISBN 81-203-0929-4
2.	Digital Image Processing for Medical Applications, Geoff Dougherty, Cambridge University Press, ISBN: 978-0-521-18193-8.
3.	Digital Image processing by S.Jayaraman, McGraw Hills Publication
4.	Fundamentals of Digital Image Processing by S. Annadurai, Pearson publication
5.	Digital Image Processing for Medical Applications by Geoff Dougherty, Cambridge university press
6.	Remote sensing and GIS by Basudeb Bhatia, 2nd edition, OXFORD University press. Chapter [1,5,9,12]

Reference Books:

Sl.No.	Reference Books
1.	Handbook of Medical Imaging, Processing and Analysis, Academic Press, ISBN 0-12-077790-8 (PDF Book)
2.	Essential Image Processing and GIS for Remote Sensing, Jian Guo Liu Phillippa Mason, ISBN 978-0-470-51032-2
3.	BoS Content: Books, Course Notes, Digital contents, Blogs developed by the BoS for bridging the gaps in the syllabus, problem solving approaches and advances in the course

410444B Elective-I: Computer Network Design and Modeling

Teaching Scheme
Lectures: 3 Hrs/Week

Examination Scheme
In semester Assessment: 30
End Semester Assessment : 70

Course Objectives:

- To expose students to the area of network design, modeling and analysis.
- To expose students to the complete life cycle of the network design.
- To motivate students to think performance perspective towards design & analysis of the computer network.
- To expose students to the various open source network design tools.
- To study algorithmic examples in distributed, concurrent and parallel environments.

Course Outcomes:

- To design, model and analyze computer network.
- To practice using FOSS tools for network design, modeling and analysis.
- To solve problems for multi-core or distributed, concurrent/Parallel environments.

Unit	Content	Hrs
I	**Introduction, requirement analysis: concepts**	8
	Overview of network analysis and design process, System description and methodology, Service description and characteristics, performance characteristics, requirement analysis (user, application, device, network, other) concepts, requirement specification and map.	
II	**Requirement Analysis: process**	6
	Requirement gathering and analysis (developing service metrics, characterizing behavior, Developing RMA, delay, capacity, performance requirements, Environment-Specific Thresholds and Limit, Requirements Mapping)	
III	**Flow analysis and Network architecture**	6
	Identifying and Developing Flows, Data Sources and Sinks, Flow Models, Flow Prioritization & specification, examples of flow analysis, Component Architectures, Reference Architecture, Architectural Models, Systems and Network Architectures.	
IV	**Addressing, routing and Network management architecture**	8
	Addressing Mechanisms, Routing Mechanisms, Addressing Strategies, Routing Strategies,Architectural Considerations of addressing, Network Management Mechanisms, Architectural Considerations of network management.	
V	**Network Performance and Design**	6
	Developing Goals for Performance, Performance Mechanisms, Architectural Considerations, Design Process, Vendor, Equipment, and Service-Provider Evaluations, Network Layout, Design Traceability, Design Metrics.	
VI	**Tools for Network Design, Modeling and Analysis**	6
	Discrete event simulation, modeling for computer simulation, NS-3 or latest version or equivalent, modeling network elements, Simulating a Computer Network, Smart Pointers, Representing Packets, Object Aggregation, Events in NS–3 or latest version or equivalent, Compiling and Running the Simulation, Animating the Simulation, Scalability with Distributed Simulation, Emulation Capabilities, Analyzing the Results, Overview of OMNet.	

Text Books:

Sl.No.	Text Books
1.	James D. McCabe, "Network Analysis, Architecture, and Design", Morgan Kaufmann Publisher (ELSEVIER), 3rd edition
2.	Wehrle, Klaus, Günes, Mesut, Gross, James, "Modeling and Tools for Network Simulation", Springer, ISBN: 978-3-642-12330-6

Reference Books:

Sl.No.	Reference Books
1.	Priscilla Oppenheimer, "Top Down Network Design", 3rd Edition, Cisco Press
2.	BoS Content: Books, Course Notes, Digital contents, Blogs developed by the BoS for bridging the gaps in the syllabus, problem solving approaches and advances in the course

410444C Elective-I: Advanced Computer Programming

Teaching Scheme	**Examination Scheme**
Lectures: 3 Hrs/Week	In semester Assessment: 30
	End Semester Assessment : 70

Course Objectives:

- To survey advanced computer programming technologies and give presentation using soft skill and FOSS tools.
- To write programs using advanced programming tools, data technologies, sensors, multimedia data.
- Write applications using the concept of Object Distribution and invoking its services remotely in Distributed environment
- To study algorithmic examples in distributed, concurrent and parallel environments

Course Outcomes:

- To present a survey on building blocks of advance programming tools.
- To practice programming problems using advance open source programming tools.
- To solve problems for multi-core or distributed, concurrent/Parallel environments.

Unit	Content	Hrs
I	**Distributed Programming**	8
	Introduction, Simple Lock, Bounded Buffer, Message-Passing Services,Distributed Lock Service:- Distributed Lock using Timestamps,Object-Transfer Service: Object Transfer using Path Reversal,Distributed Shared Memory Service:- A Single-Copy Distributed Shared Memory, A Multi-Copy Distributed Shared Memory.	
II	**Java Programming Concepts**	6
	Relflections, Boxing and Unboxing, Object serialization and Deserialization, Important Java Utility classes (StringTokenizer, Observable), Java Collection framework (LinkedList, ArrayList,Sets, Hashsets, Treeset, Hashmap,Treemap, Vectors, Stack, Dictionary,Hashtable, Itrators)	
III	**SOA and Programming**	8
	Service defined, Role/Use of service in Cloud based environment, Service Orchestration and Distribution. Introduction to RMI (Remote Method Invocation), SOAP, Servlet, WSDL,Developing Web services using Java. Introduction to Enterprise Java Beans(EJBs): Concept of Entity Beans, Message Beans and Session Beans with one example each of word count program.	
IV	**Web Programming**	6
	HTML and Java Script Programming: Embedding JS in HTML, Handling Events, Variables in JS, Creating Objects uing JS, Operators, Control flow statements, Functions, JDBC, JSP, Web Architecture models, MVC Architecture Models, advantages of JSP over Servlets, Tag based approach, JSP architecture, JSP life Cycle, Creating simple JSP Page, JSTL, JDBC features, JDBC APTs,JDBC Classes and Interfaces,Implementing JDBC Processes with MongoDB, system.js collection for MongoDB, AJAX: Creating sample AJAX Application, Document Object Model, JS and AJAX, Implementing AJAX frameworks.	
V	**Hadoop Programming**	6
	Data Science, in-memory analytics, in-database processing, symmetric multi-processing systems(SMP), Massively parallel Processing, difference between parallel and Distributed Systems,Shared memory, shared disk, Shared Nothing Architecture(SNA), advantages of SNA, CAP Theorem, NoSQL, NewSQL, Features and Advantages of Hadoop, Hadoop Ecosystem, RDBMS verses Hadoop, Hadoop Distributions: Hadoop, HDFS, HDFS Daemons,File read, File write, Hadoop YARN, Word-Count Program	

VI	**Advanced Tools, Techniques and Applications**	6
	Processing data with Hadoop, MapReduce Daemons, Concept of Mapper, Reducer, Combiner, Partitioner, Searching and Sorting using MapReduce, Map-Reduce working and example: Word count MapReduce programming using Java, MongoDB and MapReduce function, Pig: features, anatomy, Pig on Hadoop, ETL Processing, Data types and Complex data types in Pig, Running Pig: Interaction, Batch Modes, Execution modes of Pig: Local and MapReduce Modes, HDFS Commands, Relational Operators, EVAL function, UDF, Parameter Substitution, Diagnostic Operators, Word Count example using Pig.	

Text Books:

Sl.No.	Text Books
1.	Distributed Programming, Theory and Practice by Shankar and A. Udaya
2.	Seema Acharya, S. Chellapan, BIG DATA and Analytics, Wiley, 2015, ISBN:978-81-245-5478-2
3.	Web Technologies: HTML, JS, PHP, Java, JSP, ASP.NET, XML, AJAX, Black Book, DreamTech, ISBN: 978-81-7722-997-4

Reference Books:

Sl.No.	Reference Books
1.	Java Complete Reference by Herbert Schidlt
2.	Hadoop : The Definitive Guide.
3.	BoS Content: Books, Course Notes, Digital contents, Blogs developed by the BoS for bridging the gaps in the syllabus, problem solving approaches and advances in the course

410444D Elective-I: Data Mining Techniques and Applications

Teaching Scheme
Lectures: 3 Hrs/Week

Examination Scheme
In semester Assessment: 30
End Semester Assessment : 70

Requisites: TE Database Management System and Applications, Data warehouse, OLTP

Course Objectives:

- To understand Data Mining Concepts.
- To understand Data Mining needs and Application.
- To study concepts of pattern based data mining for decision making.
- To study algorithmic examples in distributed, concurrent and parallel environments.

Course Outcomes:

- To present survey on different learning, classification and data mining foundations.
- To write programs and methods for data Mining applications.
- To solve problems for multi-core or distributed, concurrent/Parallel environments

Unit	Content	Hrs
I	**Introduction, Knowledge of Data, Data Processing**	6
	Data mining described, need, kinds of pattern and technologies, issues in mining, KDD vs data mining, machine learning concepts, OLAP, knowledge representation, data pre-processing – cleaning, integration, reduction, transformation and discretization, application with mining aspect example like weather prediction.	
II	**Concepts of frequent patterns, Associations and Correlation**	4
	Market Basket Analysis, Frequent item set, Closed item set & Association Rules, mining multilevel association rules, constraint based association rule mining, Apriori Algorithm, FP Growth Algorithm.	
III	**Classification**	8
	Introduction, classification requirements, methods of supervised learning, decision trees- attribute selection, tree pruning, ID3, scalable decision tree techniques, rule extraction from decision tree, Regression, Bayes classification – Bayes theorem, Naïve Bayes classification, metrics for performance evaluation, KNN approach with Case study.	
IV	**Clustering**	5
	Cluster analysis, distance measures, partitioning methods – k-means, k-medoids, hierarchical methods – single-link, complete-link, centroid, average link, agglomerative method.	
V	**Text and Web Mining**	8
	Text mining: Text Data Analysis and Information Retrieval, Dimensionality Reduction for Text, Feature vector, Bag of words, Tf-idf, Text Mining Approaches, Web mining: Introduction, web content mining, web usage mining, web structure mining, web crawlers.	
VI	**Reinforcement Learning and Big Data Mining**	5
	Reinforcement learning- Introduction to reinforcement and wholistic learning, multi-perspective decision making for Big data and multi-perspective learning for big data, Advanced techniques for big data mining.	

Text Books:

Sl.No.	Text Books
1.	Jiawei Han, Micheline Kamber, "Data mining: concepts and techniques", Morgan Kaufmann Publisher, second edition
2.	G. K. Gupta , "Introduction to Data mining with case studies", PHI, second edition

Reference Books:

Sl.No.	Reference Books
1.	Saumen Charkrobarti, "Mining the Web Discovering Knowledge from Hypertext Data".
2.	M. Dunham, "Data mining: Introductory and Advanced topics", Pearson Education, 2003.
3.	BoS Content: Books, Course Notes, Digital contents, Blogs developed by the BoS for bridging the gaps in the syllabus, problem solving approaches and advances in the course

410445A Elective-II:Problem Solving with Gamification

Teaching Scheme	**Examination Scheme**
Lectures: 3 Hrs/Week	In semester Assessment: 30
	End Semester Assessment : 70

Course Objectives:

- To develop problem solving abilities using gamification
- To apply gamifications for Web Applications
- To apply gamifications for Mobile Applications

Course Outcomes:

- To write survey on the gamification paradigms.
- To write programs to solve problems using gamification and open source tools.
- To solve problems for multi-core or distributed, concurrent/Parallel environments

Unit	Content	Hrs
I	**Gaming Foundations**	6
	Introduction, Resetting Behavior, Replaying History, Gaming foundations: Fun Quotient, Evolution by loyalty, status at the wheel, the House always wins.	
II	**Developing Thinking**	6
	Re-framing Context: Communicology, Apparatus, and Post-history, Concepts Applied to Video games and Gamification, Rethinking 'playing the game' with Jacques Henriot, To Play Against: Describing Competition in Gamification, Player Motivation: Powerful Human Motivators, Why People Play, Player types, Social Games, Intrinsic verses Extrinsic Motivation, Progression to Mastery. Case studies for Thinking: Tower of Hanoi.	
III	**Opponent Moves in Gamification**	8
	Reclaiming Opposition: Counter gamification, Gamed Agencies: Affectively Modulating Our Screen-and App-Based Digital Futures, Remodeling design, Game Mechanics, Designing for Engagement, Case study of Maze Problem.	
IV	**Game Design**	8
	Game Mechanics and Dynamics: Feedback and Re-enforcement, Game Mechanics in depth, Putting it together, Case study of 8 queens problem.	
V	**Advanced tools, techniques**	6
	Gamification case Studies, Coding basic game Mechanics	
VI	**Advanced tools, techniques and applications**	6
	Instant Gamification Platforms, Mambo.io(Ref:http://mambi.io), Installation and use of BigDoor (Open Source http://bigdoor.com),ngageoint/gamification-server (ref: https://github.com/ngageoint/gamification-server)	

Text Books:

Sl.No.	Text Books
1.	http://projects.digital-cultures.net/meson-press/files/2014/06/9783957960016-rethinking -gamification.pdf, ISBN (PDF): 978-3-95796-001-6, Mathias Fuchs, Sonia Fizek,Paolo Ruffino, Niklas Schrape, Rethinking Gamification, Meson Press, ISBN (Print): 978-3-95796-000-9
2.	ftp://ftp.ivacuum.ru/i/WooLF/% 5B2011%5D%20Gamification%20by%20Design.pdf, Gabe Zechermann, Christopher Cunningham, Gamification Design, Oreilly, ISBN: 978-1-449-39767-8.

Reference Books:

Sl.No.	Reference Books
1.	http://press.etc.cmu.edu/files/MobileMediaLearning-DikkersMartinCoulter-web.pdf
2.	BoS Content: Books, Course Notes, Digital contents, Blogs developed by the BoS for bridging the gaps in the syllabus, problem solving approaches and advances in the course

410445B Elective-II: Pervasive Computing

Teaching Scheme
Lectures: 3 Hrs/Week

Examination Scheme
In semester Assessment: 30
End Semester Assessment : 70

Course Objectives:

- To introduce pervasive computing abilities.
- To introduce tools and techniques used while solving problems using pervasive computing.
- To study algorithmic examples in distributed, concurrent and parallel environments

Course Outcomes:

- To present a survey on pervasive computing building blocks.
- To create presentations using pervasive computing techniques and devices.
- To solve problems for multi-core or distributed, concurrent/Parallel environments.

Unit	Content	Hrs
I	**Introduction to Pervasive Computing**	7
	Concept of Distributed Computing, Mobile Computing, Pervasive Computing, Wearable Computing, Modeling the Key Ubiquitous/Pervasive Computing Properties (Ref: WileyUC), Mobile Adaptive Computing (Ref: TMH), Mobility Management and Caching (Ref:TMH)	
II	**Pervasive Computing Devices**	7
	Smart Environment : CPI and CCI (Smart Devices : Application and Requirements (Ref:Wiley UC), Device Technology and Connectivity (Ref: Pearson PC), Human Computer Interaction (Ref: Unit III,Wiley UC)	
III	**Human Computer Interaction**	6
	Explicit HCI, Implicit HCI, User Interface and Interaction for four hand-held widely used devices, Hidden UI via basic smart devices, Hidden UI via wearable and Implanted devices, Human centered design, user models (ref: Wiley UC)	
IV	**Middleware for Pervasive**	7
	Adaptive middleware, Context aware middleware, Mobile middleware, Service Discovery, Mobile Agents (Ref: Gupta TMH; Chapter 4, 5, 6)	
V	**Security in Pervasive Computing**	6
	Security and Privacy in Pervasive Networks, Experimental Comparison of Collaborative Defense Strategies for Network Security.	
VI	**Challenges and Outlook**	6
	Overview of challenges, smart devices, Smart Interaction, Smart physical environment device interaction, Smart human-device interaction, Human Intelligence versus machine intelligence, social issues. Case Study- Wearable Computing/ Cyber Physical System.	

Text Books:

Sl.No.	Text Books
1.	Stefan Poslad, Ubiquitous Computing, Smart devices, environment and interaction, Wiley.
2.	Frank Adelstein, Sandeep Gupta, Golden Richard III, Loren Schwiebert, Fundamentals of Mobile and Pervasive Computing, Tata McGraw Hills

Reference Books:

Sl.No.	Reference Books
1.	Jochen Burkhardt, Horst Henn, Stefan Hepper, Klaus Rindtorff, Thomas Schaeck, Pervasive Computing, Pearson, Eighteenth Impression, 2014.
2.	BoS Content: Books, Course Notes, Digital contents, Blogs developed by the BoS for bridging the gaps in the syllabus, problem solving approaches and advances in the course

410445C Elective-II: Embedded Security

Teaching Scheme
Lectures: 3 Hrs/Week

Examination Scheme
In semester Assessment: 30
End Semester Assessment : 70

Course Objectives:

- To learn Embedded Security in Portable Computing
- To Learn advances in security in Embedded Technology, IoT
- To study algorithmic examples in distributed environments

Course Outcomes:

- To write a survey on the embedded security concepts and technologies.
- To write programs using open source embedded technologies.
- To create presentation for solving Embedded Security problems

Unit	Content	Hrs
I	**Introduction**	6
	Cyber security in mobile edge: Three pillars of Mobile Computing, BYOD, Incident Case Study: eBay Data Breach, Target Data Breach, OpenSSL Heartbleed; Strong Authentication, Network Management, Boot Integrity, Hardware-Based Protection, Open-Source Software Best Practice, Third-Party Software Best Practice, Security Development Life cycle, CVSS and its limitations.	
II	**Embedded Solutions: from Management to Security**	8
	Management Engine Overview, Platform and System Management, Intel AMT Overview, The Engine's Evolvement: from Management to Security, Security Applications at a Glance: EPID, PAVP, IPT and Boot Guard; Virtual Security Core: ARM Trust zone: secure and non-secure modes, memory isolation, bus isolation, physical verses virtual isolation . Management Engine vs. Intel AMT,Intel AMT vs. Intel vPro Technology. Building blocks of the security and the management engine: Random number generation, Message Authentication, RSA, Digital Signature, Secure storage, debugging.	
III	**Safeguarding itself**	8
	Access to host memory, Security Requirements, Threat Analysis and Mitigation, Published Attacks: Introducing Ring-3 Rootkits. Intel's Enhanced Privacy Identification (EPID): Redefining Privacy for the Mobile Age, Processor Serial Number, EPID, Sign and Message Authentication(SIGMA)), Implementation of EPID, Applications of EPID, Next generation of EPID	
IV	**Booting**	6
	Introduction, Boot attack: Evil Maid, BIOS and UEFI,BIOS alteration, Software Replacement, rooting, Trusted Platform Module (TPM), Field Programmable Fuses Intel Boot Guard, Measured Boot, Verified Boot. TPM Overview, Intel Platform Trust Technology, Integrated vs. Discrete TPM.	
V	**Hardware-Based Content Protection Technology**	6
	Introduction, Rights protections, Digital rights management (DRM), End-to-End Content Protection, Intel's Hardware-Based Content Protection, Intel Wireless Display, HDCP, Content Protection on TrustZone; Dynamically Loaded Applications:Closed-Door Model, Dynamic Application Loader (DAL) Overview, DAL Architecture, DAl Security Considerations.	
VI	**Embedded Technology: Identity Protection Technology**	6
	Isolated Computing Environment, Security-Hardening Measures, Basic Utilities of embedded security, Anonymous Authentication and Secure Session Establishment, Protected Input and Output, Dynamic Application Loader(DAL), Summary of Firmware Ingredients, Software Guard Extensions, Intel Unifies and Simplifies Connectivity, Security for IoT, Embedded Security for Internet of Things(Ref 2)	

Text Books:

Sl.No.	Text Books
1.	Xiaoyu Ruan, Platform Embedded Security Technology Revealed, APress Open, 2014 ISBN 978-1-4302-6571-9 ebook: Platform Embedded Security Technology Revealed pdf

Reference Books:

Sl.No.	Reference Books
1.	Edward Lee, Sanjit Seshia, Introduction to Embedded Systems: A Cyber physical Systems Approach, ISBN 978-0-557-70857-4
2.	Digital Content: Arijit Ukil,Jaydip Sen, Sripad Koilakonda,Embedded Security for Internet of Things, Innovation labs TCS, IEEEXplore
3.	BoS Content: Books, Course Notes, Digital contents, Blogs developed by the BoS for bridging the gaps in the syllabus, problem solving approaches and advances in the course

410445D Elective-II: Multidisciplinary NLP

Teaching Scheme
Lectures: 3 Hrs/Week

Examination Scheme
In semester Assessment: 30
End Semester Assessment : 70

Course Objectives:

- To develop problem solving abilities using Mathematics
- To apply algorithmic strategies while solving problems
- To develop time and space efficient algorithms
- To study algorithmic examples in distributed, concurrent and parallel environments

Course Outcomes:

- To present a survey on NLP and Machine learning paradigms.
- to write programs using NLP open source tools.
- To create presentation for applying NLP for multi-core or distributed, concurrent/Parallel environments.

Unit	Content	Hrs
I	**Natural Language Processing**	6
	Theories of Parsing, Parsing Algorithms; Robust and Scalable Parsing on Noisy Text as in Web documents; Hybrid of Rule Based and Probabilistic Parsing; Scope Ambiguity and Ambiguity resolution. Lexical Knowledge Networks, Metaphors	
II	**Advanced Natural Language Processing**	6
	Automatic Morphology Learning , Named Entities; Maximum Entropy Models; Random Fields, Estimation Techniques, and Language Modeling , Parsing and Syntax, The EM Algorithm in NLP , Stochastic Tagging, and Log-Linear Models, Probabilistic Similarity Measures and Clustering , Machine Translation, Discourse Processing: Segmentation	
III	**Machine Learning and NLP**	8
	Finite State Machine Based Morphology; Automatic Morphology Learning; Finite State Machine Based Morphology , Unsupervised Methods in NLP, Introduction to HMM, HMM Ergodic models, Morphology, Graphical Models for Sequence Labeling in NLP, Probabilistic parsing; sequence labeling, Forward Backward probability; Viterbi Algorithm	
IV	**Introduction to Speech Communication**	6
	Speech Communication : Biology of Speech Processing The Acoustics and Acoustic Analysis of Speech , Linguistic level, Physiological level, Acoustic level, Auditory physiology, The Physiology of Speech Production ,Sentence-level Phenomena, The Perception of Speech, Speech Disorders and Development, Speech Synthesis	
V	**Multidisciplinary Natural Language Processing**	6
	Lexical Knowledge Networks, WordNet Theory; Indian Language WordNets and Multilingual Dictionaries; Semantic Roles, Word Sense Disambiguation Multilinguality, Metaphors	
VI	**Advanced tools, techniques and applications of NLP**	8
	Sentiment Analysis; Text Entailment; Robust and Scalable Machine Translation; Question Answering in Multilingual Setting; Cross Lingual Information Retrieval, Some applications like machine translation, database interface, Programming language Python Natural Language Tool Kit (NLTK), NLP applications in web mining and text mining.	

Text Books:

Sl.No.	Text Books
1.	Jurafsky, David, and James H. Martin. Speech and Language Processing: An Introduction to Natural Language Processing, Computational Linguistics and Speech Recognition. Upper Saddle River, NJ: Prentice-Hall, 2000. ISBN: 0130950696.
2.	Manning, Christopher D., and Hinrich Schütze. Foundations of Statistical Natural Language Processing. Cambridge, MA: 1999. ISBN: 0262133601.
3.	Stevens, K. N. Acoustic Phonetics. Cambridge, MA: MIT Press, 1999. ISBN: 9780262194044

Reference Books:

Sl.No.	Reference Books
1.	Flanagan, J. L. Speech Analysis, Synthesis and Perception. 2nd ed. New York, NY: Springer-Verlag, 1972. ISBN: 9780387055619.
2.	Kent, Raymond D., Bishnu S. Atal, and Joanne L. Miller, eds. Papers in Speech Communication: Speech Production.New York,NY: Acoustical Society of America,1991. ISBN: 9780883189580.
3.	G. Chirchia and S. McConnell Ginet.Meaning and Grammar, MIT Press, 1990.
4.	Jaes Allen.Natural Language Understanding, Benjamin-Cummins, 1987.
5.	BoS Content: Books, Course Notes, Digital contents, Blogs developed by the BoS for bridging the gaps in the syllabus, problem solving approaches and advances in the course

410446 Computer Laboratory-I

Teaching Scheme
Practicals: 4 Hrs/Week

Examination Scheme
Oral Assessment: 50
Practical Assessment : 50

Course Objectives:

- To develop problem solving abilities using Mathematical Modeling
- To apply algorithmic strategies, Software Engineering and Testing while solving problems
- To develop time and space efficient algorithms
- To study algorithmic examples in distributed, concurrent and parallel environments

Course Outcomes:

- To write efficient mathematical design, analysis and testing of algorithmic assignments.
- To debug and demonstrate the Testing of functioning using Software Engineering for OO-programming.
- To write programs using advanced FOSS tools and technologies
- To write test case using multi-core or distributed, concurrent/Parallel environments.

Tools:

64-bit Fedora or equivalent OS with 64-bit Intel-i5/ i7 or latest higher processor computers, FOSS tools, LEX, YACC, DAG, iburg, XMLVM, Intel Internet of Things (IoT) Developer Kit or Intel Galileo board or BBB or Open Source equivalent, VxWorks®, the real-time operating system (RTOS) for IoT, NS3,scala, Sqoop, Pig(Latin, Compiler), Hive, HDFS, HBase.

Evaluation and Term-work Assessment Method: Practical, Oral and Term work Assessment Scheme guidelines are to be used for evaluation.

A. Each Assignment/Class Designed must have Mathematical modeling using relevant Divide-n-Conquer strategies to be assessed for 10% of the Marks (Paper Work/Digital Write-up);

B. In A above, an ability demonstrated for eliminating the redundant Conditional statements is to be evaluated for the 20% of the marks(Paper Work/Digital Write-up).

C. In A above, an ability demonstrated for eliminating the redundant Loops statements is to be evaluated for the 20% of the marks(Paper Work/Digital Write-up).

D. The functioning of the programs is to be demonstrated by Black-Box Testing for 10% of the Marks;

E. White-Box Walk through Testing methods for 10% of the marks;

F. Positive-Negative testing for 10% of the marks;

G. In addition to these testing methods, student must select one of the advanced Software Testing method currently practiced in the Industry which is suitable for the functional assignment of the Reliability for 10% of the marks.

H. 10% of the marks are to be given for the Oral Questions using above.

I. 10% of the marks are to be given for the output generated for the practical/Oral/Term work.

J. The assessment as above is to be done by a pair of examiners as per prevailing rules of SPPU examination and items A,B,E by Examiner 1 and items C,D,F by Examiner 2 and items G,H,I to be assessed Jointly;

K. Latex or its equivalent be used to generate the document to be stored in the Read-only Digital Media as a term-work/Digital Journal after checking, removing/ avoiding the plagiarism. Give an additional assignment per assignment reporting plagiarism to be submitted in the journal under the heading extra-work.

L. Examination to be conducted on the assignments performed (Group A and Group-B).

Laboratory Assignments:

- **Group A (Mandatory Six Assignments)**

1. Using Divide and Conquer Strategies design a function for Binary Search using C++/ Java/ Python/ Scala.
2. Using Divide and Conquer Strategies design a class for Concurrent Quick Sort using C++.
3. Lexical analyzer for sample language using LEX.
4. Parser for sample language using YACC.
5. Int code generation for sample language using LEX and YACC.

Elective-I A. Design a class using C++ to read a gray scale TIFF image file of a dental digital X-Ray or Medical X-Ray or an Areal view Image, design Class to calculate histogram to return a CList, Design ImageDisplay class to display historam of a image.

Elective-I B. A company has three offices at remote locations with requirement of interoperability with remote services. Each office has a server, TCP/IP and different users including administrator, privileged users and common clients. Design a network model for the same. Demonstrate the network model using NS3.

Elective-I C. Write a java program to multiply 64-bit numbers using shared memory, java collection framework and java utilities.

Elective-I D. Implement a simple approach for k-means/ k-medoids clustering using C++.

- **Group B (Any Six Assignments: atleast 3 from the selected Elective)All assignments must be covered in a students batch of laboratory.**

1. 8-Queens Matrix is Stored using JSON/XML having first Queen placed, use back-tracking to place remaining Queens to generate final 8-queen's Matrix using Python.
2. Concurrent Implementation of traveling salesman problem.
3. Implementation of 0-1 knapsack problem using branch and bound approach.
4. Code optimization using DAG.
5. Code generation using DAG / labeled tree.
6. Generating abstract syntax tree using LEX and YACC.
7. Implementing recursive descent parser for sample language.
8. Write a program to implement SLR Parsing algorithm using Python for the ordered input Set in XML $\{$ P$\rightarrow$ E, E$\rightarrow$E+T, E$\rightarrow$T, T$\rightarrow$T*F, T$\rightarrow$F, F$\rightarrow$(E), F$\rightarrow$i, END. $\}$

Elective-I A1 Implement histogram equalization without the use of FOSS Eclipse-OpenCV library functions and compare its performance to OpenCV library function with Eclipse.

Elective-I A2 Implement adaptive thresholding of a gray scale image and compare its performance with ordinary thresholding .

Elective-I A3 Perform a two dimensional Butterworth low-pass and high-pass filter of the given image for two different cut-off frequencies.

Elective-I A4 Perform Image segmentation using watershed /fuzzy/clustering segmentation technique.

Elective-I A5 Perform any two boundary/region based feature extraction techniques for object recognition.

Elective-I B1 Write a program in python to calculate end-to-end packet delay for ethernet, 802.11 and 802.15.4 and compare the results. End-to-end packet delay should include processing delay, queuing delay, transmission delay and propagation delay.

Elective-I B2 Write a program in Java to analyze M/D/1 (Random Arrivals, constant service time distribution and 1 server) for data wireless networks and calculate channel utilization and throughput.

Elective-I B3 Write a program using Embedded Java to find CMST using Esau-Williams Algorithm use wireless networks.

Elective-I B4 For wireless routing, design and compare distributed Bellman-Ford algorithm and Dijkstra's algorithm use FOSS Eclipse C++/ Java/ Python/ Scala for programming.

Elective-I B5 The class rooms and laboratories are connected through a distributed network having 'n' nodes with security cameras (IP-based) along with the other sensors such as thumb marks of attendance. Design a network for your college for security management and attendance management. The departments are connected in a bipartite graph and Heads are connected to the administrative offices of the college. Design a network and test it the efficient data handling by different entities. Develop a model to demonstrate Dijkstra's algorithm for sampling the data. Use Python and NS3.

Elective-I C1 For a text message of 150 words, Huffman Codes are to be produced and transmitted through a messaging system or a blog. Use Python or Java Script/Java Beens to transfer such message from one user to another on a web/intranet.

Elective-I C2 For a text message of 150 words, Huffman Codes are to be produced and transmitted through a messaging system or a blog. Use Python or Java Script/Java Beens/Scala to transfer such message from one user to another on a web/intranet, Develop a mobile APP.

Elective-I C3 Write a program using Sqoop to transfer the Digital Library Book Data and related linked to multimedia/PDF files stored using MySQL to HDFS and from HDFS to MySQL.

Elective-I C4 Write a program using Hive to create a summarization and data analysis queries on the Digital Library Book Data.

Elective-I C5 Write a MapReduce program using Java/Python/Scala to arrange the data on userid, then with in the user id sort them in increasing or decreasing order of hit count of accession number demanded by students using digital library.

Elective-I D1 Using any similarity based techniques develop an application to classify text data. Perform pre-processing tasks as per requirement.

Elective-I D2 Implement Apriori approach for datamining to organize the data items on a shelf using following table of items purchased in a Mall

Transaction ID	Item1	Item2	Item3	Item4	Item 5	Item6
T1	Mango	Onion	Jar	Key-chain	Eggs	Chocolates
T2	Nuts	Onion	Jar	Key-chain	Eggs	Chocolates
T3	Mango	Apple	Key-chain	Eggs	-	-
T4	Mango	Toothbrush	Corn	Key-chain	Chocolates	-
T5	Corn	Onion	Onion	Key-chain	Knife	Eggs

Elective-I D3 Implement Decision trees on Digital Library Data to mirror more titles(PDF) in the library application, compare it with Naïve Bayes algorithm.

Elective-I D4 Implement Naïve Bayes for Concurrent/Distributed application. Approach should handle categorical and continuous data.

Elective-I D5 Implementation of K-NN approach take suitable example.

- Group C (Any One Assignment)

1. Code generation using "iburg" tool.
2. Cross compilation using XMLVM.
3. Generate Huffman codes for a gray scale 8 bit image.
4. Simulate JPEG like compression on a grayscale image and report the compression ratio.

Text Books:

Sl.No.	Text Books
1.	Laboratory Manual generated by the Laboratory Teachers of the respective college, in the Term-work Format; to be assessed and approved by the BoS
2.	Content in Digital Library

410447 Computer Laboratory-II

Teaching Scheme	**Examination Scheme**
Practicals: 4 Hrs/Week	Term Work Assessment: 50
	Oral Assessment : 50

Course Objectives:

- To develop problem solving abilities for smart devices.
- To develop problem solving abilities for gamifications.
- To develop problem solving abilities of pervasiveness,embedded security and NLP.
- To apply algorithmic strategies while solving problems
- To develop time and space efficient algorithms
- To study algorithmic examples in distributed, concurrent and parallel environments

Course Outcomes:

- To write mathematical modeling for problem solving.
- To write programs for smart devices using FOSS Tools.
- To write Programs for gamifications.
- To write test cases to solve problems for pervasiveness,embedded security and NLP applications.
- To write test cases for multi-core or distributed, concurrent/Parallel environments

Tools:

64-bit Fedora or equivalent OS with 64-bit Intel-i5/i7 or latest higher processor computers, FOSS tools, LEX, YACC, DAG, iburg, XMLVM, Intel Internet of Things (IoT) Developer Kit or Intel Galileo board or BBB or Open Source equivalent, VxWorks®, the real-time operating system (RTOS) for IoT, NS3, Scala, Python

Evaluation and Term-work Assessment Method: Practical, Oral and Term work Assessment Scheme guidelines are to be used for evaluation.

A. Each Assignment/Class Designed must have Mathematical modeling using relevant Divide-n-Conquer strategies to be assessed for 10% of the Marks (Paper Work/Digital Write-up);

B. In A above, an ability demonstrated for eliminating the redundant Conditional statements is to be evaluated for the 20% of the marks(Paper Work/Digital Write-up).

C. In A above, an ability demonstrated for eliminating the redundant Loops statements is to be evaluated for the 20% of the marks(Paper Work/Digital Write-up).

D. The functioning of the programs is to be demonstrated by Black-Box Testing for 10% of the Marks;

E. White-Box Walk through Testing methods for 10% of the marks;

F. Positive-Negative testing for 10% of the marks;

G. In addition to these testing methods, student must select one of the advanced Software Testing method currently practiced in the Industry which is suitable for the functional assignment of the Reliability for 10% of the marks.

H. 10% of the marks are to be given for the Oral Questions using above.

I. 10% of the marks are to be given for the output generated for the practical/Oral/Term work.

J. The assessment as above is to be done by a pair of examiners as per prevailing rules of SPPU examination and items A,B,E by Examiner 1 and items C,D,F by Examiner 2 and items G,H,I to be assessed Jointly;

K. Latex or its equivalent be used to generate the document to be stored in the Read-only Digital Media as a term-work/Digital Journal as per BoS format of Term work Submission after checking, removing/ avoiding the plagiarism. Give an additional assignment per assignment reporting plagiarism to be submitted in the journal under the heading extra-work.

L. Examination to be conducted on the assignments performed (Group A and Group-B).

Laboratory Assignments:

- **Group A (Mandatory Six Assignments)**

1. Implementation of any 2 uninformed search methods with some application.

2. Write a program to perform profile translation-based proactive adaptation using context management in smartphones. Objective of this assignment is to automatically generates user's profile according to the scenarios using machine learning approaches. System should allow to keep user's full profile in user domain resulting into centralizing or exchanging the profile information with increase in the consistency of profile information. .

3. Implement A* approach for any suitable application.

4. Implementation of Unification algorithm

5. Implement Naive Bayes to predict the work type for a person with following parameters: age: 30, Qualification: MTech, Experience: 8
   Following table provides the details of the available data:

Work Type	Age	Qualification	Experience
Consultancy	30	Ph.D.	9
Service	21	MTech.	1
Research	26	MTech.	2
Service	28	BTech.	10
Consultancy	40	MTech.	14
Research	35	Ph.D.	10
Research	27	BTech.	6
Service	32	MTech.	9
Consultancy	45	Btech.	17
Research	36	Ph.D.	7

Elective-II A. Implementation of any 2 informed search methods for a Three LPG companies that wants to install a gas pipe-line between five cities. The cost of pipeline installation is given in a table maintained using XML/JSON use C++/ Python/ Java/ Scala with Eclipse for the application. Calculate time and space complexities. Use concepts of gamification, define necessary rules of the gamification.

Elective-II B. A Pizza shop chain wants to automate dishes served with schemes or without scheme and delivered by the nearest shop in a chain. Use pervasive computing paradime to develop a web-application using Embedded Java/ Pythone/ Scala so that the order be delivered to the customer within 10 minutes. Use XML/JSON to store the data.

Elective-II C. Using Python/Java with BBB develop a embedded security application of a door lock.

Elective-II D. Write a program using Scala/ Python/ C++ using Eclipse to correct the spelling of English paragraph.

- **Group B (Any Six Assignments: atleast 1 from the selected Elective)All assignments must be covered in a students batch of laboratory.**

1. Write a program to build smart mobile app for context management. Objective of this assignment is to build a smart app form smart phone which can sense some parameters of the user and convert this parameters into some contextual information in order to do the context management.

2. Write a program to build smart mobile app for user profiling. Objective of this assignment is to develop smart mobile app which can create user profiles based on their preferences so that smart recommendations cab be provided at run time.

3. Implementation of MiniMax approach for TIC-TAC-TOE using Java/ Scala/ Python-Eclipse Use GUI Player X and Player O are using their mobiles for the play. Refresh the screen after the move for both the players.

4. Implementation of a simple NN for any suitable application (without tool)

5. Implementation of any 2 uninformed search methods for a LPG company that wants to install a gas pipeline between five cities. The cost of pipeline installation is given in a table maintained using XML/JSON use C++/ Python/ Java/ Scala with Eclipse for the application. Calculate time and space complexities.

6. Write a program to perform classification for the sample dataset based on the by using LIBSVM – A Library for Support Vector Machines. (using LDA for dimensionality reduction).

7. Developing an book recommend-er (a book that the reader should read and is new) Expert system or (any other).

8. Develop a POP for scheduling your higher studies exam. Assume suitable data like college submission schedule, college exams, Constraint that a paper publication is must to appear before the exam, a family function at home and so on.

9. Implement k-means for clustering data of children belonging to different age groups to perform some specific activities. Formulate the Feature vector for following parameters:

   i. height
   ii. weight
   iii. age
   iv. IQ

   Formulate the data for 40 children to form 3 clusters.

Elective-II A1 Hints data, Algorithms names data and words data is stored using XML/ JSON/ MongoDB, The game is to select appropriate algorithms of string comparison using multiple hints to display meaningful combination of words. For example, Hints: Pratapgad (Fort)⟨ Historical Place Hint⟩, ⟨ HIstorical Event hint⟩ outcome can be Shri Shivaji Raje, Use Python/ Scala/ Java/ C++. Larger the number of hints lesser the marks for the outcome. There should be large number of combinations in the hints database. Find the Algorithmic Complexity/efficiency.

Elective-II A2 Hints data, Algorithms names data and words data is stored in distributed storage media/HDFS using XML/JSON/MongoDB/HBase, The game is to select appropriate algorithms of string comparison using multiple hints to display meaningful combination of words. For example, Hints: Pratapgad (Fort)⟨ Historical place hint⟩, ⟨ Historical event hints⟩ outcome can be Shri Shivaji Raje, Use Python/ Scala/ Java/ C++. Larger the number of hints lesser the marks for the outcome. There should be large number of combinations in the hints database.

Elective-II A3 Hints data, Algorithms names data and words data is stored in distributed storage media/HDFS using XML/JSON/MongoDB/HBase, The game is to select appropriate algorithms of string comparison using multiple hints to display meaningful combination of words. For example, Hints: Pratapgad (Fort)⟨Historical Location hint⟩, ⟨Historical Event hint⟩ outcome can be Shri Shivaji Raje, Use Python/ Scala/ Java/ C++. Larger the number of hints lesser the marks for the outcome. There should be large number of combinations in the hints database. Use Concurrent searching and Merging algorithms. Find the efficiency/Complexity.

Elective-II A4 Hints data, Algorithms names data and words data is stored in distributed storage media/HDFS using XML/JSON/MongoDB/HBase, The game is to select appropriate algorithms of string comparison using multiple hints to display meaningful combination of words. For example, Hints: Pratapgad (Fort) ⟨ Historical Location hint⟩, ⟨Historical Event hint⟩ outcome can be Shri Shivaji Raje, develop Python/ Scala/ Java Mobile App. Larger the number of hints lesser the marks for the outcome. There should be large number of combinations in the hints database. Use Concurrent searching and Merging algorithms. Find the efficiency/Complexity.

Elective-II A5 Elective teacher can frame suitable distributed programming application using wireless networks and smart devices equivalent to A1/A2/A3/A4 above.

Elective-II B1 In a rolling display program of news display on a smart TV or Computer Display the input strings are supplied by the mobile phone. Develop necessary app using Scala/ Python/ Java/ C++.

Elective-II B2 In a rolling display program of news display on a smart TV or Computer Display the input strings are supplied by another computer connected through wireless networks.Develop necessary app using Scala/ Python/ Java/ C++.

Elective-II B3 The BBB (Beagale Bone Black) is used in a Samrt CAR to rotate the steeper motor of a glass window by programmable angle, use model as a HOTSPOT device to transfer the Computer/Internet/Intranet page data of angle of rotation. Write a distributed application using JSON/ xml and Java/ Scala/ Python/ C++.

Elective-II B4 Elective teacher can frame suitable distributed programming application using wireless networks using Pervasive environment equivalent to B1/B2/B3 above.

Elective-II C1 Using Python/Java with BBB development board write a embedded security application of a password based door lock(stepper motor can be used with Photo diode or use LEDs. Use Mobile/ laptop/ desktop as a hotspot device/ Bluetooth device to lock or unlock the door.

Elective-II C2 Write a mobile app using Scala/ Python/ C++/ Android using Eclipse to beep the mobile speaker for three incorrect attempts of the password.

Elective-II C3 Elective teacher can frame suitable distributed programming application using wireless networks and smart devices in distributed environment equivalent to C1/C2 above.

Elective-II D: Using Programming language Python and Natural Language Tool Kit (NLTK) perform the following:

Elective-II D1 Apply Simple language processing for 10 phonetics Indian languages (Marathi or mother-tongue)

Elective-II D2 Lab on Sound Propagation.

Elective-II D3 Lab on Quantifying the Perception of Sound.

Elective-II D4 Lab on the Acoustic Analysis of Speech.

- **Group C (Any One Assignment)**

1 Study and implementation of research paper in Multidisciplinary NLP using open source tool

2 Write a program to Smart Watch App Development with Tizen. Objective of this assignment is to design simple comic app with the Tizen SDK for Wearable and run it on the smart watch emulator that comes bundled with the IDE.

Text Books:

Sl.No.	Text Books
1.	Laboratory Manual generated by the Laboratory Teachers of the respective college, in the Term-work Format; to be assessed and approved by the BoS
2.	Content in Digital Library

410448 Project

Teaching Scheme | **Examination Scheme**

Tutorial: 2 Hrs/Week | Term Work Assessment: 50

Course Objectives:

- To develop problem solving abilities using mathematics;
- To apply algorithmic strategies while solving problems;
- To develop time and space efficient algorithms;
- To develop software engineering documents and testing plans;
- To use algorithmic solutions using distributed, Embedded, concurrent and parallel environments.
- To encourage and expose students for participation in National/ International paper presentation activities.
- Exposure to Learning and knowledge access techniques using Conferences, Journal papers and participation in research activities.

Course Outcomes:

- To write problem solutions in projects using mathematical modeling, using FOSS programming tools and devices or commercial tools;
- To write SRS and other software engineering documents in the project report using mathematical models developed and NP-Hard analysis;
- To write test cases using multi-core, distributed, embedded, concurrent/Parallel environments;
- To write a conference paper;
- To practice presentation, communication and team-work skills.

Tools:

Preferably 64-bit FOSS tools but if sponsoring company's requirement is non-open source platform then it must be latest and current version of non-absolute tools. 64-bit i5/i7/ Desktops/Mobiles, Latest SAN, BBB or open source equivalent
3-tier architectures along with latest version of FOSS Operating systems like Fedora 21 or equivalent, LAMP tools, WEB server, Applications servers, Database servers, MongoDB or latest open source BigDATA tools, FOSS Programming Tools like gcc,g++,Eclipse, Python, Java and other tools are as per the requirement of the SRS. The documentation tools like Open office, GIT, Latex, Latex-Presentation.

Activity Planning for Tutorial Sessions:

I Selection of Project Option and Framing the Problem to solve as a Project for the group of 3 to 4 students.
Option A: Industry Sponsored Project
Option B: Project as a Entrepreneur
Option C: Internal Project

II Internal guide allocation for the BE Project: Assistant Professor/Associate Professor/Professor as per AICTE norms in computer engineering having atleast 5 years of full time approved experience can guide the BE Project without compromising on the quality of the work(ref. Note1). The Project laboratory of 4 project groups (3 to 4 students in one group) constituting one laboratory tutorial batch (2 hrs per week), be allocated to the guide. The project group will submit the synopsis including title of the project, Technical Key Words (Ref. ACM Keywords) and relevant mathematics associated with the Project, names of atleast two conferences, where papers can be published, Review of Conference/Journal papers (atleast 10 papers + White papers or web references, (if any)) supporting the project idea, Plan of project execution using planner or alike project management tool.(Recommended dates: 3 weeks after Commencement of the Term). Preferably, the projects are Industry Sponsored or part of high level research/ Sponsored Research Project that are not conducted for any award of the educational degree or entrepreneurship project.

III The project conduct and procedures are amended as detailed below:- Problem statement feasibility assessment using, satisfiability analysis and NP-Hard, NP-Complete or P type using modern algebra and relevant mathematical models.(recommended date of submission:- 8 weeks before term end)

IV Use of above to identify objects, morphism, overloading, functions and functional relations and any other dependencies. (recommended submission date:- 6 weeks before term end) Functional dependency graphs and relevant UML diagrams or other necessities.(recommended submission date:- 3 weeks before term end)

V Testing of problem statement using generated test data (using mathematical models, Function testing principles) selection and appropriate use of testing tools, testing of UML diagram's reliability. (recommended submission date:- two weeks before term end)

VI The index of submission must cover above mentioned 5 heads in addition to the instructions by the guide. Students must submit a Latex Report consisting of problem definition, literature survey, platform choice, SRS (System Requirement Specification) Document in specific format and high-level design document along with Annex A: Laboratory assignments on Project Analysis of Algorithmic Design, Annex B: Laboratory assignments on Project Quality and Reliability Testing of Project Design at the end of term-I and Annex C: Project Planner and progress report **after checking, removing/ avoiding the plagiarism. Give an additional assignment per reporting plagiarism to be submitted in the report under the Annex heading extra-work. If the project is the replica of any other previous project or work from other unrelated persons than the students team, such project should be rejected for the term work.**

The term work at the end of Term-I shall be assessed and evaluated for 50 marks by the panel of examiners in the subject (Internal (preferably guide) and external examiner from Computer Department of Engineering Colleges). At-least one technical paper must be submitted on the project design in the conferences/workshops in IITs, Central Universities or UoP Conferences or equivalent International Conferences Sponsored by IEEE/ACM and review comments received as Annex D. The examiners must seek answers regarding the suggestions given in the review comments of the paper submitted.

Term-I Project Laboratory Assignments: Tutorial Session

1. To develop the problem under consideration and justify feasibilty using concepts of knowledge canvas and IDEAMatrix.
2. Project problem statement feasibility assessment using NP-Hard, NP-Complete or satisfiability issues using modern algebra and/or relevant mathematical models.
3. Use of divide and conquer strategies to exploit distributed/parallel/concurrent processing of the above to identify objects, morphisms, overloading in functions (if any), and functional relations and any other dependencies (as per requirements).
4. Use of above to draw functional dependency graphs and relevant Software modeling methods, techniques including UML diagrams or other necessities using appropriate tools.
5. Testing of project problem statement using generated test data (using mathematical models, GUI, Function testing principles, if any) selection and appropriate use of testing tools, testing of UML diagram's reliability.

For Entrepreneurship type project additional assignments: Tutorial Session

6. To sign the MoU/agreement with the Engineering College for the Industry-on-Campus. The college shall provide the company the enclosure with lock-and-key to accommodate required table space, stabilized electricity and the Internet access. The College may host such company for first two years and further by renewing the MoU/Agreement. The college shall provide all such documents necessary for the establishment of the company. The College shall provide all the facilities as per agreement for Rent FREE, without any charges or fees or returns whatsoever for the First Year or Academic Duration of the activity. The college may prepare joint proposal with company for the AICTE/Government/University grants if any.

7. To study and establish a partnership company/proprietorship and get the PAN, MVAT, Profession Tax Number and such other necessary legal permissions.

8. Try and prepare clients list and communication with the clients or advertise the product by developing the Company WEB Site.

9. To submit Product Proposal for raising venture capital through government schemes of micro/small sector industries or through private venture capital entities.

10. To submit National/International patent/Copyright for first year to the Government Department of Patents and IPR.

Note 1. **The guide for an entrepreneurship project shall be a full time approved Professor or Associate Professor possessing qualifications as per AICTE norms.**

Note 2. **If the students fails to complete the entrepreneurship assignments successfully then the project shall be treated as Internal Project for the purpose of assessment.**

Note 3. **All projects are expected to exploit multi-core, embedded and distributed computing wherever possible.**

Reference Books:

Sl.No.	Reference Books
1.	Any recently published case studies in Knowledge Innovation Strategies
2.	Any recently published case studies Electronic Health Records and related standards
3.	McKinsey report: Big data: The next frontier for innovation, competition, and productivity (PDF)
4.	Web Resource: http://www.mckinsey.com/insights ... digital competition
5.	Web Resource: http://msme.gov.in/mob/home.aspx
6.	BoS Content: Books, Course Notes, Digital contents, Blogs developed by the BoS for bridging the gaps in the syllabus, problem solving approaches and advances in the course

Semester-II
410449 Software Design Methodologies and Testing

Teaching Scheme
Lectures: 3 Hrs/Week

Examination Scheme
In semester Assessment: 30
End Semester Assessment : 70

Course Objectives:

- To understand and apply different design methods and techniques
- To understand architectural design and modeling
- To understand and apply testing techniques
- To implement design and testing using current tools and techniques in distributed, concurrent and parallel environments

Course Outcomes:

- To present a survey on design techniques for software system
- To present a design and model using UML for a given software system
- To present a design of test cases and implement automated testing for client server, Distributed, mobile applications

Unit	Content	Hrs
I	**Concepts**	6
	Introduction to software Design,Design Methods:Procedural and Structural Design methods,Object Oriented design method,Unified modeling Language overview, Static and Dynamic Modeling - Advance Use case, Class,State,Sequence Diagrams	
II	**Architectural Design**	6
	Architectural Design,importance and architecture views,client-server ,service oriented, component based concurrent and real time software architecture with case studies	
III	**Introduction to Design Patterns**	8
	Design Patterns;Introduction,creational,Structural and behavioral patterns,singleton,proxy,adapter,factory,iterator,observer pattern with application	
IV	**Principles of Software Testing**	6
	Testing concepts, Principles of software testing, verification and validation, V-test model, defect management	
V	**Testing Strategies**	8
	Testing strategies, unit, integration and system testing , acceptance, alpha,beta, performance, security testing ,white box and black box testing, basis path testing, equivalence testing, graph base testing,test metric and report	
VI	**Advanced Techniques and Tools**	4
	GUI testing ,functional testing, Automated testing tools, features, selection, mobile testing, testing tools like selenium ,Junit, monkey talk	

Text Books:

Sl.No.	Text Books
1.	HASSAN GOMAA, Software Modeling and Design, Cambridge university Press, 2011, ISBN-13 978-1-107-44735-6
2.	Erich Gamma, Richard Helm,Ralph Johnson ,John Vlissides, Design patterns Elements of Reusable Object-Oriented Software
3.	Srinivasan Desikan, ”Software Testing Principals and practices”, Pearson Publication ISBN-13 978-8-17-758295-6

Reference Books:

Sl.No.	Reference Books
1.	Grady Booch,James Rumbaugh,Ivar Jacobson, The UML Users Guide, Pearson Publication 2013 print ISBN-13-978817758372-4
2.	BoS Content: Books, Course Notes, Digital contents, Blogs developed by the BoS for bridging the gaps in the syllabus, problem solving approaches and advances in the course

410450 High Performance Computing

Teaching Scheme	**Examination Scheme**
Lectures: 3 Hrs/Week	In semester Assessment: 30
	End Semester Assessment : 70

Course Objectives:

- To develop problem solving abilities using HPC
- To develop time and space efficient algorithms
- To study algorithmic examples in distributed, concurrent and parallel environments

Course Outcomes:

- To transform algorithms in the computational area to efficient programming code for modern computer architectures
- To write, organize and handle programs for scientific computations
- To create presentation of using tools for performance optimization and debugging
- To present analysis of code with respect to performance and suggest and implement performance improvements
- To present test cases to solve problems for multi-core or distributed, concurrent/Parallel environments

Unit	Content	Hrs
I	**Parallel Processing Concepts**	8
	Introduction to Parallel Computing: Motivating Parallelism, Scope of Parallel Computing, Organization and Contents of the Text, Parallel Programming Platforms: Implicit Parallelism: Trends in Microprocessor & Architectures, Limitations of Memory System Performance, Dichotomy of Parallel Computing Platforms, Physical Organization of Parallel Platforms, Communication Costs in Parallel Machines Levels of parallelism (instruction, transaction, task, thread, memory, function) Models (SIMD, MIMD, SIMT, SPMD, Dataflow Models, Demand-driven Computation) Architectures: N-wide superscalar architectures, multi-core, multi-threaded	
II	**Parallel Programming**	8
	Principles of Parallel Algorithm Design: Preliminaries, Decomposition Techniques, Characteristics of Tasks and Interactions, Mapping Techniques for Load Balancing, Methods for Containing Interaction Overheads, Parallel Algorithm Models, Processor Architecture, Interconnect, Communication, Memory Organization, and Programming Models in high performance computing architecture examples: IBM CELL BE, Nvidia Tesla GPU, Intel Larrabee Micro architecture and Intel Nehalem micro-architecture Memory hierarchy and transaction specific memory design, Thread Organization	
III	**Fundamental Design Issues in HPC**	6
	Programming Using the Message-Passing Paradigm: Principles of Message-Passing Programming, The Building Blocks: Send and Receive Operations, MPI: the Message Passing Interface, Topology and Embedding, Overlapping Communication with Computation, Collective Communication and Computation Operations, One-Dimensional Matrix-Vector Multiplication, Single-Source Shortest-Path, Sample Sort, Groups and Communicators, Two-Dimensional Matrix-Vector Multiplication	
IV	**Synchronization and related algorithms**	6
	Synchronization: Scheduling, Job Allocation, Job Partitioning, Dependency Analysis Mapping Parallel Algorithms onto Parallel Architectures, Performance Analysis of Parallel Algorithms Programming Shared Address Space Platforms: Thread Basics, Why Threads?, The POSIX Thread API, Thread Basics: Creation and Termination, Synchronization Primitives in Pthreads, Controlling Thread and Synchronization Attributes, Thread Cancellation, Composite Synchronization Constructs, Tips for Designing Asynchronous Programs, OpenMP: a Standard for Directive Based Parallel Programming	

V	**Advanced tools, techniques and applications**	6
	Bandwidth Limitations, Latency Limitations, Latency Hiding/Tolerating Techniques and their limitations, Dense Matrix Algorithms: Matrix-Vector Multiplication, Matrix-Matrix Multiplication, Sorting: Issues, Sorting on Parallel Computers, Sorting Networks, Bubble Sort and its Variants, Quicksort, Bucket and Sample Sort, Shared-Address-Space Parallel Formulation, Single -Source Shortest Paths- Distributed Memory Formulation	
VI	**HPC enabled Advanced technologies**	6
	Search Algorithms for Discrete Optimization Problems: Search Overhead Factor, Parallel Depth-First Search, Parallel Best-First Search, Introduction to (Block Diagrams only if any) Petascale Computing, Optics in Parallel Computing Quantum Computers, Recent developments in Nanotechnology and its impact on HPC Power-aware Processing Techniques in HPC	

Text Books:

Sl.No.	Text Books
1.	Kai Hwang,"Advanced Computer Architecture: Parallelism, Scalability, Programmability", McGraw Hill 1993
2.	David Culler Jaswinder Pal Singh, "Parallel Computer Architecture: A hardware/Software Approach", Morgan Kaufmann,1999.

Reference Books:

Sl.No.	Reference Books
1.	Kai Hwang,, "Scalable Parallel Computing", McGraw Hill 1998.
2.	George S. Almasi and Alan Gottlieb, "Highly Parallel Computing", The Benjamin and Cummings Pub. Co., Inc
3.	William James Dally and Brian Towles, "Principles and Practices on Interconnection Networks", Morgan Kauffman 2004.
4.	Hubert Nguyen, GPU Gems 3 - by (Chapter 29 to Chapter 41)
5.	Ananth Grama, Anshul Gupta, George Karypis, and Vipin Kumar, "Introduction to Parallel Computing", 2nd edition, Addison-Welsey, © 2003
6.	David A. Bader (Ed.), Petascale Computing: Algorithms and Applications, Chapman & Hall/CRC Computational Science Series, © 2007.
7.	BoS Content: Books, Course Notes, Digital contents, Blogs developed by the BoS for bridging the gaps in the syllabus, problem solving approaches and advances in the course

410451A Elective-III: Mobile Computing

Teaching Scheme
Lectures: 3 Hrs/Week

Examination Scheme
In semester Assessment: 30
End Semester Assessment : 70

Course Objectives:

- To develop problem solving abilities using Mobile Computing
- To study foundations of Mobile Computing

Course Outcomes:

- To write a survey on Mobile Computing Building Blocks.
- To write a presentation on survey FOSS tools and Technologies.
- To write test cases to solve problems using Mobile Computing algorithms.

Unit	Content	Hrs
I	**Fundamental of Wireless and basics of wireless network**	6
	Digital communication, wireless communication system and limitations, wireless media, frequency spectrum, technologies in digital wireless communication, wireless communication channel specification, wireless network, wireless switching technology, wireless communication	
II	**Mobile Communications and Computing**	7
	An Overview Mobile Communication, Mobile Computing, Mobile Computing Architecture, Mobile Devices, Mobile System Networks, Data Dissemination, Mobility Management, Security, Mobile Devices and Systems, Mobile Phones, Digital Music Players, Hand-held Pocket Computers, Hand-held Devices: Operating Systems, Smart Systems,Limitations of Mobile Devices, Automotive Systems.	
III	**GSM and other architectures**	6
	GSM-Services & System Architectures ,Radio Interfaces, Protocols Localization, Calling, Handover, Security, New Data Services, modulation, multiplexing, controlling the medium access, spread spectrum, coding methods, CDMA, IMT 2000, WCDMA and CDMA 2000, 4G Networks.	
IV	**Mobile Network and Transport Layer**	7
	IP & Mobile IP Network Layers, Packet Delivery & Handover Management, Location Management, Registration, Tunneling & Encapsulation, Route Optimization, Dynamic Host Configuration Protocol, Mobile Transport Layer, Conventional TCP/IP Transport Layer Protocol, Indirect TCP, Snooping TCP, Mobile TCP, Mobile Ad-hoc Networks(MANET), Routing and Routing Algorithms in MANET, security in ad-hoc networks.	
V	**Data Dissemination and Data Synchronization in Mobile Computing**	7
	Communication Asymetry, classification of data delivery mechanism, data dissemination broadcast models, selective tuning and indexing techniques, synchronization, synchronization software for mobile devices, synchronization protocols.	
VI	**Mobile Devices and Mobile Operating System**	6
	Mobile agent, applications framework, application server, gateways, service discovery, device management, mobile file system, Mobile Operating Systems, Characteristics, Basic functionality of Operating Systems: Window 8, iOS, Android OS.	

Text Books:

Sl.No.	Text Books
1.	Raj Kamal, Mobile Computing, 2/e , Oxford University Press-New Delhi
2.	Dr. Sunil kumar S. Manavi, Mahabaleshwar S. Kakkasageri, Wireless and Mobile Networks, concepts and protocols, Wiley, India.

Reference Books:

Sl.No.	Reference Books
1.	Andrew Tanenbaum, Modern Operating System, 3rd/e, Pearson Education International, ISBN Q-lB-filBMST-L
2.	Digital Content: iOS Technology Overview: IOSTechOverview.pdf, Apple Inc. Copyright 2014
3.	BoS Content: Books, Course Notes, Digital contents, Blogs developed by the BoS for bridging the gaps in the syllabus, problem solving approaches and advances in the course

410451B Elective-III: Web Technology

Teaching Scheme
Lectures: 3 Hrs/Week

Examination Scheme
In semester Assessment: 30
End Semester Assessment : 70

Course Objectives:

- To Learn advanced Web Technologies
- To apply technologies while solving problems

Course Outcomes:

- To present a survey on building blocks of Web Technologies and open source tools.
- To write presentations on using Web Technologies with case studies.
- To write test cases to use technologies for solving problems using Web Technologies.

Unit	Content	Hrs
I	**IoT Web Technology**	6
	The Internet of Things Today, Time for Convergence, Towards the IoT Universe, Internet of Things Vision, IoT Strategic Research and Innovation Directions, IoT Applications, Future Internet Technologies, Infrastructure, Networks and Communication, Processes, Data Management, Security, Privacy & Trust, Device Level Energy Issues, IoT Related Standardization, Recommendations on Research Topics.	
II	**IoT Applications for Value Creation**	6
	Introduction, IoT applications for industry: Future Factory Concepts, Brownfield IoT, Smart Objects, Smart Applications, Four Aspects in your Business to Master IoT, Value Creation from Big Data and Serialization, IoT for Retailing Industry, IoT For Oil and Gas Industry, Opinions on IoT Application and Value for Industry, Home Management, eHealth.	
III	**Internet of Things Privacy, Security and Governance**	6
	Introduction, Overview of Governance, Privacy and Security Issues, Contribution from FP7 Projects, Security, Privacy and Trust in IoT-Data-Platforms for Smart Cities, First Steps Towards a Secure Platform, Smartie Approach. Data Aggregation for the IoT in Smart Cities, Security	
IV	**Architectural Approach for IoT Empowerment**	8
	Introduction, Defining a Common Architectural Ground, IoT Standardization, M2M Service Layer Standardization, OGC Sensor Web for IoT, IEEE, IETF and ITU-T standardization activities, Interoperability Challenges, Physical vs Virtual, Solve the Basic First, Data Interoperability, Semantic Interoperability, Organizational Interoperability, Eternal Interoperability, Importance of Standardisation, Plan for validation and testing, Important Economic Dimension, Research Roadmap for IoT Testing Methodologies. Semantic as an Interoperability Enabler and related work.	
V	**Identity Management Models in IoT**	8
	Introduction, Vulnerabilities of IoT, Security requirements, Challenges for a secure Internet of Things, identity management, Identity portrayal, Different identity management model: Local identity, Network identity, Federated identity, Global web identity, Identity management in Internet of Things, User-centric identity management, Device-centric identity management, Hybrid identity management.	
VI	**Trust Management in IoT**	6
	Introduction, Trust management life cycle, Identity and trust, Third party approach, Public key infrastructure, Attribute certificates, Web of trust models, Web services security, SAML approach, Fuzzy approach for Trust, Access control in IoT, Different access control schemes, Authentication and Access control policies modeling.	

Text Books:

Sl.No.	Text Books
1.	Dr. Ovidiu Vermesan, Dr. Peter Friess, Internet of Things: Converging Technologies for Smart Environments and Integrated Ecosystems, River Publishers, 2013, ISBN: 978-87-92982-96-4 (E-Book), ISBN: 978-87-92982-73-5 (Print)
2.	Vijay Medishetti, Arshadeep Bahga, Internet of Things: A Hands-On Approach (Paperback)

Reference Books:

Sl.No.	Reference Books
1.	Cuno Pfister, Getting Started with the Internet of Things, O'Reilly Media, 2011, ISBN: 978-1-4493-9357-1
2.	Poonam Railkar, Identity Management for Internet of Thing, River Publishers, 2015, ISBN: 978-87-93102-91-0 (EBook), ISBN:978-87-93102-90-3(Hard Copy)
3.	BoS Content: Books, Course Notes, Digital contents, Blogs developed by the BoS for bridging the gaps in the syllabus, problem solving approaches and advances in the course

410451C Elective-III: Cloud Computing

Teaching Scheme
Lectures: 3 Hrs/Week

Examination Scheme
In semester Assessment: 30
End Semester Assessment : 70

Course Objectives:

- To study cloud computing concepts;
- Enhancing cloud computing environment.
- To study various platforms
- To study the applications that uses cloud computing.

Course Outcomes:

- To install cloud computing environments.
- To present a survey on cloud building blocks and technologies.
- To perform cloud computing admin and programming using open source tools.

Unit	Content	Hrs
I	**Introduction**	6
	Introduction, Roots of Cloud Computing: From mainframe to Cloud, Benefits of Cloud Computing SOA, Web services, Web 2.0, Mashups, Grid computing, Utility computing, Hardware virtualization, Essentials of Cloud characteristics, Challenges, Cloud economics, Role of Networks in Cloud Computing: Cloud types and service models, Cloud computing platforms : Openstack, Opennimbus, Eucalyptus Primary Cloud Service models, Cloud Services brokerage, Primary cloud deployment models, cloud computing reference model, The greenfield and brownfield deployment options	
II	**Virtualization**	8
	Introduction, Characteristics of Virutalized environments, Taxonomy of Virtualization techniques, Pros and Cons of Virtualization, Technology examples: Xen, KVM, Vmware, Microsoft Hyper-V	
III	**Storage in Cloud**	8
	Storage system architecture, Big data, Virtualize data centre(VDC) architecture, VDC Environment, server, storage, networking, desktop and application virtualization techniques and benefits, Virtual Machine Components and Process of converting physical to VMs, Block and file level storage virtualization, Virtual Provisioning, and automated storage tiering, VLAN, VSAN and benifits, Network traffic management techniques in VDC, Cloud file systems: GFS and HDFS, BigTable, HBase and Dynamo. Features and comparisons among GFS,HDFS.	
IV	**Cloud computing platforms**	6
	Infrastructure as Service, best-of breed cloud infrastructure components, cloud ready converged infrastructure, Virtual machine provisioning and migration services, Anatomy of Cloud infrastructure, Distributed management of virtual infrastructure, scheduling techniques, SLA Commitment	
V	**Cloud monitoring and management**	8
	Introduction and architecture for federated cloud computing, Performance prediction for HPC on Cloud. SLA management: Types of SLA, Life cycle of SLA, Traditional approaches of SLA. service catalog, service ordering process, management and functional interfaces of services , cloud portal and its functions, cloud interface standards along with SOAP and REST, system integration and work-flow modeling, cloud service life-cycle phases: service planning, service creation, service operation, and service termination Control layer, its functions and benefits,element and unified manager, software defined approach and techniques for managing IT resources	

VI	**Security in Cloud Computing**	6
	Introduction, Global Risk and Compliance aspects in cloud environments and key security terminologies, Technologies for Data security, Data security risk, Cloud computing and identity, Digital identity and access management, Content level security, Security-As-A-Cloud Service	

Text Books:

Sl.No.	Text Books
1.	Rajkumar Buyya, "Cloud computing principles and paradigms", Wiley
2.	Gautam Shroff, Enterprise Cloud Computing, Cambridge
3.	Handbook of Cloud Computing, Springer Publication
4.	Rajkumar Buyya, "Mastering Cloud computing", McGraw Hill
5.	Tim Mather, Subra K, Shahid L.,Cloud Security and Privacy, Oreilly, ISBN-13 978-81-8404-815-5

Reference Books:

Sl.No.	Reference Books
1.	Dr. Kumar Saurabh,"Cloud Computing", Wiley Publication
2.	Greg Schulr,"Cloud and virtual data storage networking",CRC Press
3.	Barrie Sosinsky,"Cloud Computing", Wiley India
4.	Kailash Jayaswal, " Cloud computing", Black Book, Dreamtech Press
5.	Anthony T. Velte, Cloud Computing: A Practical Approach, Tata McGraw Hill, 2009, ISBN: 0070683514
6.	Richard Hill, Guide to Cloud Computing: Principals and Practices, Springer ISBN-10: 1447146026
7.	Halper Fern, Kaufman Marcia, Bloor Robin, Hurwit Judith, Cloud Computing for Dummies, Wiley India, 2009, ISBN 8126524871
8.	BoS Content: Books, Course Notes, Digital contents, Blogs developed by the BoS for bridging the gaps in the syllabus, problem solving approaches and advances in the course

410451D Elective-III:Cyber Security

Teaching Scheme
Lectures: 3 Hrs/Week

Examination Scheme
In semester Assessment: 30
End Semester Assessment : 70

Course Objectives:

- To develop problem solving abilities using Cyber Security
- To apply algorithmic strategies for cyber security
- To develop time and space efficient algorithms
- To study algorithmic examples in distributed, concurrent and parallel environments

Course Outcomes:

- To write a survey on cyber security concepts.
- To create a case study report on practice administrating using Cyber Security open source tools.
- To write problem solutions for multi-core or distributed, concurrent/Parallel environments.

Unit	Content	Hrs
I	**Security Basics**	6
	Introduction, Elements of Information security, Security Policy, Techniques, steps, Categories, Operational Model of Network Security, Basic Terminologies in Network Security.	
II	**Data Encryption Techniques and Standards**	8
	Introduction, Encryption Methods: Symmetric, Asymmetric,Cryptography, Substitution Ciphers. Transposition Ciphers, Stenography applications and limitations, Block Ciphers and methods of operations, Feistal Cipher, Data Encryption Standard(DES), Triple DES, DES Design Criteria, Weak Keys in DES Algorithms, Advance Encryption Standard(AES).	
III	**Public Key and Management**	8
	Public Key Cryptography, RSA Algorithm: Working,Key length, Security, Key Distribution, Deffie-Hellman Key Exchange, Elliptic Curve: Arithmetic, Cryptography, Security, Authentication methods, Message Digest, Kerberos, X.509 Authentication service, Digital Signatures: Implementation, Algorithms, Standards (DSS), Authentication Protocol.	
IV	**Security requirements**	8
	Electronic Mail Security: Introduction, Pretty Good Privacy, MIME, S/MIME, Comparison. IP Security: Introduction, Architecture, IPV6, IPv4, IPsec protocols and Operations, AH Protocol, ESP Protocol, ISAKMP Protocol, Oakkey determination Protocol,VPN. WEB Security:Introduction, Secure Socket Layer(SSL), SSL Session and Connection, SSL Record Protocol, Change Cipher SpecProtocol, Alert Protocol, Handshake Protocol, Secure Electronic Transaction(SET).	
V	**Intrusion and Firewall**	6
	Introduction, Intrusion detection, IDS: Need, Methods, Types of IDS, Password Management, Limitations and Challenges, Firewall Introduction, Characteristics and types, Benefits and limitations. Firewall architecture, Trusted Systems, Access Control.	
VI	**Security perspective of Hacking and its counter majors**	6
	Remote connectivity and VoIP hacking, Wireless Hacking, Mobile Hacking, Hacking Hardware, Application and data Hacking, Mobile Hacking, Counter majors:General Strategies, Example Scenario's: Desktop, Servers, Networks, Web, Database, Mobile.	

Text Books:

Sl. No.	Text Books
1.	Dr. V.K. Pachghare, Cryptography and Information Security, PHI, ISBN 978-81-303-5082-3
2.	Nina Godbole,Sunit Belapure, Cyber Security,Wiley India, ISBN:978-81-345-2179-1

Reference Books:

Sl. No.	Reference Books
1.	PDF Digital Content : Stuart McCLURE, Joel Scambray, George Kurtz, Hacking Exposed Network Security Secrets and Solutions, McGrowHill, 2012 ISBN: 978-0-07-178028-5 Digital Ref: http://84.209.254.175/linux-pdf/Hacking-Exposed-7-Network-Security-Secrets.pdf College libraries are requested to purchase the copy
2.	BoS Content: Books, Course Notes, Digital contents, Blogs developed by the BoS for bridging the gaps in the syllabus, problem solving approaches and advances in the course

410452A Elective-IV (Open Elective): Business Analytic and Intelligence

Teaching Scheme
Lectures: 3 Hrs/Week

Examination Scheme
In semester Assessment: 30
End Semester Assessment : 70

Course Objectives:

- To develop problem solving abilities using Mathematics
- To apply algorithmic strategies while solving problems
- To develop time and space efficient algorithms
- To study algorithmic examples in distributed, concurrent and parallel environments

Course Outcomes:

- To write case studies in Business Analytic and Intelligence using mathematical models.
- To present a survey on applications for Business Analytic and Intelligence.
- To write problem solutions for multi-core or distributed, concurrent/Parallel environments

Unit	Content	Hrs
I	**Concepts with Mathematical treatment**	8
	Introduction to data, Information and knowledge, Decision Support System, Theory of Operational data and informational data, Introduction to Business Intelligence, Defining BI Cycle, BI Environment and Architecture, Identify BI opportunities, Benefits of BI. Role of Mathematical model in BI, Factors Responsible for successful BI Project, Obstacle to Business Intelligence in an Organization	
II	**Decision Making Concepts**	6
	Concepts of Decision Making, Techniques of Decision Support System (DSS), Development of Decision Support System (DSS), Applications of DSS, Role of Business Intelligence in DSS.	
III	**Data-Warehouse**	6
	Introduction: Data warehouse Modeling, data warehouse design, data-ware-house technology, Distributed data warehouse, and materialized view	
IV	**Data Pre-processing and outliers**	8
	Data Analytics life cycle, Discovery, Data preparation, Preprocessing requirements, data cleaning, data integration, data reduction, data transformation, Data discretization and concept hierarchy generation, Model Planning, Model building, Communicating Results & Findings, Operationalizing, Introduction to OLAP. Real-world Applications, types of outliers, outlier challenges, Outlier detection Methods, Proximity-Based Outlier analysis, Clustering Based Outlier analysis.	
V	**Designing and managing BI systems**	6
	Determining infrastructure requirements, planning for scalability and availability, managing and maintenance of BI systems, managing BI operations for business continuity	
VI	**BI and Data Mining Applications**	6
	Data analytics, business analytics, ERP and Business Intelligence, BI Applications in CRM, BI Applications in Marketing, BI Applications in Logistics and Production, Role of BI in Finance, BI Applications in Banking, BI Applications in Telecommunications, BI Applications in Fraud Detection, BI Applications in Retail Industry.	

Text Books:

Sl.No.	Text Books
1.	R. Sharda, D. Delen, & E. Turban, Business Intelligence and Analytics. Systems for Decision Support,10th Edition. Pearson/Prentice Hall, 2015. ISBN-13: 978-0-13-305090-5, ISBN-10: 0-13-305090-4;
2.	Business Process Automation, Sanjay Mohapatra, PHI.

Reference Books:

Sl.No.	Reference Books
1.	Introduction to business Intelligence and data warehousing, IBM, PHI.
2.	Data mining concepts and techniques, Jawai Han, Michelline Kamber, Jiran Pie, Morgan Kaufmann Publishers 3rd edition.
3.	Building the data Warehouse, William H Inmon, Wiley Publication 4th edition.
4.	Data Mining for Business Intelligence, WILEY
5.	Soumendra Mohanty, Analytics in Practice,Tata McGraw Hill Education, 2011, ISBN-13 978 0 07 0707061
6.	Ken W. Collier,Agile Analytics: Avalue driven Approach to Business Intelligence and Data Warehousing, Pearson Education,2012, ISBN-13 978 8131786826
7.	Donald Miner, MapReduce Design Pattern, O'Reilly, 2012, ISBN 978 9350239810
8.	EMC Educational Services, Data Science and Big Data Analytics: Discovering, Analyzing, Visualizing and Presenting Data, Wiley ISBN-13 978 1118876138
9.	BoS Content: Books, Course Notes, Digital contents, Blogs developed by the BoS for bridging the gaps in the syllabus, problem solving approaches and advances in the course

410452B Elective-IV (Open Elective): Operations Research for Algorithms in Scientific Applications

Teaching Scheme
Lectures: 3 Hrs/Week

Examination Scheme
In semester Assessment: 30
End Semester Assessment : 70

Course Objectives:

- To develop problem solving abilities using Mathematics
- To apply algorithmic strategies while solving problems
- To develop time and space efficient algorithms
- To study algorithmic examples in distributed, concurrent and parallel environments

Course Outcomes:

- To write a presentation on mathematical Concepts applied in Operations Research.
- To write a survey on applications of Operations Research.
- To write case studies for solving problems using multi-core or distributed, concurrent/Parallel environments

Unit	Content	Hrs
I	**Introduction to Operation Research**	6
	Origins of OR, Nature, Impact and phases of OR, Operation Research as tool for Decision Support System, Productivity Improvement. Overview of OR Research Techniques.	
II	**Deterministic OR Models**	6
	Formulation of Linear Programming Problem, Linear Programming Models, Assumptions of Linear Programming, Graphical Method of solving LP problem. Simplex method for solving LP problem.	
III	**Linear Programming Extensions**	8
	Introduction and Formulation of Transportation problem, Types of Transpiration problems, Methods of Initial feasible solution, Methods of optimum solution, Unbalanced Transportation problem, Introduction to Assignment problem. Solution of an assignment problem.	
IV	**Decision, Game & Queueing Theory**	8
	Formulation of two person, Zero-sum Games, Solving Simple Games, Mixed Strategies, Non-Zero Sum Games. Basic Structure & components of decision, decision criteria, decision trees. Basic characteristics of queueing system, Terminologies & notation, Poisson process of queueing, M/M/1 system queueing model.	
V	**Hybrid OR Models, Project Management PERT & CPM**	8
	Assumption and comparison PERT & CPM, Algorithms of PERT CPM Techniques, Fundamentals of Network Model, Guidelines for Network Construction, Critical path Analysis, Methods based on Time Estimates to find critical paths. Concept of Slack & floats in network analysis, Project Evaluation & Review Techniques (PERT).	
VI	**Dynamic Programming**	8
	Terminologies, Multi Decision Process, Bellman's Principles of optimality, Characteristics of Dynamic Programming problems. Dynamic programming Algorithms, Solving LPP using Dynamic Programming Recent development in OR with perspective of Bio-Technology, Nano Technology:	

Text Books:

Sl.No.	Text Books
1.	Hamidy Taha, Operations Research: An Introduction, Pearson, 8th Edition, ISBN: 978-81-317-1104-0
2.	Dr. S.D. Sharma, Operations Research, Kedar Nath Ram Nath & Co.

Reference Books:

Sl.No.	Reference Books
1.	Kishor Trivedi, Probability & Statistics with Reliability Queuing and Computer Science Applications, PHI, ISBN: 81-203-0508-6
2.	BoS Content: Books, Course Notes, Digital contents, Blogs developed by the BoS for bridging the gaps in the syllabus, problem solving approaches and advances in the course

410452C Elective-IV (Open Elective): Mobile Applications

Teaching Scheme
Lectures: 3 Hrs/Week

Examination Scheme
In semester Assessment: 30
End Semester Assessment : 70

Course Objectives:

- To develop problem solving abilities using Mobile Applications
- To study mobile programming technology.

Course Outcomes:

- To write a survey on tools and architectures for Mobile Applications.
- To write using mathematical models the problem solutions using Mobile Applications.
- To write develop mobile applications using open source tools.

Unit	Content	Hrs
I	**Introduction**	6
	Mobile Development Importance, Survey of mobile based application development, Mobile myths, Third party frameworks, Mobile Web Presence and Applications, Creating consumable web services for mobile, JSON, Debugging Web Services, Mobile Web Sites, Starting with Android mobile Applications.	
II	**Mobile Web**	6
	Introduction, WAP1, WAP2, Fragmentation Display, Input Methods, Browsers and Web Platforms, Tools for Mobile Web Development.	
III	**Application Architectures and Designs**	8
	Mobile Strategy, Navigation, Design and User Experience, WML, XHTML Mobile Profile and Basics, Mobile HTML5, CSS for Mobile, WCSS extensions, CSS3, CSS for mobile browsers, HTML5 Compatibility levels, Basics of Mobile HTML5: Document Head, Document Body, HTML5 Mobile Boilerplate, the Content, HTML5 Forms: Design, Elements, Attributes, Validation.	
IV	**Devices, Images, Multi-Media**	6
	Device Detection, Client-side Detection, Server-side Detection, Device Interaction, Images, Video, Audio, Debugging and Performance, Content Delivery, Native and Installed Web Apps.	
V	**Advanced Tools, Techniques**	8
	J2ME programming basics, HTML5 Script Extensions,Code Execution, Cloud based browsers, JS Debugging and profiling, Background Execution, Supported Technologies and API,Standard JavaScript Behavior, Java Libraries, Mobile Libraries, UI Frameworks: Sencha Touch, JQueryMobile, Enyo, Montage, iUI, jQTouch, JavaScript Mobile UI Patterns.	
VI	**Advanced Applications**	6
	Geolocation and Maps app, Offline Apps, Storage, and Networks, Distribution and Social Web 2.0	

Text Books:

Sl.No.	Text Books
1.	Jeff McWherter, Scott Gowell, Professional Mobile Application Development, John Wiley & Sons, Ref: www.it-ebooks.org
2.	Maximiliano Firtman, Programming the mobile Web, Oreilly, 2nd Edition, 2013, ISBN: 978-1-449-33497-0

Reference Books:

Sl.No.	Reference Books Digital Content
1.	Digital Content: http://en.wikibooks.org/wiki/Category: J2ME_Programming
2.	Android Studio Development Essentials, ref: http://www.techotopia.com/
3.	BoS Content: Books, Course Notes, Digital contents, Blogs developed by the BoS for bridging the gaps in the syllabus, problem solving approaches and advances in the course

Guidelines for 410452D Open Elective:

The listed open electives or any other electives that are being taught in the current semester (Term II) under engineering faculty or an individual college and Industry can define new elective with proper syllabus using defined framework of 410452D Elective IV as per following format and GET IT APPROVED FROM THE BOARD OF STUDIES COMPUTER ENGINEERING AND OTHER NECESSARY STATUTORY SYSTEMS of SAVITRIBAI PHULE PUNE UNIVERSITY BEFORE 30th DECEMBER.

410452D Elective-IV (Open Elective)

Teaching Scheme
Lectures: 3 Hrs/Week

Examination Scheme
In semester Assessment: 30
End Semester Assessment : 70

Course Objectives:

- To develop problem solving abilities using Mathematics
- To apply algorithmic strategies while solving problems
- To develop time and space efficient algorithms
- To study algorithmic examples in distributed, concurrent and parallel environments

Course Outcomes:

- To write a presentation for solving problem of Inter-disciplinary challenges using mathematical modeling.
- To write case studies to apply algorithmic skills for computing Applications.
- To write a problem solutions for multi-core or distributed, concurrent/Parallel environments

Unit	Content	Hrs
I	**Concepts with Mathematical treatments**	
II	**Concepts**	
III	**Concepts and related algorithms**	
IV	**Concepts and related algorithms**	
V	**Advanced open source tools, techniques**	
VI	**Advanced Applications**	

Text Books:

Sl.No.	Text Books
1.	
2.	

Reference Books:

Sl.No.	Reference Books
1.	
2.	

Frame suitable assignments as per format of Computer Laboratory-IV, add necessary programming FOSS tools.

410453 Computer Laboratory-III

Teaching Scheme
Practicals: 4 Hrs/Week

Examination Scheme
Oral Assessment: 50
Practical Assessment : 50

Course Objectives:

- To develop problem solving abilities using Mathematical Modeling
- To apply algorithmic strategies while solving problems
- To develop time and space efficient algorithms
- To implement software design and testing in distributed, concurrent and parallel environments

Course Outcomes:

- To write problem solutions using mathematical modeling.
- To write reports of application of software design methods and testing.
- To write programs using FOSS tools.
- To write problem solutions using multi-core or distributed, concurrent/Parallel environments

Tools:

64-bit Fedora or equivalent OS with 64-bit Intel-i5/i7 or latest higher processor computers, FOSS tools, Ruby on Rails, iburg, XMLVM, Intel Internet of Things (IoT) Developer Kit or Intel Galileo board or BBB or Open Source equivalent, the real-time operating system (RTOS) for IoT, NS3, Scala, Python, Modelio, StarUML2.x evaluation version, HTML-5 Camel, KADOS, NoSQLUnit

Evaluation and Term-work Assessment Method: Practical, Oral and Term work Assessment Scheme guidelines are to be used for evaluation.

A. Each Assignment/Class Designed must have Mathematical modeling using relevant Divide-n-Conquer strategies to be assessed for 10% of the Marks (Paper Work/Digital Write-up);

B. In A above, an ability demonstrated for eliminating the redundant Conditional statements is to be evaluated for the 20% of the marks(Paper Work/Digital Write-up).

C. In A above, an ability demonstrated for eliminating the redundant Loops statements is to be evaluated for the 20% of the marks(Paper Work/Digital Write-up).

D. The functioning of the programs is to be demonstrated by Black-Box Testing for 10% of the Marks;

E. White-Box Walk through Testing methods for 10% of the marks;

F. Positive-Negative testing for 10% of the marks;

G. In addition to these testing methods, student must select one of the advanced Software Testing method currently practiced in the Industry which is suitable for the functional assignment of the Reliability for 10% of the marks.

H. 10% of the marks are to be given for the Oral Questions using above.

I. 10% of the marks are to be given for the output generated for the practical/Oral/Term work.

J. The assessment as above is to be done by a pair of examiners as per prevailing rules of SPPU examination and items A,B,E by Examiner 1 and items C,D,F by Examiner 2 and items G,H,I to be assessed Jointly;

K. Latex or its equivalent be used to generate the document to be stored in the Read-only Digital Media as a term-work/Digital Journal format approved by the BoS after checking, removing/ avoiding the plagiarism. Give an additional assignment per assignment reporting plagiarism to be submitted in the journal under the heading extra-work.

L. Examination to be conducted on the assignments performed (Group A and Group-B).

Laboratory Assignments:

- **Group A (Mandatory Six Assignments)**

1. Using Divide and Conquer Strategies and object-oriented software design technique using Modelio to design a software function for Binary Search for an un-ordered data stored in memory. Use necessary USE-CASE diagrams and justify its use with the help of mathematical modeling and related efficiency. Implement the design using Eclipse C++ or python.

2. Using Divide and Conquer Strategies to design an efficient class for Concurrent Quick Sort and the input data is stored using XML. Use object oriented software design method and Modelio/ StarUML2.x Tool. Perform the efficiency comparison with any two software design methods. Use necessary USE-CASE diagrams and justify its use with the help of mathematical modeling. Implement the design using Scala/ Python/Java/C++.

3. A Web Tool for Booth's multiplication algorithm is used to multiply two numbers located in distributed environment. Use software design client-server architecture and principles for dynamic programming. Perform Risk Analysis. Implement the design using HTML-5/Scala/ Python/Java/C++/ Rubi on Rails. Perform Positive and Negative testing. Use latest open source software modeling, Designing and testing tool/Scrum-it/KADOS and Camel.

4. In an embedded system application Dining Philosopher's problem algorithm is used to design a software that uses shared memory between neighboring processes to consume the data. The Data is generated by different Sensors/WSN system Network and stored in MOngoDB (NoSQL). Implementation be done using Scala/ Python/ C++/ Java. Design using Client-Server architecture. Perform Reliability Testing. Use latest open source software modeling, Designing and testing tool/Scrum-it/KADOS, NoSQLUnit and Camel.

5. A Mobile App for Calculator having Trigonometry functionality is to be designed and tested. The data storage uses 1.text files, 2. XML Use latest open source software modeling, Designing and testing tool/ Scrum-it. Implement the design using HTML-5/Scala/ Python/Java/C++/Rubi on Rails. Perform Positive and Negative testing.

Elective-III A. Write a mobile application to fetch all audio files and, play the audio file when user clicks on any audio file from list view. Create Mobile GUI using Python/ Scala/ Java/ HTMK5/ Android.

Elective-III B. Create a web based e-Health Application for online appointments for the medical practitioner or hospital.

Elective-III C. Install following Cloud Simulators/Tools and frame suitable assignments to demonstarte its use: CloudSim, CloudAnalyst, GreenCloud/Docker, iCanCloud/IBM Smart Cloud, GDCSim/SPECI, MDCSim/ NetworkCloudSim.

Elective-III D. Write a program in python/ Java/ Scala/ C++/ HTML5 to implement password data encryption. Use encryption method overloading (any to methods studied)

- **Group B (Any Six Assignments: atleast 3 from the selected Elective) All assignments must be covered in a students batch of laboratory.**

1. 8-Queens Matrix is Stored using JSON/XML having first Queen placed, use back-tracking to place remaining Queens to generate final 8-queen's Matrix using Python.

2. A Web application for Concurrent implementation of ODD-EVEN SORT is to be designed using Real time Object Oriented Modeling(ROOM). Give the necessary design diagrams and write the test cases for the white box testing. Draw Concurrent collaboration Diagrams.

3. A mobile application needs to be designed for using a Calculator (+, - ,*, /, Sin, Cos, sq-root) with Memory Save/Recall using Extended precision floating point number format. Give the Required modeling, Design and Positive-Negative test cases.

4. Write a web application using Scala/ Python/ Java /HTML5 to check the plagiarism in the given text paragraph written/ copied in the text box. Give software Modeling, Design, UML and Test cases for the same using COMET(Concurrent Object Oriented Modeling and Architectural Design Method).

5. Write a web application using Scala/ Python/ Java /HTML5 to check the plagiarism in the given text paragraph written/ copied in the text box. Give software Modeling, Design, UML and Test cases for the same using Analysis Modeling (Static Modeling, Object Structuring, Dynamic Modeling).

6. 8-Queens Matrix is Stored using JSON/XML having first Queen placed, use back-tracking to place remaining Queens to generate final 8-queen's Matrix. Use suitable Software modeling , Design and testing methods. Justify the selection over other methods.

Elective-III A1 Write a web application using Scala/ Python/ Java /HTML5 to check the plagiarism in the given text. The required dataset must be available to the application to the logged-in mobile device. The database is maintained in NoSQL.

Elective-III A2 Write a mobile application to fetch images from the sdcard. Also provide the facility of deleting, renaming the images.

Elective-III A3 Write a mobile application for uploading and downloading the files on server. The Server can also be from Cloud platform.

Elective-III A4 Create a Menu based application for mobile devices which can do all the activities for Human resource management like
a. Employee attendance
b. Employee notices
c. Payroll Systems

Elective-III A5 Write a mobile application for Configuring mobile as
a. HOTSPOT Device
b. Sharing files through Bluetooth
c. Messaging to other mobile for inviting to play a game
For playing TiC-TaC-ToY Game. Use J2ME/ Python/ Scala/Android for programming

Elective-III B1 Write a web application using Scala/ Python/ Java /HTML5 to check the plagiarism in the given text. The required data-set must be available to the application to the logged-in IoT device.

Elective-III B2 Concurrent implementation of ODD-EVEN SORT is to be implemented as a web application using HTML5/ Scala/ Python/ Java. Write a debugger to test the performance of White-box testing.

Elective-III B3 Create a video web chat server with text messaging option. Detect the web cam attached to devices like computer/mobile phone.

Elective-III B4 Create a simple web services for
a. Calculator (+, - ,*, /, Sin, Cos, sq-root) with Memory Save/Recall using Extended precision floating point number format,
b. Currency Converter or Unit Converters
using object oriented programming using HTML5/ Pythom/ Java/ Scala

Elective-III B5 Create a web page for online registration of the international seminar. The participants can be students, faculty members, professional, and company / firm representatives from different countries. The registration fees should be accepted either in rupees or dollar or Pounds or Euros. The payment can be made by credit card, debit card or demand draft. The participants should give choice for accommodation for provided four hotels with services (minimum five other than basic services) required.
Use object oriented programming to create the web page with required form elements and default values. The form should provide the controls for the information to accept above mentioned details as well as for personal and other relevant information. You can use JSP/ HTML5/ Scala/ Python along with Database connectivity.

Elective-III C1 Lab teacher to frame suitable assignment to demonstrate the use of following PaaS tools: Cloud Foundry (Hint: Use Spring Framework), GoogleApp Engine, OpenShift

Elective-III C2 Perform a suitable assignment using Xen Hypervisor or equivalent open source to configure it. Give necessary GUI.

Elective-III C3 Write a program to create a bucket in an installed cloud.

Elective-III C4 Execute atleast three command related to the Storage organization of the cloud; Create necessary GUI using Python.

Elective-III C5 Create a VM depending on the user requirements.

Elective-III D1 A message is to be transmitted using network resources from one machine to another calculate and demonstrate the use of a Hash value equivalent to SHA-1. Develop peogram in C++/Python/Scala/Java using Eclipse.

Elective-III D2 Write a program to generate a pseudorandom number generator for generating the long-term private key and the ephemeral keys used for each signing based on SHA-1 using Python/Java/C++. Disregard the use of existing pseudorandom number generators available.

Elective-III D3 Write a program to produce a DSA signature using parameter tuple¡p,q,g¿, long term key pair and a message digest.

Elective-III D4 Write a Python/ Java program to validate the parameter tuple for the security of the DSA. Design necessary classes. Use Miller-Rabin primality testing may be used.

Elective-III D5 Write a program in Python/ Java/ C++ /Scala using Eclipse to Start/Stop the IDS, View current traffic, View blocked list (IP, Domains), view current firewall rules and unblock users. Create Necessary GUI.

- **Group C (Any One Assignment)**

1 Installation of Open source Cloud Infrastructure

2 Install and Use Latest IDS (Open Source).

Text Books:

Sl.No.	Text Books
1.	Laboratory Manual generated by the Laboratory Teachers of the respective college, in the Term-work Format; to be assessed and approved by the BoS
2.	Content in Digital Library

410454 Computer Laboratory-IV

Teaching Scheme	**Examination Scheme**
Practicals : 4 Hrs/Week	Term Work Assessment: 50
	Oral Assessment : 50

Course Objectives:

- To develop problem solving abilities using HPC.
- To Develop problem solving abilities using Business Analytics, OR and Mobile Programming.
- To develop time and space efficient algorithms
- To study algorithmic examples in distributed, concurrent and parallel environments

Course Outcomes:

- To write programs to develop applications using BIA Technologies using mathematical modeling.
- To write programs using OR and Mobile Programming Technologies using mathematical modeling.
- To write programs using FOSS tools and devices.
- To write problem solutions using multi-core or distributed, concurrent/Parallel environments

Tools:

64-bit Fedora or equivalent OS with 64-bit Intel-i5/i7 or latest higher processor computers, FOSS tools, LEX, YACC, DAG, iburg, XMLVM, Intel Internet of Things (IoT) Developer Kit or Intel Galileo board or BBB or Open Source equivalent, VxWorks® or open source equivalent, the real-time operating system (RTOS) for IoT, NS3, Scala, Python, HPC infrastructure

Evaluation and Term-work Assessment Method: Practical, Oral and Term work Assessment Scheme guidelines are to be used for evaluation.

A. Each Assignment/Class Designed must have Mathematical modeling using relevant Divide-n-Conquer strategies to be assessed for 10% of the Marks (Paper Work/Digital Write-up);

B. In A above, an ability demonstrated for eliminating the redundant Conditional statements is to be evaluated for the 20% of the marks(Paper Work/Digital Write-up).

C. In A above, an ability demonstrated for eliminating the redundant Loops statements is to be evaluated for the 20% of the marks(Paper Work/Digital Write-up).

D. The functioning of the programs is to be demonstrated by Black-Box Testing for 10% of the Marks;

E. White-Box Walk through Testing methods for 10% of the marks;

F. Positive-Negative testing for 10% of the marks;

G. In addition to these testing methods, student must select one of the advanced Software Testing method currently practiced in the Industry which is suitable for the functional assignment of the Reliability for 10% of the marks.

H. 10% of the marks are to be given for the Oral Questions using above.

I. 10% of the marks are to be given for the output generated for the practical/Oral/Term work.

J. The assessment as above is to be done by a pair of examiners as per prevailing rules of SPPU examination and items A,B,E by Examiner 1 and items C,D,F by Examiner 2 and items G,H,I to be assessed Jointly;

K. Latex or its equivalent be used to generate the document to be stored in the Read-only Digital Media as a term-work/Digital Journal after checking, removing/ avoiding the plagiarism. Give an additional assignment per assignment reporting plagiarism to be submitted in the journal under the heading extra-work.

L. Examination to be conducted on the assignments performed (Group A and Group-B).

Laboratory Assignments:

- **Group A (Mandatory Six Assignments)**

1. Using Divide and Conquer Strategies design a cluster/Grid of BBB or Rasberi pi or Computers in network to run a function for Binary Search Tree using C /C++/ Java/Python/ Scala
2. Using Divide and Conquer Strategies design a class for Concurrent Quick Sort using C++.
3. Write a MPI program for calculating a quantity called coverage from data files.
Hint :- Program distributes computation efficiently across the cluster. The program should be able to work with any number of nodes and should yield the same results as the serial code.
4. Write a program on an unloaded cluster for several different numbers of nodes and record the time taken in each case. Draw a graph of execution time against the number of nodes.
5. build a small compute cluster using Raspberry Pi/BBB modules to implement Booths Multiplication algorithm.

Elective-IV A. Use Business intelligence and analytics tools to recommend the combination of share purchases and sales for maximizing the profit.

Elective-IV B. A paint manufacturing company produces the interior and exterior paints using two raw materials M1 and M2. XML/JSON is used to store the following data i.e. Tons of Raw materials required to manufacture a ton of paint;

	Exterior Paints (1 Ton)	Interior Paints (1 Ton)	Maximum daily availability (tons)
Raw Material, M1	6	4	24
Raw Material, M2	1	2	6
Profit per Ton	5	4	

The market survey indicates that the daily demand for interior paint cannot exceed that for exterior paints by more than 1 ton. The maximum daily demand for interior paint is 2 tons. Write a program to recommend the optimally best products manufacturing quantity in tons of interior and exterior paints to maximize the total daily profit. Design necessary schema/ data structure and write a program using Scala/ python/ Java/ C++ to access the data to generate result using graphical method to Linear Problem(LP) and Tabular method for LP.
(Hint: Refer page 9 of the elective text book 1 (410452B).)

Elective-IV C. Write a mobile application to generate a Scientific calculator using J2ME/ Python/ Scala/ C++/ Android.

Elective-IV D. Design a suitable assignment in consultation with the industry expert for an open elective.

- **Group B (Any Six Assignments: atleast 1 from the selected Elective) All assignments must be covered in a students batch of laboratory.**

1. 8-Queens Matrix is Stored using JSON/XML having first Queen placed, use back-tracking to place remaining Queens to generate final 8-queen's Matrix using Python. Create a backtracking scenario and use HPC architecture (Preferably BBB) for computation of next placement of a queen.
2. Concurrent implementation of Tarson's Multiplication using BBB HPC or equivalent infrastructure. Use Java/ Python/ Scala/ C++ as programming language.
3. Develop a stack sampling using threads using VTune Amplifier.
4. Write a program to check task distribution using Gprof.l
5. Develop porting linux application for sorting of task essentials
6. Implement OBST Tree search using HPC task sub-division. Merge the results to get final result.

7. Perform concurrent ODD-Even Merge sort using HPC infrastructure (preferably BBB) using Python/ Scala/ Java/ C++.

8. Perform DSP(Digital Signal Processing) convolution operation on a given signal stored using XML/JSON/ text file using HPC infrastructure.

Elective-IV A1 A Mall has number of items for sale. Build a required Database to develop BAI tool for considering one aspect of growth to the business Such as organization of products based on demand and patterns use R Programming or other equivalent latest tools used in Industry or Use Hadoop, HDFS, HIVE, PIG, mongoBD Connectors for Hadoop and/OR other latest technology tools in the Hadoop Ecosystem for unstructured data analytics to effectively use advanced SQL functions and Greenplum extensions for in-database analytics. Use MADlib bigdata tools to solve analytics problems in-database Used for this assignment.

Elective-IV A2 Frame the suitable assignment to perform computing using BIA tools effectively.

Elective-IV B1 For the given data table in XML/JSON/ Simple File, Construct a two person zero-sum game using Python/Scala/C++. Design necessary data structures/schema (Hint: Refer pages 472, 473 Text Book 1 for the data).

Elective-IV B2 Design a suitable data for transportation problem or use of Poisson Distribution for Job Arrival and efficient execution and construct the OR solution. Write a program for the same.

Elective-IV C1 Write a Mobile App program using J2ME /Python /Scala /Java /Android to check the palindrome in a given string.

Elective-IV C2 Write a mobile smart App to call a emergency land-line number/ mobile number using gyroscope/ iris recognition/ thumb recognition or alike features of smart phone.

Elective-IV D1 To be defined by Industry persons supporting the open elective.

Elective-IV D2 To be defined by Industry persons supporting the open elective.

- **Group C (Any One Assignment)**

1 Write HTML5 programming techniques to compile a text PDF file integrating Latex.

2 Select an Industrial sector and write a BIA tool for maximizing the profit. [Optional: Placement Companies.]

3 Design suitable assignment for Mobile Programming [Optional: to take a snapshot using mobile camera.]

Text Books:

Sl.No.	Text Books
1.	Laboratory Manual generated by the Laboratory Teachers of the respective college, in the Term-work Format; to be assessed and approved by the BoS
2.	Content in Digital Library

410454 Project

Teaching Scheme
Tutorials: 6 Hrs/Week

Examination Scheme
Term Work Assessment: 100
Oral Assessment: 50

Course Objectives:

- To develop problem solving abilities using mathematics;
- To apply algorithmic strategies while solving problems;
- To develop time and space efficient algorithms;
- To develop software engineering documents and testing plans;
- To use algorithmic solutions using distributed, Embedded, concurrent and parallel environments.
- To encourage and expose students for participation in National/ International paper presentation activities.
- Exposure to Learning and knowledge access techniques using Conferences, Journal papers and participation in research activities.

Course Outcomes:

- To write review SRS, reliability testing reports, and other software engineering documents in the project report;
- To write problem solution using multi-core, distributed, embedded, concurrent/Parallel environments;
- To write the test cases to demonstrate the results of the project;
- To write conference paper;
- To write code using FOSS tools and technologies or propitiatory Tools as per requirements;
- To practice presentation, communication and team-work skills.

Tools:

Preferably 64-bit FOSS tools but if sponsoring company's requirement is non-open source platform then it must be latest and current version of non-absolute tools. Latest SAN, 3-tier architectures along with latest version of FOSS Operating systems like Fedora 21 or equivalent, LAMP tools, WEB server, Applications servers, Database servers, MongoDB or latest open source BigDATA tools, FOSS Programming Tools like gcc,g++,Eclipse, Python, Java and other tools are per requirement of the SRS. The documentation tools like Open office, GIT, Latex, Latex-Presentation.

1. Project workstation selection, installations and setup along with report to the guide. (recommended submission date:- 3 weeks after commencement of second term)
2. Programming of the project, GUI (if any) as per 1 st Term term- work submission.(recommended submission date:- Progress report every week during laboratory)
3. Test tool selection for various testing recommended by preferably external guide and generate various testing result charts, graphs etc. including reliability testing. (7 weeks before Term II Conclusion)
4. Review of design and necessary corrective actions taking into consideration feedback report of Term I assessment, and other competitions/conferences participated like IIT, Central Universities, University Conferences or equivalent centers of excellence etc.
5. Students must submit and preferably publish atleast one technical paper in the conferences held by IITs, Central Universities or UoP Conference or International Conferences in Europe or US.

6. Final term work submissions in the prescribed format given by the guides consisting of a project report consisting of a preliminary report prepared in term-I, detailed design (all necessary UML diagrams) document, User Interface design, Laboratory assignments on test cases and test results generated by selected project testing tool, conclusions, appendix (if necessary), glossary, tools used and references at the end of Term-II **after checking, removing/ avoiding the plagiarism. Give an additional assignment per reporting plagiarism to be submitted in the report under the Annex heading extra-work. If the project is the replica of any other previous project or work from other unrelated persons than the students team, such project should be rejected for the term work.**

7. The Term II examination is conducted by panel of examiners (preferably guide and expert from Industry having atleast 5 years subject experience (or senior teacher in the subject in case of non- availability of industry expert). The project assessment shall be done using Live Project Demonstration [in existing functional condition], using necessary simulators (if required) and presentation by the students. The remarks of Term I assessment and related corrective actions must be assessed during examining the term-work.

Term-II Project Laboratory Assignments:

1. Review of design and necessary corrective actions taking into consideration the feedback report of Term I assessment, and other competitions/conferences participated like IIT, Central Universities, University Conferences or equivalent centers of excellence etc.

2. Project workstation selection, installations along with setup and installation report preparations.

3. Programming of the project functions, interfaces and GUI (if any) as per 1 st Term term-work submission using corrective actions recommended in Term-I assessment of Term-work.

4. Test tool selection and testing of various test cases for the project performed and generate various testing result charts, graphs etc. including reliability testing.
   Additional assignments for the Entrepreneurship Project:

5. Installations and Reliability Testing Reports at the client end.

6. To study Clients Feedback reports and related fix generations.

7. To create Documents Profit and Loss accounts and balance-sheet of the company.

Note: If the students fails to complete the Entrepreneurship assignment successfully then the project shall be treated as Internal Project for the purpose of assessment.

Reference Books:

Sl.No.	Reference Books
1.	Term-I Project Report with Corrections, Reliability testing reports, plagiarism reports
2.	Journals references necessary for the Project
3.	BoS Content: Books, Course Notes, Digital contents, Blogs developed by the BoS for bridging the gaps in the syllabus, problem solving approaches and advances in the course

	G.H. Raisoni College of Engineering & Management, Wagholi, Pune – 412 207 **(An Autonomous Institute Affiliated to SPPU, Pune)**

Computer Department

M. Tech. Computer Engineering

Course Book

Year 2017-18

PG Coordinator	**BoS Chairman/HoD**
Mrs.Vidya Dhamdhere	**Ms. Poonam Gupta**

Index

VISION

To achieve excellent standards of quality education by keeping pace with rapidly changing technologies. To create technical manpower of global standards with Capabilities of accepting new challenges.

MISSION

Our efforts will be dedicated to impart quality and Value based education to raise satisfaction level of all stake-holders. Our strength will be directed to create competent engineers. Our endeavor will be to provide all support to promote research & development activities

RAISONI GROUP
a vision beyond

Vision of Computer Engineering Department

To produce global standard ethical professionals, innovators, and entrepreneurs having strong knowledge and urge to learn latest technologies in the field of computer engineering.

Mission of Computer Engineering Department

The department strives to continuously engage in

- To pursue excellence in all areas of Computer Engineering and develop students with strong foundations, able to adapt with rapidly changing technologies through effective Teaching- Learning Process.
- To develop technical manpower for global market with the spirit of self-study, team work, innovation and professionalism among the students.
- To promote continuous learning and preparing students in developing research, design, entrepreneurial skills and employability capabilities

List of PEOs and PSOs, PO's

List of Program Educational Objectives(PEO's) **Our post Graduates in Computer Engineering will be able to Demonstrate:**	
PEO1	To analyze, design and develop cost effective solutions to the real life problems by applying the acquired knowledge
PEO2	Adoptability to learn latest technological advancement and interdisciplinary approaches by engaging in lifelong learning process
PEO3	Willingness to pursue higher studies, entrepreneurship and research in the field of computer engineering.
PEO4	Being responsible towards society, environment, and an ethical responsible team member with inter personal, and leadership skills.

List of Program Specific Outcomes (PSOs) **At the end of the programme students will be able to demonstrate:**	
PSO1	The ability to analyze, design and develop software systems applying the knowledge acquired in computer core courses. (Operating system, Database, Computer Network, Computer Organization and Architecture, Software Engineering).
PSO2	The utilization of the skills assimilated in basic Computer Engineering courses to build up expertise in advanced areas of Database, Networking (WSN, VANET, MANET), IoT, Computing etc.
PSO3	Oneself as a global standard computer professional with good morals, ethics and sensitivity towards mankind and as a responsible team member to groom as a competent professional with good

	Communication, presentation and interpersonal skills.

Goals @ 2022

- To provide skill based courses, MOOCs, industry offered courses and internships with a collective percentage of 15% in the curriculum.
- To achieve 100% placements for 80% of the students with another 10% opting for higher education and remaining 10% turned out as first generation entrepreneurs.
- To set up a Centre of Excellence in collaboration with renowned industry and to achieve 100% sponsored projects by renowned industries and to make it as a commercial product.
- To promote students for publishing at least 1 paper in standard reputed journals, to file 3-4 patents and acquire 3-4 funded R & D projects.
- To obtain average academic performance of 7.5 CGPA and overall success ratio of 95%.

List of Program Outcomes (POs)	
PO1	An ability to independently carry out research /investigation and development work to solve practical problems
PO2	An ability to write and present a substantial technical report/document.
PO3	Students should be able to demonstrate a degree of mastery over the area as per the specialization of the program. The mastery should be at a level higher than the requirements in the appropriate bachelor program.
PO4	Ethics

Course Code

M. TECH. COMPUTER ENGINEERING FIRST YEAR –SEMESTER-I

SR. NO .	SUBJECT CODE	COURSE NAME	SEM	SCHEME	SUBJECT	ELEC TIVE	OFFER
1	MCEL501	Applied Algorithms	I	PG COMPUTER ENGINEERING 2016-17 [AUTONOMOUS]	THEORY	NO	YES
2	MCEL502	Advanced Computer Architecture	I	PG COMPUTER ENGINEERING 2016-17 [AUTONOMOUS]	THEORY	NO	YES
3	MCEL503	Research Methodology	I	PG COMPUTER ENGINEERING 2016-17 [AUTONOMOUS]	THEORY	NO	YES
4	MCEL504	High Performance Database	I	PG COMPUTER ENGINEERING 2016-17 [AUTONOMOUS]	THEORY	NO	YES
5	MCEL505A	Information Retrieval & Web mining	I	PG COMPUTER ENGINEERING 2016-17 [AUTONOMOUS]	THEORY	YES	YES
6	MCEL505B	Distributed computing	I	PG COMPUTER ENGINEERING 2016-17 [AUTONOMOUS]	THEORY	YES	YES
7	MCEL505C	Real time operating system	I	PG COMPUTER ENGINEERING 2016-17 [AUTONOMOUS]	THEORY	YES	YES
8	MVEL505	Open Elective(E&TC Elective 1)	I	PG COMPUTER ENGINEERING 2016-17 [AUTONOMOUS]	THEORY	YES	YES
9	MCEL506A	Data Mining and Machine Learning	I	PG COMPUTER ENGINEERING 2016-17 [AUTONOMOUS]	THEORY	YES	YES
10	MCEL506B	Grid computing	I	PG COMPUTER ENGINEERING 2016-17 [AUTONOMOUS]	THEORY	YES	YES
11	MCEL506C	Advanced compiler Design	I	PG COMPUTER ENGINEERING 2016-17 [AUTONOMOUS]	THEORY	YES	YES
10	MCEL506D	Industry offered subject	I	PG COMPUTER ENGINEERING 2016-17 [AUTONOMOUS]	THEORY	YES	YES
13	MCEP507	Lab practice-I	I	PG COMPUTER ENGINEERING 2016-17 [AUTONOMOUS]	Practical	NO	YES
14	MSDP501	Advanced skill Development	I	PG COMPUTER ENGINEERING 2016-17 [AUTONOMOUS]	Skill Development	NO	YES

M. TECH. COMPUTER ENGINEERING FIRST YEAR –SEMESTER-II

SR. NO .	SUBJECT CODE	COURSE NAME	SEM	SCHEME	SUBJECT	ELECTIVE	OFFER
1	MCEL508	Operating System Design	II	PG COMPUTER ENGINEERING 2016-17 [AUTONOMOUS]	THEORY	NO	YES
2	MCEL509	Software Design and Architecture	II	PG COMPUTER ENGINEERING 2016-17 [AUTONOMOUS]	THEORY	NO	YES
3	MCEL510	Advanced Computer Networks	II	PG COMPUTER ENGINEERING 2016-17 [AUTONOMOUS]	THEORY	NO	YES
4	MCEL511	Cyber security and forensic	II	PG COMPUTER ENGINEERING 2016-17 [AUTONOMOUS]	THEORY	NO	YES
5	MCEL512A	Business Intelligence and Infrastructure management	II	PG COMPUTER ENGINEERING 2016-17 [AUTONOMOUS]	THEORY	YES	YES
6	MCEL512B	Mobile Computing	II	PG COMPUTER ENGINEERING 2016-17 [AUTONOMOUS]	THEORY	YES	YES
7	MCEL512C	Network Security & Cryptography	II	PG COMPUTER ENGINEERING 2016-17 [AUTONOMOUS]	THEORY	YES	YES
8	MVEL511	Open Elective(E&TC Elective 2)	II	PG COMPUTER ENGINEERING 2016-17 [AUTONOMOUS]	THEORY	YES	YES
9	MCEL513A	Big data analytics	II	PG COMPUTER ENGINEERING 2016-17 [AUTONOMOUS]	THEORY	YES	YES
10	MCEL513B	Cloud Computing	II	PG COMPUTER ENGINEERING 2016-17 [AUTONOMOUS]	THEORY	YES	YES
11	MCEL513C	Intelligent System	II	PG COMPUTER ENGINEERING 2016-17 [AUTONOMOUS]	THEORY	YES	YES
10	MVEL512	Open Elective(E&TC Elective 3)	II	PG COMPUTER ENGINEERING 2016-17 [AUTONOMOUS]	THEORY	YES	YES
13	MCEP514	Lab practice-II	II	PG COMPUTER ENGINEERING 2016-17 [AUTONOMOUS]	Practical	NO	YES

M. TECH. COMPUTER ENGINEERING SECOND YEAR SEMESTER-III

SR. NO	SUBJECT CODE	COURSE NAME	SEM	SCHEME	SUBJECT	ELEC TIVE	OFFER
1	MCEP601	Technical course-LaTeX	III	PG COMPUTER ENGINEERING 2016-17 [AUTONOMOUS]	Technical Course	NO	YES
2	MCEP602	Seminar I	III	PG COMPUTER ENGINEERING 2016-17 [AUTONOMOUS]	Seminar	NO	YES
3	MCEP603	Dissertations Phase -I	III	PG COMPUTER ENGINEERING 2016-17 [AUTONOMOUS]	Project	NO	YES

M. TECH. COMPUTER ENGINEERING SECOND YEAR SEMESTER-IV

SR NO	SUBJECT CODE	COURSE NAME	SEM	SCHEME	SUBJECT	ELEC TIVE	OFFER
1	MCEP604	Seminar II	IV	PG COMPUTER ENGINEERING 2016-17 [AUTONOMOUS]	Seminar	NO	YES
2	MCEP605	Dissertation Phase -II	IV	PG COMPUTER ENGINEERING 2016-17 [AUTONOMOUS]	Project	NO	YES

Course Structure

Scheme of Examination for M. Tech.													
Branch-Computer Engineering													
Semester-I													
Subject code	**Name of the course**	**Teaching scheme (Weekly Load in Hrs.)**				**Credits**	**Evaluation Scheme**						**ESE Duration (Hrs.)**
							Theory			**Practical (Cont. Ass.+External)**	**Total**		
		Lecture	**Tutorial**	**Practical**	**Total**		**TAE 20 %**	**CAE 20%**	**ESE 60%**				
MCEL501	Applied Algorithms	4	-	-	4	4	20	20	60	-	100		3
MCEL502	Advanced Computer Architecture	3	-	-	3	3	20	20	60	-	100		3
MCEL503	Research Methodology	2	-	-	2	2	20	20	60	-	100		3
MCEL504	High Performance Database	3	-	-	3	3	20	20	60	-	100		3
MCEL505	Elective I	3	-	-	3	3	20	20	60	-	100		3
MCEL506	Elective II	3	-	-	3	3	20	20	60	-	100		3
MCEP507	Lab practice-I	-	-	4	4	2	-	-	-	100	100		-
MSDP501	Advanced skill Development	-	-	2	2	AU	-	-	-	-	-		-
	Total	18	-	6	24	20	120	120	360	100	700		-

Subject Code	**Elective I –Subject's**	**Subject Code**	**Elective II–Subject's**
MCEL505A	Information Retrieval & Web mining	MCEL506A	Data Mining and Machine Learning
MCEL505B	Distributed computing	MCEL506B	Grid computing
MCEL505C	Real time operating system	MCEL506C	Advanced compiler Design
MVEL505	Open Elective(E&TC Elective 1)	MCEL506D	Industry offered subject

Scheme of Examination for M. Tech												
Branch-Computer Engineering												
Semester-II												
Subject code	**Name of the course**	**Teaching scheme (Weekly Load in Hrs.)**				**Credits**	**Evaluation Scheme**					**ESE Duration (Hrs.)**
							Theory			**Practical (Cont. Ass. +External)**	**Total**	
		Lecture	**Tutorial**	**Practical**	**Total**		**TAE 20 %**	**CAE 20%**	**ESE 60%**			
MCEL508	Operating System Design	3	-	-	3	3	20	20	60	-	100	3
MCEL509	Software Design and Architecture	3	-	-	3	3	20	20	60	-	100	3
MCEL510	Advanced Computer Networks	3	-	-	3	3	20	20	60	-	100	3
MCEL511	Cyber security and forensic	3	-	-	3	3	20	20	60	-	100	3
MCEL512	Elective –III	3	-	-	3	3	20	20	60	-	100	3
MCEL513	Elective –IV	3	-	-	3	3	20	20	60	-	100	3
MCEP514	Lab practice-II	-	-	4	4	2	-	-	-	100	100	-
	Total	18	-	04	22	20	120	120	360	100	700	-

Subject Code	**Elective III –Subject's**	**Subject Code**	**Elective IV–Subject's**
MCEL512A	Business Intelligence and Infrastructure management	MCEL513A	Big data analytics
MCEL512B	Mobile Computing	MCEL513B	Cloud Computing
MCEL512C	Network Security & Cryptography	MCEL513C	Intelligent System
MVEL511	Open Elective(E&TC Elective 2)	MVEL512	Open Elective(E&TC Elective 3)

Scheme of Examination for M. Tech.														
Branch-Computer Engineering														
Semester-III														
Subject code	Name of the course	Teaching scheme (Weekly Load in Hrs.)				Credits	Evaluation Scheme						ESE Duration (Hrs.)
							Theory			Practical		Total	
		Lecture	Tutorial	Practical	Total		TAE 20 %	CAE 20%	ESE 60%	TW (Cont. Ass	OR (Cont. Ass. +External		
MCEP601	Technical course-LaTeX	-	-	6	6	3	-	-	-	50	-	50	-
MCEP602	Seminar I	-	-	4	4	4	-	-	-	50	50	100	-
MCEP603	Dissertations Phase -I	-	-	8	8	8	-	-	-	50	100	150	-
	Total	-	-	18	18	15	-	-	-	150	150	300	-

Scheme of Examination for M. Tech													
Branch-Computer Engineering													
Semester-IV													
Subject code	Name of the course	Teaching scheme (Weekly Load in Hrs.)				Credits	Evaluation Scheme						ESE Duration (Hrs.)
							Theory			Practical		Total	
		Lecture	Tutorial	Practical	Total		TAE 20 %	CAE 20%	ESE 60%	TW (Cont. Ass	OR (Cont. Ass. +External		
MCEP604	Seminar II	-	-	4	4	4	-	-	-	50	50	100	-
MCEP605	Dissertation Phase -II	-	-	16	16	16	-	-	-	100	100	200	-
	Total	-	-	20	20	20	-	-	-	150	150	300	-

Course Syllabus
SEM-I

MCEL501- Applied Algorithms		
Teaching Scheme: **Lectures:**4Hrs/Week **Tutorials:** Hrs./Week **Practical:** Nil	**Examination Scheme (Theory)** **Teacher Assessment Exam :** 20 Marks **Class Assessment Exam:** 20 Marks. **End Sem. Examination:**.60 Marks	**Examination Scheme (Laboratory)** **Internal(TW):** Nil **External(OR)**: Nil **External(PR)** : Nil
Credit	**4**	

Prerequisite(If any):

1. Data structure

Course Objective:

1. This course covers selected topics in algorithms that have found applications in areas such as geometric modeling, graphics, computer animation, etc.
2. The course objective is to teach problem formulation and problem solving skills.
3. The course aims at keeping a sound balance between programming and analytical problem solving.

Course Outcome:

1. To develop problem formulation and problem solving skills.
2. To understand fundamentals of algorithm.
3. To solve problems for Linear Programing.
4. To understand analysis of algorithm
5. Able to understand computing algorithm
6. Able to understand and design geometric & approximation algorithm

Course Contents	**Hrs.**
Unit – I : Analysis of Algorithms	8
Review of algorithmic strategies, Asymptotic analysis: upper and lower complexity bounds. Identifying differences among best, average and worst Case Behaviors. Big O, little O, omega and theta notations, Standard complexity classes. Empirical measurements of performance. Time and space trade-offs in algorithms. Analyzing recursive algorithms using recurrence relations.	
Unit – II : Fundamental Computing Algorithms	8
Numerical algorithms, Sequential and binary search algorithms. Quadratic sorting algorithms and O (n log n) sorting algorithms. Algorithms on graphs and their complexities using Greedy Approach for --- Prim's and Kruskal's Algorithm for minimum spanning tree, Single source shortest path Algorithm, all pair shortest paths in Graph.	
Unit – III : Approximation Algorithms	8
Introduction, Absolute approximation, Epsilon approximation, Polynomial time Approximation schemes, probabilistically good algorithms.	

Unit – IV : Geometric Algorithms	8
Prerequisites – Basic properties of line, intersection of line, line segment, polygon, etc. Line segment properties, detaining segment intersection in time complexity (n log n),Convex Hull problem – formulation, solving by Graham scan algorithm, Jarvis march algorithm; closest pair of points – problem formulation, solving by divide & conquer method.	
Unit – V : Linear Programming	8
Standard and Slack forms, formulation of problems as linear programs, simplex algorithm, duality, initial basic feasible solution. Problem formulation for – single source shortest path, maximum flow problem, Vertex cover problem, Knapsack problem.	
Unit – VI : Probability Based Analysis	8
Expectations**:** Introduction, Moments, Expectations of functions of more than one random variable, transform methods, moments and transforms of distributions, computation of mean time to failure, inequalities and limit theorems.	

Text Books:
1. Horowitz and Sahani, "Fundamentals of Computer Algorithms", 2ND Edition. University Press, ISBN: 978 81 7371 6126, 81 7371 61262
2. Gilles Brassard and Paul Bartley, "Fundamental of Algorithmics", PHI, New Delhi.
3. Algorithms, Kenneth Berman and Jerome Paul, Cenage Learning ISBN-13 978-81-315-0521-2
Reference Books:
1. Kishore S. Trivedi, “Probability & Statistics with Reliability, Queing, and Computer Science Applications” PHI
2. `Cormen, Leiserson, Rivest,Stein , “Introduction To Algorithms”, Third Edition, PHI
3. Bressard, “Fundamentals of Algorithms”, PHI
4. Horowitz, Sahni, “Fundamentals of Computer Algorithm”, Galgotia
5. S. Baase, S and A. Van Gelder, "Computer Algorithms: Introduction to Design and Analysis", 3rd edition. Addison Wesley,2000
6. Aho, Hopcraft, Ullman, “The Design and Analysis of Computer Algorithms”, Addison Wesley
7. Knuth, “Art of Programming”, Addison Wesley
8. C Papadimitriou and K Steiglitz, “Combinatorial Optimization”, PHI

<table>
<tr><td colspan="4">MCEL502 - Advanced Computer Architecture</td></tr>
<tr><td>Teaching Scheme:
Lectures:3Hrs/Week
Tutorials: Hrs.
Practical: NIL</td><td>Examination Scheme (Theory)
Teacher Assessment Exam: 20 Marks
Class Assessment Exam: 20 Marks.
End Sem. Examination:.60 Marks</td><td colspan="2">Examination Scheme (Laboratory)
Internal(TW): NIL
External(OR):NIL
External(PR) :NIL</td></tr>
<tr><td>Credit</td><td colspan="3">3</td></tr>
<tr><td colspan="4">Prerequisite (If any):</td></tr>
<tr><td colspan="4">1. Microprocessor Architecture</td></tr>
<tr><td colspan="4">2. Distributed System</td></tr>
<tr><td colspan="4">Course Objective:</td></tr>
<tr><td colspan="4">1. To learn concept of parallel processor working.</td></tr>
<tr><td colspan="4">2. To understand concept of hardware parallel pipeline.</td></tr>
<tr><td colspan="4">3. To study Parallel programming and program development environments</td></tr>
<tr><td colspan="4">Course Outcome:</td></tr>
<tr><td colspan="4">1. To understand concept of parallel processing.</td></tr>
<tr><td colspan="4">2. To study the concept of pipeline concepts.</td></tr>
<tr><td colspan="4">3. To understand parallel programming and program development environments.</td></tr>
<tr><td colspan="4">4. To understand the concept of architecture & computing model</td></tr>
<tr><td colspan="4">5. To study and understand the concept of hardware parallelism</td></tr>
<tr><td colspan="4">6. To study the concept of advanced computing architecture</td></tr>
<tr><td colspan="3">Course Contents</td><td>Hrs.</td></tr>
<tr><td colspan="3">Unit – I :Introduction to architectures and Computing Models</td><td rowspan="2">6</td></tr>
<tr><td colspan="3">Evolution in processor development, Generic computer architecture, Data representation, Instruction sets, data path and control, memory management, Buses and peripherals, Networking and communication, Multiprocessor and multicomputer, multi vector and SIMD systems, PRAM and VLSI models, network properties, conditions for parallelisms, partitioning and scheduling, program flow mechanisms, system interconnect architectures</td></tr>
<tr><td colspan="3">Unit – II : Performance metrics</td><td rowspan="2">6</td></tr>
<tr><td colspan="3">Metrics and measures for parallel programs, Speedup performance laws, scalability analysis approaches, Amdahl’s law, limitation, Benchmark, SIMD, MIMD Performance.</td></tr>
<tr><td colspan="3">Unit – III : Hardware parallelism</td><td rowspan="2">6</td></tr>
<tr><td colspan="3">Processor and memory hierarchy- Advanced processor technology, superscalar and vector processors, memory hierarchy, virtual memory, shared memory organizations, bus systems, consistency on shared data, Pipelining- Linear and non linear pipelines, Instruction pipelines,</td></tr>
</table>

instruction and arithmetic pipeline design	
Unit – IV : Parallel and Scalable architectures	6
Multiprocessor and system interconnects, cache coherence and synchronization mechanisms, multicomputer generations, message passing paradigms, Multi vector architecture principles of vector processing, multiprocessors, compound vector processing, SIMD organization, MIMD organization, multithread and dataflow architectures: Multithreading, fine grained multi computers, dataflow and hybrid architectures, Single Program-Multiple Data(SPMD), Multiple Program, Multiple Data(MPMD), Case study of non-coherent multiprogramming in PRAM	
Unit – V: Parallel programming and program development environments	6
Parallel programming models, parallel languages and compilers, dependence analysis and of data arrays, code optimization and scheduling, loop parallelism and pipelining, Parallel programming environments, synchronization and multiprocessing modes, shared variable programs, message passing programs, mapping programs on multi-computers. Operating system support for parallel program execution, processes and threads, parallel programming languages-C-Linda, Fortran-90, Programming with MPI. Introduction to map reduce.	
Unit – VI : Advanced Computing Architectures	6
Quantum Computing, Bio/Molecular Computing, Grid Computing, Neuro Computing, Cloud Computing, Introduction to GPU parallel architecture.	

Text Books:
1. High Performance Computer Architectures by Harrold Stone
2. Computer Architecture: A Quantitative Approach, John L Hennessy, David a Patterns, 4th Edition,
3. Kai Hwang, "Advanced Computer Architecture: Parallelism, Scalability, Programmability", McGraw Hill 1993
4. David Culler Jaswinder Pal Singh, "Parallel Computer Architecture: A hardware/Software Approach", Morgan Kaufmann,1999.
5. David A. Bader (Ed.), Petascale Computing: Algorithms and Applications, Chapman & Hall/CRC Computational Science Series, c 2007
Reference Books:
1. Computer Architecture and Organization, Miles Murdocca , Vincent Heuring- Wiley Publication
2. Advanced Computer Architecture, Kai Hwang and Naresh Jotwani, Mc. Graw. Hill Publication
3. Kai Hwang,, "Scalable Parallel Computing", McGraw Hill 1998.
4. George S. Almasi and Alan Gottlieb, "Highly Parallel Computing", The Benjamin and Cummings Pub. Co., Inc
5. Ananth Grama, Anshul Gupta, George Karypis, and Vipin Kumar, "Introduction to Parallel Computing", 2nd edition, Addison-Welsey, c 2003
6. Hubert Nguyen, GPU Gems 3 - by (Chapter 29 to Chapter 41)

MCEL503- Research Methodology		
Teaching Scheme: **Lectures:** 2 Hrs./Week **Tutorials:** -- Hrs./Week **Practical:** -- Hrs./Week	**Examination Scheme (Theory)** **Teacher Assessment Exam:** 20 Marks **Class Assessment Exam:** 20 Marks. **End Sem. Examination**.60 Marks	**Examination Scheme (Laboratory)** **Internal(TW):** --- Marks **External(OR)**:--- Marks **External(PR)** :--- Marks
Credit	**2**	
Prerequisite (If any): -		

Course Objective:

1. To understand concept of research and its different method
2. How to write research synopsis.
3. How to write research report.
4. How to write research proposals.

Course Outcome: Student should be able to

1. Understand research concept and different method used.
2. Write research synopsis or proposal.
3. Apply research design methods in dissertation.
4. Apply different tools and techniques for research findings.
5. Learn and apply different data processing techniques
6. Understand and make good dissertation report

Course Contents	**24 Hrs.**
Unit – I : **Understand the research process**	4
Evolution of research methodology; Meaning, nature, scope, and significance of research; Research paradigm; Objectives of research, Motivation for research; Postulates underlying scientific investigations; Types of research; Research process and workflow; Principles of ethics, ethical considerations in research; Intellectual Property Rights (IPR)	
Unit – II : **Problem identification and hypothesis formulation**	4
Selecting an area for research; Problem identification; Literature search; “Understanding” reported research; Fitting the pieces; Ascertaining current state of knowledge; Sources of information; Recording literature search findings; Defining the problem; Hypothesis formulation	
Unit – III : **Research design**	4
Type of research designs, pitfalls and advantages; Research approaches; Principles of experimental design; Design of experiments; Characteristics of good research design; Universe, population, and sample; Sampling concepts, principles, and techniques; Sample design (random, pseudo random, cluster, stratified, multi-stage); Sampling considerations (size, design, selection, measurements); Measures, Measurements, Metrics, and Indicators; Measurement scales and direct measurements	
Unit – IV : **Methods, tools, and techniques**	4
Data collection techniques (observation, interviewing, questionnaires, web-based, group techniques, experimentation, surveys); Sources of errors; Reliability and validity; Probability	

theory and theoretical distributions; Parametric statistics, Simple linear models (ANOVA, correlation and Regression, ANACOVA), Multivariate analysis, Step-wise regression; Nonparametric statistics, Sign test, Paired ranking test, Pearson Correlation, Man-Whitney U Test, Chi-square test	
Unit – V: **Data processing and Data analysis**	4
Primary and secondary data; coding and summarization of data, quantification of qualitative data (content analysis); Computation of indirect metrics; Role of descriptive statistics; Measures of central tendency, dispersion, skewness, kurtosis; plots and correlations; Inferential statistics hypothesis testing, Type I and Type II errors, Power of tests	
Unit – VI : **Reporting research**	4
Dissemination of research findings; Reporting and interpretation of results; cautions in interpretations, Type of reports, Typical report outlines, use of diagrams, tables, and charts; Optimization and optimization methods	

Text Books:
1. Kothari C.R., Research Methodology (2 nd Ed.), New Age International, (2004); ISBN(13): 978-81-224-1522-3
2. Kumar, Ranjit, Research Methodology (3 rd Ed); Sage Publications, 2011; IBSN: 978-1-8492-0301-2
3. Berkman, Elliot T., A Conceptual Guide to Statistics Using SPSS, Sage Publications, 2011; ISBN: 978-1-4129-7406-6
Reference Books:
1. Statistical Methods for Research Workers by Fisher R. A., Cosmo Publications, New Delhi ISBN:81-307-0128-6
2. Donald R. Cooper, Pamela S. Schindler, Business Research Methods, 8/e, Tata McGraw - Hill Co. Ltd., 2006.

MCEL504 - High Performance Databases		
Teaching Scheme: **Lectures:** 3Hrs/Week **Tutorials:** Nil **Practical:** Nil	**Examination Scheme (Theory)** **Teacher Assessment Exam:** 20 Marks **Class Assessment Exam:** 20 Marks. **End Sem. Examination:**.60 Marks	**Examination Scheme (Laboratory)** **Internal(TW):** Nil **External(OR)**: Nil **External(PR)** : Nil
Credit	**3**	

Prerequisite (If any):

1. Database Management System
2. Advanced Database

Course Objective:

1. To Study of the physical database design.
2. To understand and design transaction processing.
3. To study distributed databases
4. To study structured and semi structured data.

Course Outcome:

1. To understand and design physical databases.
2. To learn distributed database concepts
3. To understand transaction processing concepts
4. To learn design and analysis of structure query and semi structure query.
5. To study Advance Transaction Processing
6. To learn Semi-Structured Data and XML

Course Contents	**Hrs.**
Unit – I : Physical database design & Tuning	6
Database workloads, physical design and tuning decisions, Need for Tuning Index selection: Guideline for index selection, Clustering & Indexing Tools for index selection Database Tuning: Tuning indexes, Tuning Conceptual schema Tuning Queries &views, Impact of Concurrency, Benchmarking	
Unit – II : Distributed Databases	6
Introduction, Design Framework, Design of database fragmentation, The Allocation of Fragments, Translation of global queries to fragment queries, Optimization of access queries, Distributed Transaction Management, Concurrency Control, Reliability.	
Unit – III : Advance Transaction Processing	6
Transaction Processing Monitors, Transactional Workflow, Real time transaction System, Long duration Transactions, Transaction Management in Multi-databases, Distributed Transaction	

Management, Main Memory Databases, and Advanced Transaction Models.	
Unit – IV : Semi-Structured Data and XML	6
Semi-Structured Data, Introduction to XML, XML hierarchical Model, DTD & XML schema, XML Namespace, XML query & Transformation: Xpath, XSLT, XQuery, Storage of XML data, XML Technologies : DOM &SAX Interfaces X pointer, Xlink, XHTML, SOAP, WSDL,UDDI,XML database Application.	
Unit – V : Emerging Trends in Databases	6
Introduction, Motivation, Temporal databases, Spatial & geographic databases, Multimedia Databases, Mobility & personal Databases.	
Unit – VI : Advanced Application Development	6
Performance Tuning, Performance Benchmarks, Standardization, E-Commerce, Legacy Systems, Large-scale Data Management with HADOOP, Semi structured database COUCHDB: Introduction, Architecture and principles, features.	

Text Books:
1. Database system Concept by Silberschatz And Korth 6th Edition
2. Distributed Databases principles & systems by Stefano Ceri, Giuseppe Pelagatti
3. Web Data Management, Abiteboul, Loana, Philippe Et. Al Cambridge publication
4. Database system, Thomas Connolly, Carolyn Begg, Pearson 4th Edition
Reference Books:
1. “Structured Query Language”, BPB Publication.
2. Web Data Management, Abiteboul, Loana, Philippe Et. al Cambridge publication
3. Database Systems, Thomas Connolly, Carolyn Begg, Pearson 4th Edition
4. Database Management Systems by Raghu Ramakrishnan and Johannes Gehrke

MCEL505A: Information Retrieval And Web Mining		
Teaching Scheme: **Lectures:** 3Hrs/Week **Tutorials:** Nil **Practical:** Nil	**Examination Scheme: (Theory)** **Teacher Assessment Examination :** 20 Marks **Class Assessment Examination :** 20 Marks **End Sem Examination:** 60 Marks	**Examination Scheme: (Laboratory)** **Internal(TW):** Nil **External(OR)**:Nil **External(PR)** :Nil
Credit	**3**	

Prerequisite (If any):

1. Knowledge of web.

Course Objective:

1. Understand various models for information retrieval
2. Learn web mining types

Course Outcome:

1. Able to understand models in IR in application
2. Able to implement client and server web sites.
3. To understand concepts of web mining
4. To understand concepts of performance metrics
5. To understand concepts of semantic web
6. To understand concepts of information retrieval models

Course Contents	Hrs
Unit – I :Information Retrieval Basics	6
Goals and history of IR. The impact of the web on IR. Components of an IR system, Boolean and vector-space retrieval models; ranked retrieval; text-similarity metrics; TF-IDF, (term frequency/inverse document frequency) weighting; cosine similarity. Simple tokenizing, stop-word removal, and stemming; inverted indices, Index Construction and compression.	
Unit – II :Information Retrieval Models	6
Probabilistic Information Retrieval, Language Modeling for Information Retrieval, Adhoc Retrieval, Latent Semantic Indexing, Relevance feedback, Pseudo relevance feedback, Query expansion, Query languages, POS tagging.	
Unit – III :Web Mining	6
Web Structure, content and usage mining, Web Crawling, Indexes, Search engines; spidering; *metacrawlers*; directed spidering; link analysis (e.g. hubs and authorities, Google PageRank), Information Extraction, spam filtering, XML retrieval.	
Unit – IV : Performance metrics	6
Recall, precision, and F-measure; Evaluations on benchmark text collections, TREC Tracks. **Social Networks:** Social Web, Blogs, Wikis, Forums, Social Network analysis, Recommender systems, Information Filtering, Collaborative filtering and content-based recommendation of documents and products.	

Unit – V : Semantic web	6
Web 3.0, Ontology, OWL, RDF Schema, ontology learning, Knowledge representation, management and extraction, Multimedia Retrieval, Content based Image retrieval, Pattern Matching and classification for IR.	
Unit – VI :Specific topics in IR and Web Mining	6
Focused Retrieval, Transfer Learning, Learning to Rank, Personalization, Behavioral Targeting, Cross Language IR, Digital Libraries, Bibliographic systems, Patent Search, E-learning, Security Issues, Political and ethical issues.	

Text Books:
1. Yates &Neto, "Modern Information Retrieval", Pearson Education, ISBN 81-297-0274-6 (2011).
2. Christopher D. Manning, PrabhakarRaghavan, HinrichSchütze , “Introduction to Information Retrieval” (available online at http://nlp.stanford.edu/IR-book/)
3. Chakrabarti, S., Mining the Web, Morgan Kaufmann (An Imprint of Elsevier) 2005.
Reference Books:
1. C.J. Rijsbergen, "Information Retrieval", http: www.dcs.gla.ac.uk/Keith/Preface.html)
2. Grossman, D. A. and Frieder, O., Information Retrieval: Algorithms and Heuristics. Kluwer 1998.
3. Search Engines: Information Retrieval in Practice by Bruce Croft, Donald Metzler, and Trevor Strohman, Addison-Wesley, 2009.
4. Information Retrieval: Implementing and Evaluating Search Engines by S. Buttcher, C. Clarke and G.Cormack, MIT Press, 2010.
5. Web Data Mining: Exploring Hyperlinks, Contents, and Usage Data by B. Liu, Springer, Second Edition, 2011

<table>
<tr><td colspan="3">MCEL505B: Distributed Computing</td></tr>
<tr><td>Teaching Scheme:
Lectures: 3 Hrs./Week
Tutorials: Hrs./Week
Practical: Nil</td><td>Examination Scheme: (Theory)
Teacher Assessment Examination : 20 Marks
Class Assessment Examination : 20 Marks
End Sem. Examination:-60 Marks</td><td>Examination Scheme:
(Laboratory)
Internal(TW): Nil
External(OR):Nil
External(PR) :Nil</td></tr>
<tr><td>Credit</td><td>3</td><td></td></tr>
<tr><td colspan="3">Course Objective:</td></tr>
<tr><td colspan="3">1. To understand and correlate the distributed system concepts for designing of the distributed application.</td></tr>
<tr><td colspan="3">2. To understand the Role of Distributed operating system in Distributed application design.</td></tr>
<tr><td colspan="3">3. To expose the students to design the internet application as Distributed System Application</td></tr>
<tr><td colspan="3">Course Outcome:</td></tr>
<tr><td colspan="3">1. Able to design network for an application</td></tr>
<tr><td colspan="3">2. Able to work on various Name Services</td></tr>
<tr><td colspan="3">3. Able to solve issue of deadlock in distributed systems</td></tr>
<tr><td colspan="3">4. Able to design distributed File System</td></tr>
<tr><td colspan="3">5. Able to build distributed systems using various techniques for tolerating partial failures</td></tr>
<tr><td colspan="3">6. Able to develop/design distributed system/applications for an enterprise using SOA</td></tr>
</table>

<table>
<tr><td>Course Contents</td><td>Hrs.</td></tr>
<tr><td>Unit – I : Distributed System Design and Models</td><td rowspan="2">6</td></tr>
<tr><td>Introduction – Examples of Distributed Systems – Resource Sharing and the Web – Challenges- System Models - Physical Models – Architectural Models – Fundamental Models- Characterization of Distributed Systems – Client-Server Communication – Distributed Objects and Remote Invocation – Communication Between Distributed Objects – Remote Procedure Call – Events and Notifications</td></tr>
<tr><td>Unit – II : Naming and Name services</td><td rowspan="2">6</td></tr>
<tr><td>Naming and Name services , Time and Global State Management :Introduction – Issues – Communication Primitives – Inherent Limitations - Lamport’s Logical Clock; Vector Clock; Causal Ordering; Global State; Cuts; Termination Detection. Transactions and Concurrency control, Distributed Transactions</td></tr>
<tr><td>Unit – III :Modeling Networks</td><td rowspan="2">6</td></tr>
<tr><td>Distributed Mutual Exclusion: Non-Token Based Algorithms, Lamport’s Algorithm, Ricart-Agrawala algorithm, Singhal’s dynamic information-structure algorithm, Lodha and Kshem kalyani’s fair mutual exclusion algorithm, Quorum-based mutual exclusion algorithms, Maekawa’s algorithm, Agarwal–El Abbadi quorum-based algorithm, Token-Based Algorithms, Suzuki-Kasami’s Broadcast Algorithm, Raymond’s tree-based algorithm – Distributed Deadlock Detection – Issues – Centralized Deadlock-Detection Algorithms – Distributed Deadlock-Detection Algorithms. Agreement Protocols – Classification - Solutions – Applications.</td></tr>
</table>

Unit – IV :Distributed File System	6
Distributed File systems – Architecture – Mechanisms – Design Issues Distributed Shared Memory – Architecture – Algorithm – Protocols - Design Issues. Distributed Scheduling – Issues – Components – Algorithms. Distributed Transactions	
Unit – V :Recovery and Fault Tolerance Mechanism	6
Failure recovery and Fault Tolerance, classification of failures. Backward and forward error recovery, Basic approaches of backward error recovery, recovery in concurrent systems, consistent set of checkpoints, synchronous check pointing and recovery, asynchronous check pointing and recovery. Atomic actions and committing, commit protocols, non-blocking commit protocols, Voting protocols, Dynamic vote re-assignment protocols, failure resistant processor, Reliable communication. Distributed Multimedia systems, Mobile and Ubiquitous computing	
Unit – VI :Advanced topics in computer networks	6
Internet-enabled Distributed Computing Technologies Application Server architectures: JEE Extensions of the Java Distributed Object model and the DCOM component-based architectures Web Services: WSDL, UDDI, SOAP, XML http-based RPC combined with standards for interface definition and naming. Discussion and application of select API's from the API layer of the JEE architecture to illustrate distributed transactions, middleware access protocols (MQ Series API), and Messaging services (JMS).	

Text Books:
1. George Coulouris, Jean Dellimore and Tim KIndberg, "Distributed Systems Concepts and Design", 5th Edition, Pearson Education
2. Ajay D. Kshem kalyani and Mukesh Singhal, " Distributed Computing – Principles, Algorithms and Systems", Cambridge University Press, 2008.
3. Pradeep K. Sinha, Distributed Operating Systems, PHI, 2005.
Reference Books:
1. Nancy A. Lynch, Distributed Algorithms, Morgan Kaufmann Publishers, 2000

MCEL505C - Real Time Operating Systems		
Teaching Scheme: **Lectures:**3Hrs/Week **Tutorials:** NIL **Practical:** NIL	**Examination Scheme (Theory)** **Teacher Assessment Exam:** 20 Marks **Class Assessment Exam:** 20 Marks. **End Sem. Examination:**.60 Marks	**Examination Scheme (Laboratory)** **Internal(TW):** NIL **External(OR)**:NIL **External(PR)** :NIL
Credit	**3**	
Prerequisite (If any):		
Operating Systems		
Course Objective:		
1. To understand the structure of RTOS		
2. To study real time scheduling and communication.		
Course Outcome:		
1. To learn fundamentals of RTOS		
2. To study implementation aspects of real time concepts.		
3. To study applications of RTOS.		
4. To learn Scheduling in RTOS		
5. To study different Real Time Operating Systems		
6. To learn case studies related to RTOS		

Course Contents	Hrs.
Unit – I : Programming Fundamentals of RTOS	6
Tasks and Task states – Semaphores – Shared data – Message queues, Mail boxes and pipes – Memory management – Interrupt routines – Encapsulating semaphore and queues.	
Unit – II : RTOS Fundamentals	6
Task management – Dual role of time – Intertask communication – Process input/output. RT Linux – device drivers – Real time library of Keil IDE - RTOS Porting to a Target.	
Unit – III : Real Time Scheduling	6
Schedulability problem: classification, schedulability test, worst case execution time (WCET) - static scheduling: - dynamic scheduling: dependent tasks, independent tasks.	
Unit – IV : Real-Time Operating Systems	6
VX works - uCOS – POSIX standards - 3. To study example RTOSs and applications.	
Unit – V : RTOS Application Domains	6
Comparison and study of RTOS: Vxworks and μCOS – Case studies: RTOS for Image Processing – Embedded RTOS for voice over IP – RTOS for fault Tolerant Applications – RTOS for Control Systems	
Unit – VI : Case Studies	6
Case studies : Free-RTOS architecture - Embedded RTOS for voice over IP– RTOS for fault Tolerant Applications – RTOS for Control Systems. 11 EST-2013 SRM(E&T)	

Text Books:
1. Hermann Kopetz, ”Real–Time systems – Design Principles for distributed Embedded Applications”, Second Edition, Springer 2011.
2. C.M.Krishna and G.Shin, “Real Time Systems,” McGraw-Hill International Edition, 1997.
3. Real time System, Jane W. S. Liu, Pearson edition
Reference Books:
1. Doug Abbott, “Linux for embedded and real time applications”, Elsevier Science, 2003.
2 .”Getting started with RT-Linux”, FSM Labs., Inc.
3. Keil Real Time library documentation

<table>
<tr><td colspan="3">MVEL505- Open Elective form E&TC dept.(Elective-I)</td></tr>
<tr><td>Teaching Scheme:
Lectures:3Hrs/Week
Tutorials: NIL
Practical: NIL</td><td>Examination Scheme (Theory)
Teacher Assessment Exam: 20 Marks
Class Assessment Exam: 20 Marks.
End Sem. Examination:.60 Marks</td><td>Examination Scheme
(Laboratory)
Internal(TW): NIL
External(OR):NIL
External(PR) :NIL</td></tr>
<tr><td>Credit</td><td colspan="2">3</td></tr>
<tr><td colspan="3">Course Objective: To acquired knowledge of new subject</td></tr>
</table>

*Please referred E&TC M tech Syllabus

<table>
<tr><td colspan="3">MCEL506A: Data Mining And Machine Learning</td></tr>
<tr><td>Teaching Scheme:
Lectures: 3 Hrs/Week
Tutorials: Nil
Practical: Nil</td><td>Examination Scheme: (Theory)
Teacher Assessment Examination : 20 Marks
Class Assessment Examination : 20 Marks
End Sem Examination: 60 Marks</td><td>Examination Scheme: (Laboratory)
Internal(TW): Nil
External(OR):Nil
External(PR) :Nil</td></tr>
<tr><td>Credit</td><td>3</td><td></td></tr>
<tr><td colspan="3">Prerequisite (If any):</td></tr>
<tr><td colspan="3">1. Basic of Database Management System</td></tr>
<tr><td colspan="3">Course Objective:</td></tr>
<tr><td colspan="3">1. This course introduces principles, concepts, of machine learning functions and uses of data mining.</td></tr>
<tr><td colspan="3">2. This course has various functions and uses of algorithms in data mining.</td></tr>
<tr><td colspan="3">3. This course also provides carrier opportunities in data mining tools and research oriented techniques.</td></tr>
<tr><td colspan="3">Course Outcome:</td></tr>
<tr><td colspan="3">1. To know the basic concept of machine learning.</td></tr>
<tr><td colspan="3">2. To understand concepts of data mining and association.</td></tr>
<tr><td colspan="3">3. To use concepts of classical algorithms on various dataset.</td></tr>
<tr><td colspan="3">4. To use algorithms of clustering in data mining application.</td></tr>
<tr><td colspan="3">5. To understand working of world wide web and text mining application</td></tr>
<tr><td colspan="3">6. To study different research based application in the fields of data mining.</td></tr>
<tr><td colspan="2">Course Contents</td><td>Hrs</td></tr>
<tr><td colspan="2">Unit – Introduction to Machine Learning</td><td rowspan="2">5</td></tr>
<tr><td colspan="2">Machine Learning - Machine Learning Foundations, Overview, Types of Machine Learning – Supervised Learning, Unsupervised Learning, Active and Passive Learning, Online and Batch Learning, Reinforcement Learning ,Examples of Machine Learning and Applications.</td></tr>
<tr><td colspan="2">Unit – II : Data Mining and Data Association</td><td rowspan="2">6</td></tr>
<tr><td colspan="2">Data mining concepts, need, kinds of pattern and technologies, issues in mining, KDD vs data mining, OLAP vs OLTP, data pre-processing -cleaning, integration, reduction, transformation and discretization, Market Basket Analysis, Frequent item set, Association Rules, mining multilevel association rules, constraint based association rule mining, Apriori Algorithm, FP Growth Algorithm.</td></tr>
<tr><td colspan="2">Unit – III : Classification and Prediction</td><td rowspan="2">7</td></tr>
<tr><td colspan="2">Introduction, classification requirements, decision trees- attribute selection methods, ID3, scalable decision tree techniques, rule extraction from decision tree, tree pruning, Bayes classification: Bayes</td></tr>
</table>

theorem, Naive Bayes classification, SVM, KNN approach with Case study. Regression models	
Unit – IV : Clustering	6
Cluster analysis, distance measures, data types used in clustering, partitioning methods: k-means, k-medoids, hierarchical Methods: agglomerative and divisive, density-based methods: DBSCAN, outlier analysis.	
Unit – V :Text Mining and Web Mining	6
Text mining: Text Data Analysis and Information Retrieval, Dimensionality Reduction for Text, Feature vector, Bag of words, Tf-idf, Text Mining Approaches, Web mining: Introduction, web content mining, web usage mining, web structure mining, web crawlers.	
Unit – VI : Application and Trends in Data Mining	6
How to Choose a Data Mining System ,Examples of Commercial Data Mining Systems, Ubiquitous and Invisible Data Mining , Data Mining : Privacy, and Data Security, Data Mining and Collaborative Filtering, Social Network Analysis, Graph Mining, Data Mining for Biological Data Analysis, Data Mining for the Telecommunication Industry.	

Text Books: (Book Title, Name of the author, name of the Publisher, edition, year of publication)
1. ‘”Data Mining Concepts and Techniques” ,Han and Kamber, Morgan Kaufmann
2. “Introduction To Machine Learning” by Ethem Alpaydin © The MIT Press, 2014 , 3RD Edition http://www.cmpe.boun.edu.tr/~ethem/i2ml3e/3e_v1-0/i2ml3e-chap1.pdf
3. “ Understanding Machine Learning : From Theory to algorithms”, by Shai Shalev-Shwartz and Shai Ben-David Published 2014 by Cambridge University Press
Reference Books:
1. Margaret Dunham, “Data Mining: Concepts and Techniques”, Morgan Kaufmann Pub.
2. Alex Berson, S.J. Smith, “Data Warehousing, Data Mining and OLAP”, Tata McGraw Hill

MCEL506B: Grid Computing		
Teaching Scheme: **Lectures:** 3 Hrs/Week **Tutorials:** Nil **Practical:** Nil	**Examination Scheme: (Theory)** **Teacher Assessment Examination :** 20 Marks **Class Assessment Examination :** 20 Marks **End Sem Examination:** 60 Marks	**Examination Scheme:** **(Laboratory)** **Internal(TW):** Nil **External(OR)**:Nil **External(PR)** :Nil
Credit	**3**	

Prerequisite (If any):	
1. Basics of Networking	
Course Objective:	
1. To understand Grid Computing infrastructure, monitoring system	
2. To understand Grid security and grid data management	
3. To understand Grid middleware and its tool kits	
Course Outcome:	
1. To get an overview about system infrastructure of grid, current architecture, services and instantiations of the Grid.	
2. To learn about various grid monitoring systems & tools	
3. To learn about security issues and working of scheduling paradigms in grids.	
4. To cover important network security tools and applications	
5. To learn about various available grid middleware.	
6. To understand grid tool kits functionalities.	
Course Contents	**Hrs**
Unit – I : Introduction To Grid Computing	6
Introduction - Parallel and Distributed Computing - Cluster Computing - Grid Computing - Anatomy and Physiology of Grid - Review of Web Services – OGSA – WSRF	
Unit – II : Grid Monitoring	6
Grid Monitoring Architecture (GMA) - An Overview of Grid Monitoring Systems- Grid ICE – JAMM – MDS - Network Weather Service - R-GMA - Other Monitoring Systems - Ganglia and GridMon	
Unit – III : Grid Security And Resource Management	6
Grid Security - A Brief Security Primer - PKI-X509 Certificates - Grid Security - Grid Scheduling and Resource Management - Scheduling Paradigms - Working principles of Scheduling - A Review of Condor, SGE, PBS and LSF - Grid Scheduling with QoS.	
Unit – IV : Data Management And Grid Portals	6
Data Management- Categories and Origins of Structured Data - Data Management Challenges- Architectural Approaches - Collective Data Management Services - Federation Services - Grid Portals - First-Generation Grid Portals - Second-Generation Grid Portals	
Unit – V : Grid Middleware	6
List of globally available Middleware - Case Studies - Recent version of Globus Toolkit and gLite - Architecture, Components and Features.	
Unit – VI : Grid Computing Tool Kit	6
Globus Toolkit –Versions –Architecture –GT Programming model –A sample grid service	

implementation.	

Text Books: (Book Title, Name of the author, name of the Publisher, edition, year of publication)
1. Maozhen Li, Mark Baker, The Grid Core Technologies, John Wiley & Sons , 2005.
2. Joshy Joseph & Craig Fellenstein, “Grid Computing”, Pearson Education 2004.
3. Ahmar Abbas, “Grid Computing: A Practical Guide to Technology and Applications”, Charles River media, 2003
Reference Books:
1. Ian Foster & Carl Kesselman, “The Grid 2 – Blueprint for a New Computing Infrastructure” , Morgan Kaufman – 2004
2. Vladimir Silva—Grid Computing for Developers, Dreamtech Press, 2006.
3. D Janakiram “Grid Computing: A Research Monograph Paperback ‘ , McGraw Hill Education 2005.

MCEL506C - Advanced Compiler Design		
Teaching Scheme: **Lectures:**3 Hrs./Week **Tutorials:** NIL **Practical:** NIL	**Examination Scheme (Theory)** **Teacher Assessment Exam:** 20 Marks **Class Assessment Exam:** 20 Marks. **End Sem. Examination:**60 Marks	**Examination Scheme (Laboratory)** **Internal(TW):** NIL **External(OR)**:NIL **External(PR)** :NIL
Credit	**3**	

Prerequisite :

1. Principles of Compiler Design
2. Theory of Computation
3. Data Structures

Course Objective:

1. To understand attribute grammars
2. To study and design parallel programming.
3. To study concepts in assembling, parsing and compiling into target code for execution.
4. To understand systems and methods of compilation.
5. To introduce basic tools for compiler writing and expose the latest techniques and advances in compiler.
6. To get exposed to concurrent, embedded and distributed compilation tools and techniques.

Course Outcome:

1. To understand concepts of Compiler architecture
2. To be able to write attribute grammars
3. To be able to understand concepts of Intermediate Code Generation
4. To be able to write code generation of any complex parsers.
5. To learn concepts of Functional & Logic Programs
6. To be able to know parallel programming models

Course Contents	**Hrs**
Unit I. Introduction	6
Notation and Concepts for Languages and Grammars, Traditional compilers, structure of compiler, architecture, properties, portability and re-targetability, optimization, grammars, Closure algorithms, abstract syntax tree: lexical structure, syntax.	
Unit II. Attribute grammars	6
Dependency graphs, attribute evaluation, cycle handling, attribute allocation, multi-visit attribute grammars, types of attribute grammars, L-attribute grammar, S-attributed grammars, equivalence of L-attributed and S-attributed grammars, Extended grammar notations and attribute grammars, manual methods.	

Unit III. Intermediate code processing	6
Interpretation, Code generation, Assembler design issues, linker design issues. Memory Management: data allocation with explicit de-allocation, data allocation with implicit dead lock allocation, Static, Dynamic and Heap Storage allocation.	
Unit IV.Code generation	6
Context handling, source language data representations, routines and their activation, Code generation for control flow assessment, Code generation for modules. Examples of Parser generators, machine-independent Code generation.	
Unit V. Functional & Logic Programs	6
Offside rules, Lists, List comprehensions, pattern matching, polymorphic typing, referential transparency, High-order functions, lazy evaluation, compiling functional languages, polymorphic type checking, DE sugaring, Graph reduction, Code generation for functional, core programs, Optimizing the functional Core, Advanced graph manipulations The logic programming models, implementation model interpretation, unification, implementation model compilation, compiled code for unification.	
Unit VI. Parallel programming	6
Parallel programming models, processes and threads, shared variables, message passing, parallel object -oriented languages, Tuple space, automatic parallelization. Case study of simple object oriented compiler/interpreter.	

Text Books: (Book Title, Name of the author, name of the Publisher, edition, year of publication)
1. Compilers: Principles, Techniques, and Tools ("Dragon book") by Alfred V. Aho, Monica S. Lam, Ravi Sethi, Jeffrey D. Ullman, 2006
2. Modern Compiler Design, Dick Grune, Henri E Bal, Jacobs, Langendoen Wiley India Pvt Ltd, ISBN: 81-265-0418-8
3. Compiler Design "Syntactic and Semantic Analysis" by Reinhard Wilhelm, Helmut Seidl and Sebastian Hack, 2013
4. Steven Muchnick,Advanced Compiler Design Implementation, Morgan Kaufmann.
Reference Books:
1. The Theory and Practice of Compiler Writing, Trembley Sorenson, MacGrawHill India ISBN:0-07-Y66616-4
2. Advanced Compiler Design and Implementation by Steven Muchnick, 1997
3. Steven Muchnick,Advanced Compiler Design Implementation, Morgan Kaufmann.

<table>
<tr><td colspan="4">MCEL506D- Industry Offered Subject</td></tr>
<tr><td>Teaching Scheme:
Lectures:3Hrs/Week
Tutorials: NIL
Practical: NIL</td><td>Examination Scheme (Theory)
Teacher Assessment Exam: 20 Marks
Class Assessment Exam: 20 Marks.
End Sem. Examination:.60 Marks</td><td colspan="2">Examination Scheme
(Laboratory)
Internal(TW): NIL
External(OR):NIL
External(PR) :NIL</td></tr>
<tr><td>Credit</td><td colspan="3">3</td></tr>
<tr><td colspan="4">Course Objective: To acquired knowledge of new subject</td></tr>
<tr><td colspan="4">Course Outcome:</td></tr>
<tr><td colspan="4">1. To aware about resent trends</td></tr>
<tr><td colspan="4">2. To understand & solve concepts of complex problem</td></tr>
<tr><td colspan="4">3. To design & analysis of different types of real time problem</td></tr>
<tr><td colspan="4">4. To aware about research methodology</td></tr>
<tr><td colspan="4">5. To aware about communication skill & presentation</td></tr>
<tr><td colspan="4">6. To solve problem apply engineering concepts</td></tr>
<tr><td colspan="3">Course Contents</td><td>Hrs.</td></tr>
<tr><td colspan="3">Student should take any advanced and huge deep subject and study theoretically and practically. Technology certification is must from reputed institute or company.</td><td>36</td></tr>
</table>

<table>
<tr><th colspan="3">MCEP507: Laboratory Practice-I</th></tr>
<tr><td>Teaching Scheme:
Lectures: Nil
Tutorials: Nil
Practical: 4-Hr/Week</td><td>Examination Scheme: (Theory)
Teacher Assessment Examination :Nil
Class Assessment Examination : Nil
End Sem Examination: Nil</td><td>Examination Scheme (Laboratory)
Internal(TW): 50 Marks
External(OR): 50 Marks
External(PR) : Nil</td></tr>
<tr><td>Credit</td><td>2</td><td></td></tr>
<tr><td colspan="3">Course Objective:</td></tr>
<tr><td colspan="3">1. The course objective is to teach problem formulation and problem solving skills.</td></tr>
<tr><td colspan="3">2. To understand concept of research and its different methods.</td></tr>
<tr><td colspan="3">3. To understand distributed database.</td></tr>
<tr><td colspan="3">4. To understand various models for information retrieval and learn web mining types.</td></tr>
<tr><td colspan="3">5. To study Different Data mining algorithms.</td></tr>
<tr><td colspan="3">Course Outcome:</td></tr>
<tr><td colspan="3">1. Able to implement application of algorithm.</td></tr>
<tr><td colspan="3">2. Able to write research synopsis.</td></tr>
<tr><td colspan="3">3. Able to install and implement distributed database.</td></tr>
<tr><td colspan="3">4. Able to understand models in IR in application and semantic Web.</td></tr>
<tr><td colspan="3">5. Able to implement client and server web sites.</td></tr>
<tr><td colspan="3">6. Able to implement data mining algorithms.</td></tr>
</table>

List of Practical (Any Eight Assignment)	**4Hrs./week**
1. Implement BFS and DFS algorithm for any application.	
2. Implementation of 0-1 knapsack problem using dynamic programming	
3. Design one journal papers (IEEE Transactions/Elsevier/Springer/ACM) related to Information Retrieval & Web mining	
4. Write synopsis for any problem statement using Research methodology steps. Each student should do one synopsis.	
5. Implement using any open source tool for assignment number 3	
6. Design and implement the distributed architecture for the Hadoop having Name node, Tracker node and data nodes (separated by ADSL routers) or such recent technology. Prepare architecture diagram and installation document	
7. Retrieval of information based on semantic web using DAML and OIL Semantic web language	
8. Mining information using web crawler and its practical information using java	
9. Implement Apriori algorithm using any open source tool.	
10. Implement Naive Bayes to predict the sex for a person with following parameters: Magazine promotion: yes, Watch promotion: yes, Life Insurance:No, Credit card Insurance=No, sex=?	

Following table provides the details of the available data:

magazine promotion	Watch promotion	Life Insurance	Credit card Insurance	Sex
yes	No	No	No	Male
yes	yes	yes	Yes	Female
No	No	No	No	Male
yes	yes	yes	yes	Male
yes	No	yes	No	Female
No	No	No	No	Female
yes	yes	yes	Yes	Male
No	No	No	No	Male
yes	No	No	No	Male
yes	yes	yes	No	Female

MSDP501: Advanced Skill Development		
Teaching Scheme: **Lectures:** Nil **Tutorials:** Nil **Practical:** 2-Hr/Week	**Examination Scheme: (Theory)** **Teacher Assessment Examination :**Nil **Class Assessment Examination :** Nil **End Sem Examination:** Nil	**Examination Scheme (Laboratory)** **Internal(TW):** 50 Marks **External(OR)**: 50 Marks **External(PR)** : Nil
Credit	**AU**	

Audit course			
The students must complete any one (A or B) of the following audit course for 20-25 hrs. Submit the certificate (B) A/B- Project guide/subject teacher is going to evaluate .Mini project /IEEE paper implementation			
A Technical Course:		**B General Proficiency / Foreign Language:**	
i	Configure the Public Cloud	i	German
ii	Configure the Private Cloud	ii	Spanish
iii	Configure the Hadoop	iii	French
iv	Any Cryptography tool	iv	Japanese
v	Any Data Mining tool	v	Chinese
		vi	Skill Development: Presentation Skills

Course Syllabus
SEM-II

MCEL508 -Operating System Design		
Teaching Scheme: **Lectures:**3Hrs./Week **Tutorials:**NIL **Practical:** NIL	**Examination Scheme (Theory)** **Teacher Assessment Exam:** 20 Marks **Class Assessment Exam:** 20 Marks. **End Sem. Examination:**60 Marks	**Examination Scheme (Laboratory)** **Internal(TW):** NIL **External(OR)**:NIL **External(PR)** :NIL
Credit	**3**	
Prerequisite(If any):		
1. Operating System		
Course Objective:		
1. To understand operating system concept.		
2. To study memory I/O management techniques.		
Course Outcome:		
1. To understand operating system concept.		
2. To study memory I/O management techniques.		
3. To learn concepts of Inter process Communication		
4. To learn concepts of memory management		
5. To understand concepts of Resource Management		
6. To understand concepts of process implementation		

Course Contents	**Hrs**
Unit – I : Introduction	6
System levels, Hardware Resources, Resource management, Virtual Computers, The Hardware Interface, The CPU, Memory and Addressing, Interrupts, I/O Devices, The Operating System Interface, Information and Meta-Information, Naming Operating System Objects, Device as Files, The process Concept, Communication between Processes, UNIX-Style Process Creation, Standard Input and Standard Output, The User Interface to an Operating Design Techniques: Operating Systems and Design, Design Problems, Design Techniques, Two Level Implementation, Interface Design, Connection in Protocols, Interactive and Programming Interfaces, Decomposition Patterns.	
Unit – II : Implementing Processes	6
Implementation of a Simple Operating System, Implementation of Processes, System	

Initialization, Process Switching, System Call Interrupt Handling, Program Error Interrupts, Disk Driver Subsystem, Implementation of Waiting, Flow of Control Through the Operating System, Signalling in an Operating System, Interrupts in the Operating System, Operating Systems as Event and Table Managers, Process Implementation, Examples of Process Implementation, Mono-programming, Parallel System.	
Unit – III :Inter process Communication Patterns	6
Patterns of Inter process communication, New message-passing system calls, IPC Patterns, Failure of Processes, Processes: Everyday Scheduling, Pre-emptive Scheduling Methods, Policy versus Mechanism in Scheduling, Scheduling in Real Operating Systems, Deadlock, Two Phase Locking, Starvation, Synchronization, Semaphores, Programming Language Based Synchronization Primitives, Message Passing Design Issues design Techniques: Indirection, Using State Machines, Win Big Then Give Some Back, Separation of Concepts, Reducing a Problem to a Special Case, Re-entrant Programs, Using Models for Inspiration, Adding a New Facility To a System.	
Unit – IV : Memory Management	6
Levels of Memory Management, Linking and Loading a Process, Variations in Program Loading, The Memory Management Design Problem, Dynamic Memory Allocation, Keeping Track of the Blocks, Multiprogramming Issues, Memory Protection, Memory Management System Calls, Virtual Memory, Virtual Memory Systems Design Techniques: Multiplexing, Late binding, Static Versus Dynamic, Space-Time Tradeoffs, Simple Analytic Models	
Unit – V : I/O Devices & File Systems	6
I/O Devices, I/O Systems, The File Abstraction, File Naming, File System Objects and Operations, File System Implementation, File Systems Organization Design Techniques: Caching, Optimization and Hints, Hierarchical Names, Naming of Objects, Unification of Concepts.	
Unit – VI : Resource Management	6
Resource management Issues, Types of Resources, Integrated Scheduling, Queuing Models of Scheduling, Real-time Operating Systems, Protection of Resources, User Authentication, Mechanisms for Protecting Hardware Resources, Representation of Protection Information, Mechanisms For Software Protection, The Use of Cryptography in Computer Security, The Client Server Model	

Text Books:
1. Charles Crowley, “ Operating System: A Design-Oriented Approach”, Tata McGrawHill.
2. William Stallings,” Operating Systems Design and Implementation (3rd Edition) (Prentice Hall Software Series) ”, April 19, 2008
3. Peter Baer Galvin, Greg Gagne Abraham Silverschatz, “ Operating System Principles (7th International Edition)” 2006
4. William Stallings, “ Operating Systems : Internals and Design Principles”, 2004

Reference Books:
1. Abraham Silberschatz, Peter Baer Galvin, and Greg Gagne , “ Operating System Concepts (7th Edition ”, Tata McGrawHill. Dec 14, 2004
2. Andrew S. Tanenbaum,” Modern Operating Systems (3rd Edition) (GOAL Series)”, Dec 21, 2007
3. Abraham Silberschatz, “ Operating System Concepts”, Mar 2, 2009
4. Ramez Elmasri, A. Gil Carrick, and David Levine, “ Operating Systems: A Spiral Approach”, Mar 1, 2009

.

MCEL509- Software Design and Architecture		
Teaching Scheme: **Lectures:** 3 Hrs./Week **Tutorials:** Hrs./Week **Practical:** NIL	**Examination Scheme (Theory)** **Teacher Assessment Exam:** 20 Marks **Class Assessment Exam:** 20 Marks. **End Sem. Examination:** 60 Marks	**Examination Scheme (Laboratory)** **Internal(TW):** NIL **External(OR)**:NIL **External(PR)** :NIL
Credit	**3**	

Prerequisite (If any):

1. Software Engg.

Course Objective:

1. To study software process models.
2. To design and understand software architecture

Course Outcome:

1. To understand different software process models.
2. To understand object oriented design
3. To learn concepts of software architecture
4. To understand concepts of software architecture design
5. To learn concepts of Architecture type Patterns
6. To learn concepts of software architecture diagram

Course Contents	**Hrs**
Unit – I : Software Design Process	6
Role of Software Design: Software design process, nature of design process, design qualities; Transferring Design Knowledge: describe design solution, transferring design knowledge, design notations, design strategies,	
Unit – II : Object Oriented Design	6
Creational, Structural, behavioral design patterns, Component based design, Formal Approach to design	
Unit – III :Introduction to Software Architecture	6
What Is Software Architecture? Why Is Software Architecture Important? Quality Attributes, Architecture and Requirements, Designing an Architecture, Documenting software Architecture, Architecture and Software Product lines	

Unit – IV : Software Architecture Design	6
Designing, Describing, and Using Software Architecture, IS2000: The Advanced Imaging Solution, Global Analysis, Conceptual Architecture View, Module Architecture View, Styles of the Module View type, Execution Architecture View, Code Architecture View. Component-and-Connector View type, Styles of Component-and-Connector View type, Allocation View type and Styles.	
Unit – V : Archetype Patterns	6
Archetypes and Archetype Patterns, Model Driven Architecture with Archetype Patterns. Literate Modeling, Archetype Pattern. , Customer Relationship Management (CRM) Archetype Pattern, Product Archetype Pattern, Quantity Archetype Pattern, Rule Archetype pattern.	
Unit – VI : Software Architectures	6
Object-Oriented Paradigm, Data Flow Architectures, Data-Centered Software Architecture, Hierarchical Architecture, Interaction-Oriented Software Architectures, Distributed Architecture, Component-Based Software Architecture, Heterogeneous Architecture, Architecture of User Interfaces, Implicit asynchronous communication software architecture.	

Text Books:
1. Applied Software Architecture ,Christine Hofmeister, Robert Nord, Deli Soni, Addison-Wesley Professional; 1st edition (November 4, 1999) ,ISBN-10: 0201325713 , ISBN-13:9780201325713
2. Enterprise Patterns and MDA: Building Better Software with Archetype Patterns and UMLJimArlow, IlaNeustadt ,Addison-Wesley Professional, 2004, ISBN-10: 032111230X ISBN-13: 9780321112309
3. Kai Qian, Xiang Fu, Lixin Tao, “Software Architecture and Design Illuminated”, Jones & Bartlett Learning, 2009, ISBN 076375420X, 9780763754204

Reference Books:
1. David Budgen, “Software Design”, 2nd edition, Pearson Education (LPE)
2. Software Design:From Programming to Architecture Eric J. Braude ISBN:978-0-471-20459-6
3. Software Architecture in Practice, 3rd Edition By Len Bass, Paul Clements, Rick Kazman Published Sep 25, 2012 by Addison-Wesley Professional

<table>
<tr><td colspan="4">MCEL510- Advanced Computer Networks</td></tr>
<tr><td>Teaching Scheme:
Lectures:3Hrs./Week
Tutorials: NIL
Practical: NIL</td><td colspan="2">Examination Scheme (Theory)
Teacher Assessment Exam: 20 Marks
Class Assessment Exam: 20 Marks.
Examination: 60 Marks</td><td>Examination Scheme (Laboratory)
Internal(TW): NIL
External(OR):NIL
External(PR) :NIL</td></tr>
<tr><td>Credit</td><td colspan="3">3</td></tr>
<tr><td colspan="4">Prerequisite (If any):</td></tr>
<tr><td colspan="4">1. Computer Network</td></tr>
<tr><td colspan="4">Course Objective:</td></tr>
<tr><td colspan="4">1. To study basics of computer network</td></tr>
<tr><td colspan="4">2. To study network design and analysis algorithms</td></tr>
<tr><td colspan="4">3. To study advanced Network Technologies</td></tr>
<tr><td colspan="4">Course Outcome:</td></tr>
<tr><td colspan="4">1. To understand concepts of computer network.</td></tr>
<tr><td colspan="4">2. To learn concepts delay models in data network</td></tr>
<tr><td colspan="4">3. To learn concepts of different graph algorithms</td></tr>
<tr><td colspan="4">4. To understand concepts of network algorithm for designing network</td></tr>
<tr><td colspan="4">5. To understand concepts of Quality of Service in Networks</td></tr>
<tr><td colspan="4">6. To learn concepts of Internet Protocol</td></tr>
<tr><td colspan="3">Course Contents</td><td>Hrs.</td></tr>
<tr><td colspan="3">Unit – I : Introduction:</td><td rowspan="2">6</td></tr>
<tr><td colspan="3">Types of Networks. Network design issues. Network design tools, Routing and forwarding, resource allocation, Mobility, Networked applications, Data in support of network design, General Principles of Network Design, network characteristics.</td></tr>
<tr><td colspan="3">Unit – II : Analysis of loss and Delay</td><td rowspan="2">4</td></tr>
<tr><td colspan="3">Analysis of delay in networks, Queuing Systems: M/M/1, M/M/2, M/M/m, M/G/1 ,System with loss</td></tr>
<tr><td colspan="3">Unit – III : Fundamental Graph Algorithm</td><td rowspan="2">6</td></tr>
<tr><td colspan="3">Finding trees in graphs, shortest paths : Dijkstra’s algorithm, Bellman algorithm, Floyds algorithm, Incremental shortest path algorithm, Single commodity network flows : Ford Fulkerson algorithm, minimum cost flows</td></tr>
<tr><td colspan="3">Unit – IV : Centralized network design</td><td>10</td></tr>
</table>

Multipoint line topology- CMST, Esau-William's Algorithm, Sharma's Algorithm, Bin Packing algorithms. Terminal Assignment- Greedy algorithm and exchange algorithms, Concentrator location- COM, Add, Drop, Relaxation algorithm.	
Unit – V : Quality of Service in Networks	6
Application and QoS, QoS mechanisms, Queue management Algorithms, Feedback, Resource reservations, traffic engineering, Ubiquitous Computing: Applications and Requirements, Smart Devices and Services, Smart Mobiles, Cards and Device Networks.	
Unit – VI : IPv4 and IPv6	4
IP packet format, IP routing method, routing using masks, fragmentation of IP packet, IPv6, filtering, IP QoS, NAT, routers	

Text Books: (Book Title, Name of the author, name of the Publisher, edition, year of publication)
1. Kershenbaum A., "Telecommunication Network Design Algorithms", Tata McGraw Hill
2. Behrouz Forouzan, De Anza College "TCP/IP Protocol Suite", 4th edition, McGraw-Hill
3. Stefen Poslad, "Ubiquitous Computing Smart Devices Environments And Inetraction," Wiley
Reference Books:
1. Forensic Science, Computers and the Internet, "Digital Evidence and Computer Crime", academic publisher 3rd Edition,2011
2. Averill M. Law, W. D. Kelton "Simulation Modeling and analysis", McgrawHill 3rd edition © 2000

MCEL511: CYBER SECURITY AND FORENSIC		
Teaching Scheme: **Lectures:**3 Hrs/Week **Tutorials:** Nil **Practical:** Nil	**Examination Scheme : (Theory)** **Teacher Assessment Examination:** 20 Marks **Class Assessment Examination:** 20 Marks **End Sem Examination:** 60 Marks	**Examination Scheme (Laboratory)** **Internal(TW):** Nil **External(OR)**:Nil **External(PR)** : Nil
Credit	**3**	

Prerequisite (If any):

1. Basic knowledge of Network Security

Course Objective:

1. To learn Forensics and use of Computers
2. To learn Tools used in Computer Forensics and Cyber Applications
3. To learn programming for Computer Forensics

Course Outcome:

1. To develop Computer Forensics Awareness
2. Ability to use Computer Forensics Tools
3. Ability to use Computer Forensics Cyber Applications
4. To understand concepts of basics of computer network
5. To understand concepts of digital forensic
6. To understand concepts of crime intrusion

Course Contents	Hrs
Unit – I Basics of Computer Networks	10
Protocols and Standards, OSI Model, TCP/IP Model, Network topology (Physical & logical), LAN standards, Ethernet (802.3), Transmission media: Guided transmission media - Twisted Pair, Coaxial and Fiber-optic cables, Switching techniques: Circuit switching, Packet switching and message switching, Network Hardware Components: Connectors, Repeaters, hubs, NICs, Bridges and Switches Motivation for a specialized MAC, Fundamentals of MAC protocols, Sensor MAC Case Study (Protocol overview, Periodic listen and sleep operations, Schedule selection and coordination, Adaptive listening, Message passing), IEEE 802.15.4 protocol: Physical, MAC layer, naming and addressing, Assignment of MAC addresses, Distributed assignment of locally unique addresses, content based and geographic addressing	
Unit – II :Digital Forensics	6
Foundations of digital Forensics, Language of Computer Crime Investigation, Digital	

Evidence of Courtroom, Cyber-crime Law: United State Perspective, Indian Perspective, Indian IT Act, conductive Digital Investigation, Handling a Digital Crime Scene: Principles, Preservation, Modus Operandi, Motive, and Technology.	
Unit – III :Crime Intrusions	4
Violent Crime and Digital Evidence, Digital Evidence as Alibi, Gender Offenders on the Internet, Computer Intrusions, Case study : Maltego, Shodan, Metagoofil, FOCA, EXIF data viewers, Social Engineer Toolkit.	
Unit – IV :Forensics Science	4
Cyber stalking, Computer Basics for Digital Investigators, Applying Forensic Science to Computers, Install and use Android Mobile Forensics Open Source Tools..	
Unit – V :**IPR**	6
Digital Evidence on Windows Systems, Digital Evidence on UNIX Systems, Digital Evidence on Mobile Devices, Intellectual Property Rights.	
Unit – VI :Forensic Science to Networks	6
Network Basics for Digital Investigators, Applying Forensic Science to Networks, Digital ,Evidence on the Internet, Digital Evidence on Physical and Data-Link Layers, Digital, Evidence at the Network and Transport Layers, Security and Fraud detection in Mobile and wireless networks.	

Text Books: (Book Title, Name of the author, name of the Publisher, edition, year of publication)
1. Digital Evidence& Computer Crime, Eoghan Casey Bs Ma Ac, ELSEVIER-Academic Press,Third Edition, ISBN 13 : 978-0123742681, ISBN 10 : 0123742684
2. Unix and Linux System Administration Handbook, Evi Nemeth, Garth Snyder, et al, Person Publication.
3. Behrouz A Fourouzan & Firouz Masharraf "Computer Network a Top Down Approach", 1st Edition, Mcg raw hill (2012).
4. http://www.computerweekly.com/photostory/2240160102/Nine-must-have-OSINT-tools
Reference Books:
1. Guide to Computer Forensics & Investigation, Bill Nelson, Amelia Phillips, Christopher Steuart,Cengage Learning, Fourth Edition, ISBN 13 : 978-1435498839, ISBN 10 : 1435498836
2. Ivan Stojmenovic, Handbook of Wireless Networks and Mobile Computing, Wiley India StudentEdition, ISBN 978-81-265-0768-9

<table>
<tr><th colspan="3">MCEL512A- Business Intelligence and Infrastructure Management</th></tr>
<tr><td>Teaching Scheme:
Lectures:3Hrs./Week
Tutorials: NIL
Practical: NIL</td><td>Examination Scheme (Theory)
Teacher Assessment Exam: 20 Marks
Class Assessment Exam: 20 Marks.
End Sem. Examination: 60 Marks</td><td>Examination Scheme (Laboratory)
Internal(TW): NIL
External(OR):NIL
External(PR) :NIL</td></tr>
<tr><td>Credit</td><td colspan="2">3</td></tr>
<tr><td colspan="3">Prerequisite:</td></tr>
<tr><td colspan="3">1. Data mining and Data Warehousing</td></tr>
<tr><td colspan="3">2. Database Concepts</td></tr>
<tr><td colspan="3">Course Objective:</td></tr>
<tr><td colspan="3">1. To learn Datawarehouse and Business Intelligence concepts.</td></tr>
<tr><td colspan="3">2. To design and manage Business Intelligence</td></tr>
<tr><td colspan="3">3. To study data mining and apply in Business Intelligence.</td></tr>
<tr><td colspan="3">4. Understanding components of modern information storage infrastructure.</td></tr>
<tr><td colspan="3">Course Outcome:</td></tr>
<tr><td colspan="3">1. To be able to understand role of Datawarehouse and Business Intelligence</td></tr>
<tr><td colspan="3">2. To be able to apply Business Intelligence in Infrastructure Management</td></tr>
<tr><td colspan="3">3. To apply Data Mining approaches in Business Intelligence.</td></tr>
<tr><td colspan="3">4. To Evaluate storage architecture and understand logical and physical components of a storage infrastructure including storage subsystems</td></tr>
<tr><td colspan="3">5. To Describe storage networking technologies and data archival solution</td></tr>
<tr><td colspan="3">6. To Understand and articulate business continuity solutions including, backup and recovery technologies, and local and remote replication solutions</td></tr>
</table>

Course Contents	Hrs
Unit –I : Introduction to Datwarehouse and Business Intelligence	6
Datawarehouse: Introduction, Data warehouse Modeling, data warehouse design, data-ware-house technology, Distributed data warehouse, and materialized view **Business Intelligence** : Introduction to data, Information and knowledge, Decision Support System, Theory of Operational data and informational data, Introduction to Business Intelligence, Defining BI Cycle, BI Environment and Architecture, Identify BI opportunities, Benefits of BI. Business Intelligence in an Organization.	
Unit – II : Designing and managing BI systems	6
Determining infrastructure requirements, planning for scalability and availability, managing and maintenance of BI systems, managing BI operations for business continuity.	
Unit – III : BI and Data Mining Applications	6
Data analytics, business analytics, ERP and Business Intelligence, BI Applications in CRM,	

BI Applications in Marketing, BI Applications in Logistics and Production, Role of BI in Finance, BI Applications in Banking, BI Applications in Telecommunications, BI Applications in Fraud Detection, BI Applications in Retail Industry.	
Unit – IV : Infrastructure Management Overview	6
Definitions, Infrastructure management activities, Evolutions of Systems since 1960s (Mainframes-to-Midrange-to-PCs-to-Client-server computing-to-New age systems) and their management, growth of internet, current business demands and IT systems issues, complexity of today's computing environment, Total cost of complexity issues, Value of Systems management for business.	
Unit – V : Preparing for Infrastructure Management	6
Factors to consider in designing IT organizations and IT infrastructure, Determining customer's Requirements, Identifying System Components to manage, Exist Processes, Data, applications, Tools and their integration, Patterns for IT systems management, Introduction to the design process for information systems, Models, Information Technology Infrastructure Library (ITIL).	
Unit – VI :Service Management	6
Service Delivery Processes- Service-level management, financial management and costing, IT services continuity management, Capacity management, Availability management. Service Support Processes- Configuration Management, Service desk. Incident management. Problem management, Change management, Release management	

Text Books: (Book Title, Name of the author, name of the Publisher, edition, year of publication)
1. R. Sharda, D. Delen, & E. Turban, Business Intelligence and Analytics. Systems for Decision Support,10th Edition. Pearson/Prentice Hall, 2015. ISBN-13: 978-0-13-305090-5, ISBN-10: 0-13-305090-4
2.Business Process Automation, Sanjay Mohapatra, PHI.
3. Jan Van Bon, "Foundations of IT Service Management: based on ITIL", Van Haren Publishing, 2nd edition 2005
4.Business Intelligence and Data Mining, Anil Maheshwari, Business Expert Press ISBN: 9781631571206
Reference Books:
1.Introduction to business Intelligence and data warehousing, IBM, PHI.
2. Ken W. Collier,Agile Analytics: Avalue driven Approach to Business Intelligence and Data Warehousing, Pearson Education,2012, ISBN-13 978 8131786826
3. EMC Educational Services, Information Storage and Management, Wiley India,.
4.Robert Spalding, "Storage Networks: The Complete Reference", Tata McGraw Hill, Osborne,2003.

MCEL512B: Mobile Computing		
Teaching Scheme: **Lectures:** 3Hrs/Week **Tutorials:** Nil **Practical:** Nil	**Examination Scheme: (Theory)** **Teacher Assessment Examination :** 20 Marks **Class Assessment Examination :** 20 Marks **End Sem Examination:** 60 Marks	**Examination Scheme: (Laboratory)** **Internal(TW):** Nil **External(OR):**Nil **External(PR):**Nil
Credit	**3**	

Prerequisite (If any):

1. Computer Network

Course Objective:

1. To learn GSM Architecture
2. To learn Mobile operating system and IP network protocols.
3. To understand the concept of Mobile Ad-Hoc and Sensor Networks
4. To Define Mobile Computing and look at current trends
5. To learn concept of data synchronization
6. To Examine Theory Research in Mobility Examine Systems Research in Mobility

Course Outcome:

Upon successful completion of this course, students should be able to:

1. Understand basic concepts and principles in mobile computing
2. Understand the concept of Wireless LANs, PAN, Mobile Networks, and Sensor Networks
3. Explain the structure and components for Mobile IP and Mobility Management
4. Understand positioning techniques and location-based services and applications
5. Understand data synchronization
6. Study Advance/Recent trends and technologies

Course Contents	**Hrs**
Unit – I Mobile Communications and Computing : An Overview	6
Mobile Communication, Mobile Computing, Mobile Computing Architecture, Mobile Devices, Mobile System Networks, Data Dissemination, Mobility Management, Security, Mobile Devices and Systems, Mobile Phones, Digital , Music Players, Handheld Pocket Computers, Handheld Devices: Operating Systems, Smart Systems, Limitations of Mobile Devices, Automotive Systems	
Unit – II : GSM and Similar Architectures	6

GSM-Services & System Architectures ,Radio Interfaces, Protocols Localization, Calling, Handover, Security, New Data Services, General Packet Radio Services, High Speed Circuit Switched Data, DECT , Wireless Medium Access Control and CDMA - based Communication ,Medium Access Control, Introduction to CDMA – basedSystems, Spread Spectrum in CDMA Systems, Coding Methods in CDMA,IS-95 CDMA One System,IMT-2000,i-mode, OFDM	
Unit – III : Mobile Ad-Hoc and Sensor Networks	6
Introduction to Mobile Ad-Hoc Networks, MANET, Wireless Sensor Networks, Applications, Wireless LAN, Mobile Internet Connectivityand Personal Area Network, Wireless LAN (WiFi) Architecture & Protocol Layers, WAP 1.1 & WAP 2.0 Architectures, XHTML-MP (Extensible Hypertext Markup Language Mobile Profile),Blue tooth-enabled Devices Networks, Layers in Bluetooth Protocol, Security inBluetooth Protocol, IrDA, ZigBee, Mobile Application Languages-XML, Java, J2ME, and JavaCard.	
Unit – IV : Mobile IP Network Layer	6
IP & Mobile IP Network Layer s, Packet Delivery & Handover Management, Location Management, Registration, Tunneling & Encapsulation, Route Optimization, Dynamic Host Configuration Protocol, Mobile Transport Layer , Conventional TCP/IP Transport Layer Protocol, Indirect TCP, Snooping TCP, Mobile TCP, Other Methods of TCP layer Transmission for Mobile Networks, TCP over 2.5G/3G Mobile ,Networks	
Unit – V : Data Synchronization in Mobile Computing Systems	6
Synchronization, Synchronization Software for Mobile Devices, Synchronization Protocols, SyncML Synchronization Language for Mobile Computing, Sync4J (Funambol), Synchronized Multimedia Markup Language (SMIL), Mobile Devices: Servers and Management , Mobile Agent, Application Server, Gateway, Portals, Service Discovery, Device Management, Mobile File System, Security	
Unit – VI : Mobile Operating Systems& Advance/Recent trends and technologies	6
Characteristics, Basic functionalities of Operating Systems, Windows CE, Symbian OS, Android OS, Linux for Mobile Devices, SIM card File system	

Text Books: (Book Title, Name of the author, name of the Publisher, edition, year of publication)
1. Raj Kamal, Mobile Computing, 2/e , Oxford University Press-New Delhi13
2. Handbook of Algorithms for Wireless Networking and Mobile Computing, edited by Azzedine Boukerche, CHAPMAN & HALL/CRC COMPUTER and INFORMATION SCIENCE SERIES
3. Ashok K. Talukder, Roopa R. Yavagal, Mobile Computing Technology, Applications, and Service Creation, McGraw-Hill Communications Engineering, 2005
4. Martyn Mallick, Mobile and Wireless Design Essentials, Wiley Publishing, 2003.
5. J. Schiller, Mobile Communications, 2nd edition, Pearson Education, 2003.

6.	D.P. Agrawal and Q.-A. Zeng, Introduction to Wireless and Mobile Systems, Brooks/Cole, Thomson Learning, 2003.
7.	H.M. Deitel, P.J. Deitel, T.R. Nieto, and K. Steinbuhler, Wireless Internet & Mobile Business – How to Program, Prentice Hall, 2002
8.	J. Burkhardt, H. Henn, S. Hepper, K. Rindtorff and T. Schaeck, Pervasive Computing: Technology and Architecture of Mobile Internet Applications, Addison-Wesley, 2002
Reference Books:	
1.	Handbook of Wireless Networks and Mobile Computing, Edited by IvanStojmenovic, John Wiley & Sons.

MCEL512C : Network Security & Cryptography		
Teaching Scheme: **Lectures:** 3Hrs/Week **Tutorials:** Nil **Practical:** Nil	**Examination Scheme: (Theory)** **Teacher Assessment Examination :** 20 Marks **Class Assessment Examination :** 20 Marks **End Sem Examination:** 60 Marks	**Examination Scheme: (Laboratory)** **Internal(TW):** Nil **External(OR)**:Nil **External(PR)** :Nil
Credit	**3**	

Prerequisite (If any):	
1. Computer Networks	
Course Objective:	
1. To develop problem solving abilities using Network Security &cryptography.	
2. To develop a basic understanding of cryptography techniques.	
3. To develop an understanding of security policies.	
Course Outcome:	
1. To understand the basic concepts of network security & cryptography.	
2. To study public key cryptography.	
3. To study various security policies..	
4. To learn the concept of authentication.	
5. To understand the concepts of intrusion and firewalls.	
6. To learn and apply the concepts of web security .	
Course Contents	**Hrs**
Unit – I:Overview	8
Services, Mechanisms and attacks, OSI security architecture, Model for network security. Classical Encryption Techniques: Symmetric cipher model, Substitution techniques, Transposition techniques, Rotor machine, Steganography. Block and Stream Ciphers, DES (Data Encryption Standards): Simplified DES, Strength of DES, Block cipher design principles, Block cipher modes of operation, AES(Advanced Encryption Standard)	
Unit – II : Public Key Cryptography	6
Principles of public key cryptosystems, RSA Algorithm, Other Public Key Crypto Systems and Key Management: Key Management, Diffie-Hellman key exchange, Elliptic curve arithmetic, Elliptic curve cryptography.	
Unit – III : Message Authentication and Hash Functions	6
Authentication requirements, Authentication functions, Message authentication codes, Hash functions, Security of Hash functions and MAC's. Digital Signature and Authentication Protocol:	

Digital signature, Authentication protocols, Digital signature standard.	
Unit – IV :Authentication	6
Kerberos, X.509 authentication service, Kerberos encryption technique. Electronic Mail Security: Pretty good privacy, S/MIME, Data compression using ZIP, Radix-64 conversion, PGP random number generator. IP Security: Overview, IP security architecture, Authentication header, ESP (encapsulating security pay load), Security associations, Key management.	
Unit – V : Intrusion And Firewalls	6
Introduction, Intrusion detection, IDS: Need, Methods, Types of IDS, Password Management, Limitations and Challenges, Firewall Introduction, Characteristics and types, Benefits and limitations. Firewall architecture, Trusted Systems, Access Control.	
Unit – VI : Web Security	4
TCP/IP Vulnerabilities : Securing TCP/IP Spoofing: The process of an IP spoofing attack, Cost of Spoofing, Types of spoofing, spoofing tools, prevention and Mitigation.	

Text Books: (Book Title, Name of the author, name of the Publisher, edition, year of publication)
1. William Stallings " Cryptography and Network Security Principles and Practices", Fourth Edition Pearson Education (Asia) Pvt. Ltd./Prentice Hall of India2003
2. Atul Kahate , "Cryptography and Network Security", Tata McGraw-Hill 2003
3. Merike Kaeo, "Designing Network Security", 2nd Edition , published Oct 30, 2003 by Cisco Press.
Reference Books:
1. Eric Maiwald , "Fundamentals of Network Security" McGraw-Hill 2003
2. John Hershey ,"Cryptography Demystified", McGraw-Hill 2003

MVEL511- Open Elective form E&TC dept.(Elective-II)		
Teaching Scheme: **Lectures:**3Hrs/Week **Tutorials:** NIL **Practical:** NIL	**Examination Scheme (Theory)** **Teacher Assessment Exam:** 20 Marks **Class Assessment Exam:** 20 Marks. **End Sem. Examination:**.60 Marks	**Examination Scheme (Laboratory)** **Internal(TW):** NIL **External(OR)**:NIL **External(PR)** :NIL
Credit	**3**	

- Please referred E&TC M tech syllabus

<table>
<tr><td colspan="4">MCEL513A : Big Data Analytics</td></tr>
<tr><td>Teaching Scheme:
Lectures: 3 Hrs/Week
Tutorials: Nil
Practical: Nil</td><td>Examination Scheme: (Theory)
Teacher Assessment Examination : 20 Marks
Class Assessment Examination : 20 Marks
End Sem Examination:-60 Marks</td><td colspan="2">Examination Scheme:
(Laboratory)
Internal(TW): Nil
External(OR):Nil
External(PR) :Nil</td></tr>
<tr><td>Credit</td><td>3</td><td colspan="2"></td></tr>
<tr><td colspan="4">Prerequisite :</td></tr>
<tr><td colspan="4">1. Data Warehousing and Data Mining
2. Database Concepts</td></tr>
<tr><td colspan="4">Course Objective:</td></tr>
<tr><td colspan="4">1. Understand Business Intelligence, decision support systems in Data warehouse
2. Study the Data analysis using data mining, data preparation and exploration
3. To forester the development of data mining capability in Hadoop and R and facilitate sharing of data mining codes/functions/algorithms among Hadoop and R users.</td></tr>
<tr><td colspan="4">Course Outcome:</td></tr>
<tr><td colspan="4">1. Able to understand Business Intelligence, decision support systems in Data warehouse
2. Able to understand the concept of Big data.
3. Understand Hadoop Ecosystem.
4. Comprehend Structure and algorithms for Big data.
5. Able to understand Hadoop Architecture.</td></tr>
<tr><td colspan="3">Course Contents</td><td>Hrs</td></tr>
<tr><td colspan="3">UNIT I – Components of Decision-making process</td><td rowspan="2">4</td></tr>
<tr><td colspan="3">Business Intelligence, Decision Support Systems, Data ware-housing.</td></tr>
<tr><td colspan="3">UNIT II – Data analysis and exploration</td><td rowspan="2">6</td></tr>
<tr><td colspan="3">Mathematical models for decision making, data mining, data preparation, data exploration.</td></tr>
<tr><td colspan="3">Unit – III : Introduction of Big data and Hadoop Ecosystem</td><td rowspan="2">8</td></tr>
<tr><td colspan="3">Big data definition, Elements of Big data, Big data analytics, Big Data Stack, Hadoop Ecosystem, Hadoop Distributed file system (HDFS, MapReduce, Hadoop YARN, Hbase, Hive, Pig and Pig latin, Sqoop, ZooKeeper, Flume, Oozie.</td></tr>
<tr><td colspan="3">Unit – IV : Data mining tasks</td><td rowspan="2">6</td></tr>
<tr><td colspan="3">Regression and association rules- structure of regression model, single linear regression, and multiple linear regression.</td></tr>
<tr><td colspan="3">Unit – V: Association rules and clustering</td><td rowspan="2">6</td></tr>
<tr><td colspan="3">Structure of association rules, Single dimension association rules, Apriori algorithm, General association rules.
Clustering – clustering methods, partition methods and Hierarchical methods.</td></tr>
<tr><td colspan="3">Unit – VI : Exploring R</td><td rowspan="2">6</td></tr>
<tr><td colspan="3">Basic Features of R, Exploring RGui, Working with vectors, Handling data in R workspace.Reading datasets and exporting data from R, Manipulating and processing data in R.</td></tr>
</table>

Text Books: (Book Title, Name of the author, name of the Publisher, edition, year of publication)
1. Business Intelligence - Data Mining and optimization for Decision Making- Carlo Vercellis- Wiley Publications. (Units 1, 2, 4, 5)
2. Big Data (Black Book)- DT Editorial Services- Dreamtech Press (Units 3, 6)
3. Data mining Introductory and Advanced topics- Margaret H. Dunham-Pearson (Units 4, 5)
Reference Books:
1. Data Mining Concepts and Techniques, Jiawei Han, Micheline Kamber, Elsevier.2008 ,2 edition.
2. Big Data and Analytics- Seema Acharya and Subhashini Chellappan- Wiley Publications.
3. Data mining and Analysis Fundamental Concepts and Algorithms - Mohammed J. Zaki and Wagner Meira Jr. - Cambridge University Press.

MCEL513B:Cloud Computing		
Teaching Scheme: **Lectures:** 3Hrs/Week **Tutorials:** Nil **Practical:** Nil	**Examination Scheme: (Theory)** **Teacher Assessment Examination :** 20 Marks **Class Assessment Examination :** 20 Marks **End Sem Examination:** 60 Marks	**Examination Scheme: (Laboratory)** **Internal(TW):** Nil **External(OR)**:Nil **External(PR)** :Nil
Credit	**3**	

Prerequisite (If any):
1. Parallel & Distributed Computing
Course Objective:
1. To understand the need of cloud computing
2. To learn architectural framework of cloud computing
3. To discuss Cloud and (new) Service Level Management
4. To discuss how to approach and evaluate a Cloud business case
Course Outcome:
1. To understand Cloud Computing Architectural framework
2. To understand various cloud services
3. To understand Cloud Computing Security challenges
4. To evaluate a Cloud business case and Risk Management
5. To understand concepts of cloud application development
6. To understand various commercial clouds

Course Contents	**Hrs**
Unit – I : Introduction to Cloud Computing	6
Virtualization Concepts, Cloud Computing Fundamental: Overview of Computing Paradigm, Evolution of cloud computing, Defining cloud computing, Components of a computing cloud, Essential Characteristics of Cloud Computing, Cloud Taxonomy.	
Unit – II : Cloud Computing Architectural Framework	6
Cloud architectural principles, Role of Networks in Cloud computing, Role of Web services, Benefits and challenges to Cloud architecture, Cloud Service Models, cloud computing vendors. Cloud Services Management, Performance and scalability of services, tools and technologies used to manage cloud services deployment.	
Unit – III : Exploiting Cloud Services	6
Software as a Service (SaaS): Introduction to SaaS, Inspecting SaaS technologies, Implementing web services, Deploying Infrastructure as a Service (IaaS): Introduction to IaaS,	

Scalable server clusters, Machine Image, Virtual Machine (VM). Elastic storage devices, Data storage in cloud computing, Delivering Platform as a Service(PaaS): Introduction to PaaS, Service Oriented Architecture (SOA), Cloud Platform and Management, Hardware-as-a-service: HaaS.	
Unit – IV : Cloud Application Development	6
Role of business analyst, Technical architecture considerations, Service creation environments to develop cloud based applications, Technologies and the processes required when deploying web services; Deploying a web service from inside and outside a cloud architecture, advantages and disadvantages, Cloud Economics,	
Unit – V : Cloud Security and Risk Management	6
Cloud Security: Understanding cloud based security issues and threats, Data security and Storage, Identity & Access Management, Risk Management in cloud, Governance and Enterprise Risk Management.	
Unit – VI : Analysis on Case study	6
Business Case: Business case evaluation criteria, Business outcomes examples, Case Studies: Case Study on Open Source & Commercial Cloud: Eucalyptus, Microsoft Windows Azure, Amazon EC2, Amazon Elastic Block Storage – EBS. Google Cloud Infrastructure, MapReduce. AWS, Simple Storage Service – S3, Recent trends in Computing/ advanced topic.	

Text Books: (Book Title, Name of the author, name of the Publisher, edition, year of publication)
1. Kai Hwang, Jack Dongarra & Geoffrey C. Fox. , “Distributed and Cloud Computing: Clusters, Grids, Clouds, and the Future Internet of things”, Morgan Kaufmann Publishers, 2012.
2. Barrie Sosinsky ,“Cloud Computing Bible”, Wiley-India, 2010
3. Nikos Antonopoulos, Lee Gillam, “Cloud Computing: Principles, Systems and Applications”, Springer, 2012
Reference Books:
1. Ronald L. Krutz, Russell Dean Vines , “Cloud Security: A Comprehensive Guide to Secure Cloud Computing” , Wiley-India, 2010
2. Gautam Shroff “Cloud Computing Technology Architecture Applications”, Enterprise [ISBN: 978-0521137355] Cambridge University Press (14 October 2010)
3. Anthony T. Velte, “Cloud Computing: Practical Approach”, McGraw-Hill Education; 1 edition 2009

<table>
<tr><td colspan="3">MCEL513C - Intelligent Systems</td></tr>
<tr><td>Teaching Scheme:
Lectures: -3-Hrs/Week
Tutorials: NIL
Practical: NIL</td><td>Examination Scheme (Theory)
Teacher Assessment Exam: 20 Marks
Class Assessment Exam: 20 Marks.
End Sem. Examination:.60 Marks</td><td>Examination Scheme (Laboratory)
Internal(TW): NIL
External(OR):NIL
External(PR) :NIL</td></tr>
<tr><td>Credit</td><td colspan="2">3</td></tr>
<tr><td colspan="3">Prerequisite (If any):</td></tr>
<tr><td colspan="3">1. Artificial intelligence</td></tr>
<tr><td colspan="3">Course Objective:</td></tr>
<tr><td colspan="3">1. To planning and acting in real word.</td></tr>
<tr><td colspan="3">2. To study uncertain knowledge and reasoning.</td></tr>
<tr><td colspan="3">3. To make simple and complex problem decision.</td></tr>
<tr><td colspan="3">Course Outcome:</td></tr>
<tr><td colspan="3">1. To study concepts of agents in Intelligent System.</td></tr>
<tr><td colspan="3">2. To understands search strategies and to solve constraint satisfaction problems.</td></tr>
<tr><td colspan="3">3. .To study planning of real world problem approaches.</td></tr>
<tr><td colspan="3">4. To understand uncertain problems and its reasoning.</td></tr>
<tr><td colspan="3">5. To understand concept of complex decisions.</td></tr>
<tr><td colspan="3">6. To solve simple and complex problem for various expert system.</td></tr>
<tr><td colspan="2">Course Contents</td><td>Hrs.</td></tr>
<tr><td colspan="2">Unit – I : Introduction</td><td rowspan="2">6</td></tr>
<tr><td colspan="2">Intelligent Agents: Introduction. Agents and Environments, Good Behavior: The Concept of Rationality, The Nature of Environments, The Structure of Agents.
Problem Formulation: Problem-Solving Agents, Example Problems, Searching for Solutions, Uninformed Search Strategies, Avoiding Repeated States, Searching with Partial Information</td></tr>
<tr><td colspan="2">Unit – II : Search Methods</td><td rowspan="2">6</td></tr>
<tr><td colspan="2">Informed Search and Exploration: Informed (Heuristic) Search Strategies, Heuristic Functions, Local Search Algorithms and Optimization Problems, Local Search in Continuous Spaces, Online Search Agents and Unknown Environments, Generic Algorithms for TSP.
Constraint Satisfaction Problems: Constraint Satisfaction Problems, Backtracking Search for CSPs, Local Search for Constraint Satisfaction Problems, Structure of Problems.</td></tr>
<tr><td colspan="2">Unit – III : Planning</td><td rowspan="2">6</td></tr>
<tr><td colspan="2">The Planning Problem, Planning with State-Space Search, Partial-Order Planning,
Planning Graphs, Planning with Prepositional Logic, Analysis of Planning Approaches. Time,</td></tr>
</table>

Schedules and Resources, Hierarchical Task Network Planning, Planning and Acting in Nondeterministic Domains, Conditional Planning, Execution Monitoring and Preplanning, Continuous Planning, Multi-Agent Planning.	
Unit – IV : **Uncertain knowledge and reasoning**	6
Acting under Uncertainty, Basic Probability Notation, Representing Knowledge in an Uncertain Domain, The Semantics of Bayesian Networks, Efficient Representation of Conditional Distributions, Exact Inference in Bayesian Networks, Approximate Inference in Bayesian Networks, Extending Probability to First-Order Representations, Other Approaches to Uncertain Reasoning.	
Unit – V : **Making Simple & Complex Decisions**	6
Combining Beliefs and Desires under Uncertainty, The Basis of Utility Theory, Utility Functions, Multi-attribute Utility Functions, Decision Networks, The Value of Information, Decision-Theoretic Expert Systems, Sequential Decision Problems, Value Iteration, Policy Iteration.	
Unit – VI : **Expert Systems and Advances in Intelligence System**	6
Representing and Domain Knowledge, Expert System ,shell, Explanation, Knowledge Acquisition, Fuzzy Expert system, Frame Based Expert System, Artificial Neural Network, Evolutionary Computation, Hybrid Intelligent System.	

Text Books: (Book Title, Name of the author, name of the Publisher, edition, year of publication)
1. Patrick Henry Winston, “Artificial Intelligence”, 3rd Edition. Pearson Publication, ISBN No.978-81-317-1505-5.
2. Laxmidhar Behara,” Intelligent Systems Technologies and Applications
3. Michael Negnevitsky ,“Artificial Intelligence: A Guide to Intelligent Systems” 2 nd Edition, Pearson Publication, ISBN 0 321 20466 2.
4. Zbigniev W Ras “Foundation of Intelligent Systems”
Reference Books:
1. Stuart Russell, Peter Norvig, “Artificial Intelligence – A Modern Approach” 2nd Edition Pearson Publication, ISBN No.978-81-775-8367-0.
2. ”Patrick Henry Winston., “Lisp programming language”, Pearson Publication.
3. Jef Hawkins “On Intelligence “
4. Dan Patterson “Introduction to Artificial Intelligence”

<table>
<tr><th colspan="3">MVEL512 - Open Elective form E&TC dept.(Elective-III)</th></tr>
<tr><td>Teaching Scheme:
Lectures:3Hrs/Week
Tutorials: NIL
Practical: NIL</td><td>Examination Scheme (Theory)
Teacher Assessment Exam: 20 Marks
Class Assessment Exam: 20 Marks.
End Sem. Examination:.60 Marks</td><td>Examination Scheme (Laboratory)
Internal(TW): NIL
External(OR):NIL
External(PR) :NIL</td></tr>
<tr><td>Credit</td><td colspan="2">3</td></tr>
<tr><td colspan="3">Course Objective: To acquired knowledge of new subject</td></tr>
</table>

*please referred E&Tc M tech syllabus

MCEP514 : Lab Practical –II		
Teaching Scheme: **Lectures:** NIL **Tutorials:**4 Hrs./Week **Practical:** NIL	**Examination Scheme (Theory)** **Teacher Assessment Exam:** NIL **Class Assessment Exam:** NIL **End Sem. Examination :**NIL	**Examination Scheme (Laboratory)** **Internal(TW):** 50 Marks **External(OR)**:50Marks **External(PR)** :NIL
Credit -	**2**	

Course Objective:

1. To understand deadlock problems and socket programming
2. To study various algorithm of network security
3. To design IEEE /ACM/Springer transaction journal paper for BDA & SDA

Course Outcomes:

1. To implement deadlock solution with software architecture and IPC mechanism
2. To Design suitable software architecture
3. To understand configuration WAN and web server.
4. To implement Honeypot and to identify DOS attack.
5. To implement BIA tools for marketing applications.
6. To implement E-commerce application and design an IEEE paper.

List of Practical (Any Ten Assignment)	4Hrs./week
1. Demonstrate the Reader-Writer Problem solution by creating multiple Processes and share regions or blocks. Use 64-bit Linux derivative and tools for implementation.	
2. Write a program in Python for IPC using pipe and socket.	
3. Design suitable software architecture for reader -writer problem.	
4. Take one IEEE /ACM/Springer transaction journal paper and design SDA and list all requirements using S/W life cycle model.	
5. Implement and configure RIP using packet tracer.	
6. Implement multithreaded web server using JAVA.	
7. Write a program to implement to identify DOS attack on a wireless cluster of servers.	
8. Design and implementation of Honeypot	
9. Develop dynamic and interactive web client using JSP, Scripting/Applets/ActiveX controls	

10. Use Business intelligence and analytics tools to recommend the combination of share purchases and sales for maximizing the profit.	
11. Select an Industrial sector and write a BIA tool for maximizing the profit.	
12. Implement using HIVE/HBASE for any e-commerce application.	
13. Design of one journal papers (IEEE/Elsevier/ACM/Springer/Thomas Reuters) related to Big Data Analysis.	
14. Implement using any open source tool for assignment 12.	
15. Write a program for Identifying the tampering of digital signature using Python.	

Course Syllabus SEM-III

MCEP601 : Technical Course-Latex		
Teaching Scheme: **Lectures:** Nil **Tutorials:** Nil **Practical:** 6 Hrs. /Week	**Examination Scheme : (Theory)** **Teacher Assessment Examination:** Nil **Class Assessment Examination:** Nil **End Sem. Examination:** Nil	**Examination Scheme:** **(Laboratory)** **Internal(TW):** 50 Marks **External(OR)**: NIL **External(PR)** :Nil
Credit	**3**	
Course Objectives:		
1. To write technical/scientific papers for journal		
2. To understand Typesetting of journal articles, technical reports, thesis, books, and slide presentations.		
3. To predict the behavior of the system to be designed		
4. To develop scientific understanding through quantitative expression of current knowledge of the system		
1. To write technical/scientific papers for journal		
Course Outcomes:		
Students will be able to		
1. Write technical/scientific papers for journals		
2. Do typesetting of journal articles, technical reports, thesis, books, and slide presentations.		
3. Predict the behavior of the system to be designed		
4. Develop scientific understanding through quantitative expression of current knowledge of the system		
Students will be able to		
Course Contents		**Hrs**
1. Install and setup MikTex 2.9 (Latex setup) software on windows 2. Write a code to prepare Latex document for following things a. Document Structure b. Creating Title c. Creating sections d. Print simple “Hello” word 3. Write a code to prepare Latex document for following things: a. Alignment b. Font c. Header d. Page number 4. Write a code to prepare Latex document for Math Equations. 5. Write a code to prepare Latex document for following:		6 Hrs. /Week

a. Create table and Update table b. Add image 6. Write a code to prepare list of items in Latex document 7. Develop the mathematical model for any suitable application	

Text: 1. "The LaTeX Companion", M. Goossens, F. Mittelbach, and A. Samarin, Addison-Wesley, ISBN 0-201-54199-8
Reference: 1. "LaTeX Line by Line", Diller, Wiley 2. "An introduction to mathematical modeling", Edward A. Bender

<table>
<tr><th colspan="4">MCEP602: Seminar-I</th></tr>
<tr><td>Teaching Scheme:
Lectures: Nil
Tutorials: Nil
Practical:4 Hrs./Week</td><td colspan="2">Examination Scheme: (Theory)
Teacher Assessment Examination: Nil
Class Assessment Examination: Nil
End Sem. Examination: Nil</td><td>Examination Scheme: (Laboratory)
Internal(TW): 50 Marks
External(OR): 50 Marks
External(PR) :Nil</td></tr>
<tr><td>Credit</td><td colspan="3">4</td></tr>
<tr><td colspan="4">Course Outcome:</td></tr>
<tr><td colspan="4">1. Able to select topics from recent trends.</td></tr>
<tr><td colspan="4">2. Apply the Research Methodology concepts and survey research topic.</td></tr>
<tr><td colspan="4">3. Able to apply Theoretical concepts</td></tr>
<tr><td colspan="4">4. Able to learn technical writing skills</td></tr>
<tr><td colspan="4">5. Able to use Communication skills</td></tr>
<tr><td colspan="4">6. Able to apply Presentation skills</td></tr>
<tr><td colspan="3">Course Contents</td><td>Hrs.</td></tr>
<tr><td colspan="3">Seminar based on state-of-the art in the selected electives and approved by guide. The presentation and the report should cover motivation, mathematical modeling, data-table discussion and conclusion.
The reports to be prepared using LATEX derivative. To maintain the quality of the seminar work it is mandatory to the seminar guides to maintain a progressive record of the seminar.
Contact Hrs of 4 Hrs per week per seminar which shall include the discussion agenda, weekly outcomes achieved during practical sessions, corrective actions and comments on the progress report as per the plan submitted by the students including dates and timing, along with the signature of the student as per the class and teacher time table (as additional teaching load).
Such record of progressive work shall be referred by the examiners during evaluation. Students should implement the idea of seminar topic using any technical open tools appropriately.</td><td>4 Hrs./Week</td></tr>
</table>

MCEP603 : Dissertation Phase-I		
Teaching Scheme: **Lectures:** Nil **Tutorials:** Nil **Practical:** 8 Hrs./Week	**Examination Scheme: (Theory)** **Teacher Assessment Examination:** Nil **Class Assessment Examination:** Nil **End Sem. Examination:** Nil	**Examination Scheme (Laboratory)** **Internal(TW): 5**0 Marks **External(OR)**: 100 Marks **External(PR)** : Nil
Credit	**8**	
Course Outcome:		
1. Able to understand research problem.		
2. Apply the knowledge and survey research problem.		
3. Able to apply recent trends.		
4. Able to provide solution for research problem		
5. Able to apply concepts of research methodology		
6. Able to apply engineering concepts and solve the problem		

Course Contents	Hrs.
Motivation, Problem statement, survey of journal papers related to the problem statement, problem modeling and design using set theory, NP-Hard analysis, SRS, UML, Classes, Signals, Test scenarios and other necessary, problem specific UML, software engineering documents. Student should publish one International Journal Paper (having ISSN Number and preferably with Citation Index II); or paper can be published in reputed International Journal recommended by the guide of the Dissertation and in addition to above the term work shall include the paper published, reviewers comments and certificate of presenting the paper in the conference organized/sponsored by the University. To maintain the quality of the dissertation work it is mandatory on the dissertation guides to maintain a progressive record of the dissertation contact Hrs. of 8Hrs per week which shall include the dissertation discussion agenda, weekly outcomes achieved during practical sessions, corrective actions and comments on the progress report as per the plan submitted by the students including dates and timing, along with the signature of the student as per the class and teacher time table. Such record of progressive work shall be referred by the dissertation examiners during evaluation. At the most 8 dissertations can be assigned to a guide.	8Hrs/Week

Course Syllabus SEM-IV

<table>
<tr><td colspan="4">MCEP604 : Seminar-II</td></tr>
<tr><td>Teaching Scheme:
Lectures: Nil
Tutorials: Nil
Practical: 4 Hrs./Week</td><td>Examination Scheme : (Theory)
Teacher Assessment Examination: Nil
Class Assessment Examination: Nil
End Sem. Examination: Nil</td><td colspan="2">Examination Scheme (Laboratory)
Internal(TW): 50 Marks
External(OR): 50 Marks
External(PR) : Nil</td></tr>
<tr><td>Credit</td><td>4</td><td colspan="2"></td></tr>
<tr><td colspan="4">Course Outcome:</td></tr>
<tr><td colspan="4">1.Able to select topics from latest research topic.</td></tr>
<tr><td colspan="4">2.Apply the Research Methodology concepts and survey research topic.</td></tr>
<tr><td colspan="4">3.Able to apply Theoretical concepts and compare with other related topics.</td></tr>
<tr><td colspan="4">4.Able to learn technical writing skills</td></tr>
<tr><td colspan="4">5.Able to use Communication skills</td></tr>
<tr><td colspan="4">6.Able to apply Presentation skills</td></tr>
<tr><td colspan="3">Course Contents</td><td>Hrs.</td></tr>
<tr><td colspan="3">Seminar based on selected research methodology preferably algorithmic design advances as an extension to seminar-II, approved by the guide. The presentation should cover motivation, mathematical modeling, data-table discussion and conclusion.
The reports shall be prepared using LATEX derivative. To maintain the quality of the seminar work it is mandatory for the seminar guides to maintain a progressive record of the seminar .
Contact Hrs of 4 Hrs per week per seminar which shall include the discussion agenda, weekly outcomes achieved during practical sessions, corrective actions and comments on the progress report as per the plan submitted by the students including dates and timing, along with the signature of the student as per the class and teacher time table (as additional teaching load).
Such record of progressive work shall be referred by the examiners during evaluation.
Topic should be technically inclined to implementation of project. Students must do valid certification from industry or institute.</td><td>4 Hrs./ Week</td></tr>
</table>

<table>
<tr><td colspan="4">MCEP605: Dissertation Phase-II</td></tr>
<tr><td>Teaching Scheme:
Lectures: Nil
Tutorials: Nil
Practical: 16 Hrs./Week</td><td colspan="2">Examination Scheme : (Theory)
Teacher Assessment Examination: Nil
Class Assessment Examination: Nil
End Sem. Examination: Nil</td><td>Examination Scheme (Laboratory)
Internal(TW): 100 Marks
External(OR): 100 Marks
External(PR) : Nil</td></tr>
<tr><td>Credit</td><td colspan="3">16</td></tr>
<tr><td colspan="4">Course Outcome:</td></tr>
<tr><td colspan="4">1.Able to design system for research problem</td></tr>
<tr><td colspan="4">2.Able to implement research problem.</td></tr>
<tr><td colspan="4">3.Able to apply latest technology.</td></tr>
<tr><td colspan="4">4.Able to compare research finding with others.</td></tr>
<tr><td colspan="4">5.Able to apply testing skills.</td></tr>
<tr><td colspan="4">6.Able to implement other real time problems.</td></tr>
<tr><td colspan="3">Course Contents</td><td>Hrs.</td></tr>
<tr><td colspan="3">Selection of Technology, Installations, UML implementations, testing, Results, and performance discussions using data tables per parameter considered for the improvement with existing known algorithms and comparative graphs to support the conclusions drawn.
Student should publish one International Journal Paper (having ISSN Number and preferably with Citation Index II); or paper can be published in reputed International Journal recommended by the guide of the Dissertation and in addition to above the term work shall include the paper published, reviewers comments and certificate of presenting the paper in the conferences. To maintain the quality of the dissertation work it is mandatory on the dissertation guides to maintain a progressive record of the dissertation contact 8 Hrs of at least 4Hrs per week which shall include the dissertation discussion agenda.
Weekly outcomes achieved during practical sessions, corrective actions and comments on the progress report as per the plan submitted by the students including dates and Such record of progressive work shall be referred by the dissertation examiners during evaluation. At the most 8 dissertations can be assigned to a guide.</td><td>16 Hrs./Week</td></tr>
</table>

Department of
First Year B.Tech.

F.Y.B.Tech Course Book

(2016 Pattern)
(With effect from June 2016)

Department of
First Year B.Tech.

Under Graduate (UG) Course Book

F.Y. B.Tech. (Common)

Semester I /II

INDEX

About First Year Department

- Department provides a common platform to all branches students by imparting fundamental knowledge
- Involvement of Experts from IITs, NITs, Govt. Colleges, Reputed Industries, Alumni and Students in development of curriculum
- Choice Based Credit System (CBCS)
- General Proficiency - Foreign Language (German, French, Japanese and Spanish)
- Remedial Teaching
- Sponsorship for Publications and IPR
- Research Mentorship
- Industry Internship
- Provision of Credit Transfer Scheme (CTS)
- Peer Teaching Scheme
- Teacher Guardian Scheme (TGS)
- Various Clubs and Hobby Modules
- Emphasis on English Communication
- Activity based learning

INSTITUTE VISION AND MISSION

VISION

To achieve excellent standards of quality education by keeping pace with rapidly changing technologies and to create technical manpower of global standards with capabilities of accepting new challenges.

MISSION

Our efforts are dedicated to impart quality and value based education to raise satisfaction level of all stake holders. Our strength is directed to create competent professionals. Our endeavor is to provide all possible support to promote research and development activities.

DEPARTMENT VISION AND MISSION

DEPARTMENT VISION

To achieve excellent standard of quality education through effective teaching and learning process and to create technical manpower with capabilities of global standards.

DEPARTMENT MISSION

To impart quality and value education by providing high standard technical knowledge to create competent professionals.

To inculcate research amongst students and faculties.

Program outcomes

Engineering Graduate will be able to:

PO1	**Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO2	**Identify**, formulate, review research literature, and analyse complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences
PO3	**Design/development of solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
PO4	**Conduct investigations of complex problems**: Use research-based knowledge and research methods including design of experiments, analysis, and interpretation of data, and synthesis of the information to provide valid conclusions.
PO5	**Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.
PO6	**The engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
PO7	**Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and a need for sustainable development.
PO8	**Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO9	**Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO10	**Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions
PO11	**Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
PO12	**Life-long learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

First Year B.Tech Structure & Evaluation Scheme

Semester - I														
S N	**Subject Code**	**Subject Name**	**Teaching**				**Credits**	**Evaluation Scheme (Marks)**						**ESE Duration (Hrs)**
			Lect.	**Tut.**	**Pract.**	**Total**		**Theory**			**Practical**		**Total**	
								TAE	**CAE**	**ESE**	**Cont. Assessment**	**Ext**		
1	BEML101	Engineering Mathematics-I	3	1	–	4	4	20	20	60	–	–	100	3
2	BPHL102 BPHP102 / BCHL103 BCHP103	Engineering Physics/Engineering Chemistry	4	1	2	7	6	20	20	60	25	25	150	3
3	BITL104 BITP104 / BECL105 BECP105	Programming in C / Basic Electronics Engineering	2	–	2	4	3	10	10	30	25	25	100	2
4	BEEL106 BEEP106 / BCEL107 BCEP107	Basic Electrical Engineering /Engineering Mechanics	3	1	2	6	5	20	20	60	25	25	150	3
5	BMEL108 BMEP108/ BHUL113, BMEP111, BFYP112	Basic Mechanical and Engineering Graphics/ Communication Skills, Workshop, Mini modeling	2	–	2	4	3	20	20	60	25	25	150	3
6	BHUP109 / BIDL101	Environmental Studies and Professional Ethics / Bio System in Engineering	2	–	–	2	Audit Course	–	–	–	–	–	–	–
Total			**16**	**3**	**8**	**27**	**21**	**90**	**90**	**270**	**100**	**100**	**650**	**14**

First Year B.Tech Structure & Evaluation Scheme

Semester - II

S N	Subject Code	Subject Name	Teaching				Credits	Evaluation Scheme (Marks)						ESE Duration (Hrs)
								Theory			Practical		Total	
			Lect.	Tut.	Pract.	Total		TAE	CAE	ESE	Cont. Assessment	Ext		
1	BEML110	Engineering Mathematics-II	3	1	_	4	4	20	20	60	_	_	100	3
2	BPHL102 BPHP102 /BCHL103 BCHP103	Engineering Physics/ Engineering Chemistry	4	1	2	7	6	20	20	60	25	25	150	3
3	BITL104 BITP104 /BECL105 BECP105	Programming in C / Basic Electronics Engineering	2	_	2	4	3	10	10	30	25	25	100	2
4	BEEL106 BEEP106 /BCEL107 BCEP107	Basic Electrical Engineering / Engineering Mechanics	3	1	2	6	5	20	20	60	25	25	150	3
5	BMEP111	Workshop	_	_	2	2	1	_	_	_	50	_	50	_
6	BFYP112	Mini Modeling	_	_	2	2	1	_	_	_	50	_	50	_
7	BMEL108 BMEP108 /BHUL113 & BMEP111	Basic Mechanical and Engineering Graphics/ Communication Skills	2	_	_	2	2	10	10	30	_	_	50	2
8	BHUP109 / BIDL101	Environmental Studies and Professional Ethics / Bio System in Engineering	2	–	–	2	Audit Course	–	–	–	–	–	–	–
Total			**16**	**3**	**10**	**29**	**22**	**80**	**80**	**240**	**175**	**75**	**650**	**13**

Department of First Year B.Tech.

Detailed Syllabus

F. Y. B. Tech
Semester I/II

BEML101: Engineering Mathematics - I

Teaching Scheme	Examination Scheme (Theory)	Examination Scheme(Lab)
Lectures: 3 Hrs/Week	**Teachers Assessment Exam:** 20 Marks	**Internal(TW):** ---
Tutorials: 1 Hr/Week	**Class Assessment Exam:** 20 Marks	**External(PR) :**Nil
	End Semester Exam: 60 Marks	**External(OR) :** Nil
Credit	**4**	**-----**

Prerequisite: 12th Science Basics

Course Objective : After completing this course student will able

1. To understand system of linear equations arising in all engineering fields using matrix methods where knowledge of Eigen values and Eigen vectors are essential.
2. To introduce Successive Differentiation and its application in the field of Engineering.
3. To understand concept of convergence of sequences and series with applications to modeling of realistic problems
4. To understand concept of sphere, Cone and Cylinder that arise in vector calculus, electro-magnetic field theory, CAD-CAM, computer graphics etc.

Course Outcome:

1. It will be possible to express the physical problems in to mathematical formulation and to find the proper solutions and apply concepts of matrices and its application for solving engineering problems.
2. Able to find solution of linear algebraic equations with consistency and inconsistency.
3. Able to find the limits and continuity of functions of multiple variables and finding nth derivative by various methods.
4. Able to find the convergence, divergence and range of convergence of various series.
5. Able to find Reduction formulae of various functions and its applications.
6. Able to calculate Cartesian, spherical, polar co-ordinate system as well as equation of sphere, cone, cylinder with guiding curve.

Course Contents **Hrs**

Unit – I : Matrices 6

Basics of Matrix, Rank of Matrix, Reduction methods Normal form, Row Echelon form and PAQ form, System of Linear algebraic equations , homogeneous and Non-homogeneous equations with consistency and inconsistency.

Unit – II : Linear Algebra 6

Linear dependence and independence of vectors, Linear and Orthogonal Transformation, Eigen values, Eigen vectors (Symmetric and Non Symmetric Matrices), Cayley-Hamilton theorem.

Unit –III: Differential Calculus and Expansion of Functions 8

Successive Differentiation, Finding Nth Derivative by standard function, trigonometrical transformation, Partial fraction method. Leibnitz's Theorem. Indeterminate Forms, L' Hospital's Rule, Taylor's Series and Maclaurine's series with standard expansion, differentiation and Integration, use of substitution.

Unit – IV : Infinite Series 6

Infinite Sequences, Infinite Series, Alternating Series, Tests for Convergence by Cauchy's nth root test, p test, comparison test, D'Alemberts Ratio test, Raabe's test, Leibnitz test, Absolute and Conditional Convergence, Range of Convergence.

Unit – V : Integral Calculus 8

Reduction Formulae, Beta and Gamma functions, Differentiation Under Integral Sign, Error Functions.

Unit – VI : Solid Geometry 8

Cartesian, Spherical, Polar and Cylindrical Co-ordinate Systems. Sphere, Cone and Cylinder

Tutorials

1. Basics & Problem solving of rank, LD & LI, Normal form.
2. Problem solving of Eigen values, Eigen vectors, Cayley-Hamilton theorem.
3. Leibnitz Theorem, Indeterminate forms.
4. Infinite Series, Taylor's & Maclaurine's Series.
5. Examples on Reduction Formulae, Beta & Gamma functions.
6. Examples on Right Circular Cone & Cylinder.

Text Books:

1. "Higher Engineering Mathematics", B.S. Grewal, Khanna Publishers.
2. Applied Mathematics (Volumes I and II) by P. N. Wartikar & J. N. Wartikar (Pune Vidyarthi Griha Prakashan, Pune)
3. Higher Engineering Mathematics by B.V. Ramana (Tata McGraw-Hill).

Reference Books:

1. Advanced Engineering Mathematics, 7e, by Peter V. O'Neil (Thomson Learning).
2. *Advance Engineering Mathematics* Erawin Kreyszig, Wiley India Pvt. Ltd New Delhi.
3. Advanced Engineering Mathematics, 2e, by M. D. Greenberg (Pearson Education).

Web Links:

- **Matrices:**
  https://www.youtube.com/watch?v=mYVbYBZZdW0
  https://www.youtube.com/watch?v=hbk01uhgsos
- ***Eigen value & Eigen Vectors***
  https://www.youtube.com/watch?v=XM4GU8hPoZs
  https://www.youtube.com/watch?v=P2pL5VThrzQ
- **Successive differentiation**
  https://www.youtube.com/watch?v=zWURS768QrA
- ***Leibnitz thm:***
  https://www.youtube.com/watch?v=67uJGwsZz-Q
- **Indeterminate forms:**
  https://www.youtube.com/watch?v=PNTnmH6jsRI
- **Infinite Series**
  http://ocw.mit.edu/courses/mathematics/18-01-single-variable-calculus-fall-2006/video- lectures/lecture-37-infinite-series/
  https://www.youtube.com/watch?v=qNZxf0j41tw
- **Gamma function:**
  www.youtube.com/watch?v=Vc8dIykQRhy
  www.youtube.com/watch?v=SYfLj-koGJO
- **DUIS:**
  www.youtube.com/watch?v=NpXWv2jR4nC

BEML110: Engineering Mathematics – II

Teaching Scheme	**Examination Scheme (Theory)**	**Examination Scheme(Lab)**
Lectures: 3 Hrs/Week	**Teachers Assessment Exam:** 20 Marks	**Internal(TW):** Nil
Tutorials: 1 Hr/Week	**Class Assessment Exam:** 20 Marks	**External(PR) :**Nil
	End Semester Exam: 60 Marks	**External(OR) :** Nil
Credit	**4**	**-------**

Course Objective : After completing this course student will able

1. To analyze and solve first order differential equations

2. To aware of the applications of first order differential equations and modeling of various physical systems such as Newton's Law of cooling and simple electrical circuits.
3. To design and analysis of continuous and discrete system where the knowledge of Fourier series and Harmonic analysis required.
4. To understand multiple integration.
5. To understand concept of Partial Differential Equation in Engineering Applications such as Electric circuit, Heat transfer etc.
6. To understand Stationary Values of functions (Maxima and Minima), arising in optimization problems.

Course Outcome:

1. To compute solutions for first order ordinary differential equations using different analytic techniques and able to model and solve various simple real world phenomenon governed by ordinary differential equations of first order.
2. Able to understand application of differential equation.
3. Able to trace the curve and use multiple integral to formulate various engineering problems and find its area and volume.
4. Students are able to find maxima & minima, critical points, points of inflection, Errors and Approximations.
5. It will help to develop analytical skills to provide solution to the simple engineering problems.
6. Apply the fundamentals of mathematics in various branches of engineering.

Course Contents	Hrs
Unit – I :Differential Equations	6
Definition, Order and Degree of DE, Formation of DE. Solutions of Variable separable, Homogeneous DE, Exact DE (without Integrating Factor method), Linear DE and reducible to these types.	
Unit – II :Applications of Differential Equations	6
Applications of DE to orthogonal trajectories, Rate of decay of radioactive materials, Newton's Law of Cooling, Kirchhoff's Law of Electrical Circuits, Simple harmonic motion, One–Dimensional Conduction of Heat.	
Unit – III : Fourier series	8
Definition, Dirichlet's conditions, Full Range Fourier Series, Half Range Fourier Series, Harmonic Analysis and Applications to Problems in Engineering.	
Unit – IV : Multiple Integral & Applications	8

Basics of Curve Tracing, Double Integration, triple integration, Applications to Area , Volume.

Unit – V : Partial Differential Equation 8

Partial derivatives of composite function, variable to be treated as constants, Euler's theorem on homogeneous functions of two & three variables, Implicit functions, Total Derivatives.

Unit – VI : Application of Partial Differential Equation 6

Jacobians and their applications, Errors and Approximations, Maxima and Minima of Functions of two variables, Lagrange's Method of undetermined multipliers.

Tutorials

1. Basics & Problem solving of Differential Equations.
2. Problem solving of Newton's Law of Cooling, Electrical Circuits, Conduction of Heat.
3. Examples on Fourier series.
4. Examples on Multiple Integral & Applications
5. Examples on Partial differential equations.
6. Examples on Error & Approximations, Maxima & Minima.

Text Books:

1) Higher Engineering Mathematics by B. S. Grewal (Khanna Publication, Delhi).
2) Higher Engineering Mathematics by B.V. Ramana (Tata McGraw-Hill).
3) Applied Mathematics (Volumes I and II) by P. N. Wartikar & J. N. Wartikar (Pune Vidyarthi Griha Prakashan, Pune)

Reference Books:

1) Advanced Engineering Mathematics by Erwin Kreyszig, Volume I & II (Wiley Eastern Ltd)
2) Advanced Engineering Mathematics, 7e, by Peter V. O'Neil (Thomson Learning).
3) Advanced Engineering Mathematics, Wylie C.R. & Barrett L.C. (McGraw-Hill, Inc.)

Weblink:

- **Ordinary Differential Equations:**
  www.youtube.com/watch?v=P7gVp333B6M
- **Linear Differential Equations:**
  www.youtube.com/watch?v=1FnBPmEWpus
- **Fourier series:**

www.youtube.com/watch?v=3bXH7AkIV6C

www.imperial.ac.uk/worksspace/mathematics/Public

- **Multiple Integral:**

  http://freevideolectures.com/Course/2267/Mathematics-I/28#

  http://www.learnerstv.com/video/Free-video-Lecture-1823-Maths.htm

- **Partial Differential Equations:**

  http://nptel.ac.in/courses/111103021/

  https://www.youtube.com/watch?v=PTvvoVLzVCE

BPHL102: Engineering Physics

Teaching Scheme	Examination Scheme (Theory)	Examination Scheme(Lab)
Lectures: 4 Hrs/Week	**Teachers Assessment Exam:** 20 Marks	**Internal(TW):** 25 Marks
Tutorials: 1 Hr/Week	**Class Assessment Exam:** 20 Marks	**External(PR) :** 25 Marks
Practical: 2 Hrs/Week	**End Semester Exam:** 60 Marks	**External(OR) :** Nil
Credit	**5**	**1**

Prerequisite : Class XII Knowledge on the course

Course Objective:

1. To understand fundamental principles of Engineering physics specifically concern to electron optics and quantum physics and their engineering applications.
2. To use various techniques for measurement, calculation, control and analysis of engineering problems based on the principles of Electron Optics, Ultrasonic, Acoustics, Laser, Band theory of solids, Quantum Mechanics, Superconductivity, and Nanophysics
3. To provides the basic ideas and gives the solution for developing mathematical and analytical abilities with higher precision.

Course Outcome: At the end of the course student will be able to

1. Solve the problems related to the applications of uniform & non uniform electric and magnetic fields and its use related devices for engineering applications.
2. Understand the nature and characterization of acoustics and its applications.
3. Demonstrate the knowledge of semiconductors and their applications.
4. Apply the concepts of light in optical fibers, light wave communication systems, and holography and for sensing physical parameters
5. Apply knowledge of physics in mechanics, wave properties, properties of matter and to solve simple qualitative and quantitative problems

6. Apply the concepts of physics in various branches of engineering

Course Contents	Hrs
Unit – I : Electron Ballistics	
Motion of charges in uniform electric and magnetic fields; Electron optics: Bethe's law; Electrostatic and magneto static focusing; Devices: CRT, CRO and Cyclotron	8
Unit – II : Ultrasonics & Acoustics of Building	
Ultrasonics: Introduction, Production of ultrasonics waves, Magnetostriction and Piezo electric method, Detection of ultrasonics waves, Applications Acoustics of Building: Basic requirement of acoustically good hall, Reverberation, Sabine formula for reverberation, factors affecting the architectural acoustics and their remedy.	8
Unit – III : Lasers and Holography	
Introduction, Absorption and Emission of Radiation, Characteristics of Laser light, Pumping Scheme, Population Inversion, metastable state, Types of Laser i) two level – semiconductor laser, ii)three level I – Ruby laser, iii)four level – He:Ne laser Applications of Lasers – Holography, Recording and Reconstruction of Image, Applications of Holography, Optical Fiber communication system	8
Unit – IV : Band Theory of Solids	
Introduction, Distinction between Insulators, Semiconductors and Conductors, Intrinsic Semiconductor, Extrinsic Semiconductor, Hall Effect, Fermi Distribution Function, Fermi level in Intrinsic and Extrinsic Semiconductors, band structure of PN junction diode under i) zero bias, ii) forward bias, iii) reverse bias, Working of transistor (NPN only) on the basis of band diagram, photovoltaic effect, working of solar cell on the basis of band diagram and its applications.	9
Unit – V : Quantum Mechanics	
Introduction, Wave particle duality, de Broglie waves, Phase and Group velocities, Heisenberg Uncertainty Principle, Wave function and its Physical Significance, Time Independent and Time dependent Schrodinger Equation, Applications of Schrodinger Equation (infinite potential well – with derivation of energy and wave function), Tunneling through potential barrier, Applications of Tunnel Effect.	9
Unit – VI : Advanced Trends in Physics	6

BPHL102: Engineering Physics

Part A: List of Practical (Any Six)

1. Application of Velocity filter using CRT: To determine e/m by Thomson's method.
2. Study of Lissajou's Figure using CRO
3. Ultrasonic interferometer for the determination of compressibility of liquid
4. Determination of band gap of a given semiconductor
5. Characteristics of Solar cell and Calculation of fill factor
6. Determination of thickness of wire using LASER.
7. Determination wavelength of Laser using Diffraction Grating.
8. Determination of electrical resistivity of semiconductor by using four probe method.

Part B:Mini Project Modeling

Every Students has to performed mini project in a group based on curriculum courses

Instructions to Student:

1. Maximum Three Students are permissible in each group
2. Project must be based on the contents of syllabus of subject.
3. Project report has to be prepared and attach in practical file individually.

Text Books:

1. Engineering Physics, Hitendra K. Malik & A. K. Singh, Tata McGraw Hill, New Delhi, 2010
2. Engineering Physics, Avadhanulu, Kshirsagar, S. Chand Publications
3. Engineering Physics, Guar, Gupta, Dhanpat Rai and Sons Publications

Reference Books:

1. Fundamentals of Physics, Resnick and Halliday, John Wiley and Sons.
2. Lectures on Physics, Volume 1, 2 and 3 by Richard P. Feynman, Narosa Publisers /
3. Pearson Education.
4. Laser and Non-Linear Optics, B. B. Laud (Oscar publication)

Web Links:

1. https://www.youtube.com/watch?v=Lcy3f3QkTIw (Electron Ballistics)
2. http://www.nptel.ac.in/courses/122107035/6 (Acoustics)
3. https://www.youtube.com/watch?v=HFvPzXr7rxU (Nanophysics)
4. https://www.youtube.com/watch?v=knVD1AfiozA (Fermi energy & Fermi level)
5. https://www.youtube.com/watch?v=T8WCr5axQXM (Energy Bands)
6. https://www.youtube.com/watch?v=GglT1RoBPzg (Superconductivity)

BCHP103: Engineering Chemistry

Teaching Scheme:	Examination Scheme (Theory)	Examination Scheme(Lab)
Lectures: 4Hrs/Week	**Teachers Assessment Exam:** 20 Marks	**Internal(TW):** 25 Marks
Tutorials:1 Hr/Week	**Class Assessment Exam :** 20 Marks	**External(PR) :**25 Marks
Practical: 2Hrs/Week	**End Semester Exam:** 60 Marks	**External(OR) :**Nil
Credit	**5**	**1**

Prerequisite : 12th Standard Curriculum

Course Objective:

1. Technology involved in improving quality of water for its industrial use.
2. The basic concept of Electro analytical techniques that facilitate rapid and reliable measurements.
3. Chemical structure of Polymers and its effect on various properties when used as engineering materials.
4. Study of Fossil fuel and derived fuels with its properties and applications.
5. The principles of chemical and electrochemical reactions causing corrosion and methods used for minimizing.
6. An insight in to Nano materials and advance materials aspect of modern chemistry.

Course Outcome:

1. To apply the knowledge of basic science in engineering and technology and also understand the concept of applied chemistry and analyze it with experiments.
2. The broad education necessary to understand the impact of engineering solutions in global, economic and in environmental context.
3. An ability to design and conduct experiments as well as to organize, analyze and interpret data.
4. An ability to use the techniques, skills and modern engineering tools necessary for engineering practice.
5. To apply the knowledge of advance engineering materials for varied engineering applications.
6. The significance of teaching the aforementioned course is realized in both research, and development of innovative technologies by the student's successful participation in various basic level research oriented programs, and competitions, both at the national and international levels..

Course Contents	Hrs
Unit – I : Water technology and Green chemistry	8

Impurities in water. Hardness of water &its determination by EDTA method. Alkalinity of water and its determination and Numerical on alkalinity and hardness. Ill effects of hard water in boilers. Boiler feed water treatment -1) Internal treatment-calgon and phosphate conditioning, 2) External treatment- a) Zeolite process & its numerical b) Ion exchange method. Desalination of brackish water/Purification of water by Reverse osmosis and Electro dialysis.

Green Chemistry: Introduction, Twelve Principles of green Chemistry Major uses- traditional and green path ways of synthesis of adipic acid, indigo dye.

Unit – II : Electro analytical techniques

Type of reference electrode (calomel electrode), indicator electrode (glass electrode), Ion selective electrode, Half-cell reaction and complete cell reaction.

Conductometery: Introduction, Kohlrausch's law, Conductivity cell, Measurement of conductance, applications-Counductometric titrations, Acid-Base Titrations, precipitation titration, Potentiometry: Introduction, Potentiometric titrations-differential plots. Applications- 8
redox titrations Fe^{2+}/Ce^{4+}titration. UV/Visible spectroscopy: Beer lambert's law, chromophore and auxochrome, types of electronic transitions. Instrumentation and principle- block diagram of single and double beam spectrophotometer. Applications of uv-visible spectroscopy.

Unit – III : Synthetic Organic Polymers

Introduction, functionality of monomer, polymerization-Free radical mechanism & step growth polymerization, Tm and Tg, Thermoplastic and Thermosetting polymers. Compounding of plastics. Preparation, properties & engineering applications of: Polyethylene (LDPE & HDPE) and Bakelite. Elastomers- Natural rubber-processing & vulcanization by sulphur. Synthetic rubbers-SBR. Specialty polymers: Engineering 8
thermoplastics- Polycarbonate, Biodegradable polymers- Poly (hydroxyl butarate-hydroxyvalanate), Conducting polymers- Polyacetylene, Liquid Crystal polymer-Kevlar.

Unit – IV : Fuel & Combustion

Fossil Fuels: Definition, Calorific values, Determination- Bomb calorimeter, Numerical Boy's gas calorimeter, Numerical Solid fuel-coal-Proximate analysis, Ultimate analysis & Numerical. Liquid fuels-Petroleum-composition and refining. Octane number of petrol, 8
Cetane number of diesel, Power alcohol, Biodiesel. Gaseous fuel-Composition, properties and applications of NG, CNG & LPG, Combustion- Chemical reactions, Calculations for air required. Numerical.

Fuel cell: Introduction, applications.

Unit – V: Corrosion science

Introduction. Types of corrosion- Dry corrosion- mechanism, Pilling-bed worth rule. Wet corrosion- mechanism. Factors influencing corrosion- Nature of metal, Nature of environment, Catholic and anodic protection, Use of corrosion Inhibitors Protective coatings: surface preparation 8

a) Metallic coatings:, Electroplating & Electro less plating.

b) Non-metallic coatings: chemical conversion coatings

Unit –VI : Advances in Engineering Chemistry

Nanomaterial: Graphite, Carbon nanotube (CNT) & Fullerenes- Structure, Properties, Applications, Lubricants: Introduction, classification of lubricants, (Liquid, semi– solid (Grease). Biomaterial: classification, Properties, Examples. Biosensor- Introduction, Classification, Applications. Smart Material: Introduction, Shape Memory Alloy and its Example, Advantages, Disadvantages, Applications. 8

BCHP103: Engineering Chemistry

Part A:List of Practical(Any Six)	**Hrs.**
1.Determination of hardness of water by EDTA method.	02
2.Determination of alkalinity of water.	0 2
3.To determine maximum wavelength of absorption of $CuSO_4$ / FeSO4, verify Beer's law and find unknown concentration in given sample	02
4.Titrationofmixture of weak acidands trong acid with strong base using conductometer.	02
5. Preparation of Urea-formaldehyde resin and its characterization.	02
6.Determination of molecular weight/radius of macromolecule polystyrene/polyvinylalcohol	02
7.Proximate analysis of coal	
8. Preparation of nickel coating on copper metal using electroplating & electro less plating	02
9.TO calculate the electrochemical equivalent of copper by electrolysis of copper sulphate solution using copper electrode.	02
10.Determination of acid value of given lubricating oil.	02

Part B:Mini Project Modeling

Every Students has to performed mini project in a group based on curriculum courses 02

Instructions to Student:

1. Maximum Three Students are permissible in each group
2. Project must be based on the contents of syllabus.
3. Project report has to be prepared and attach in practical file individually.

Text Books:

1. Engineering chemistry by O.G. Palana, Tata Mcgraw Hill Eduction Pvt. Ltd.
2. Engineering chemistry by Dr. S.S. Dara Dr. S.S.Umare, S. Chand & company ltd.

Reference Books:

1. Engineering chemistry by Wiley India Pvt. Ltd. First edition
2. Inorganic chemistry, 5e, by Shriver and Atkins, Oxford university press.
3. Shashi Chawala Text book of Engineering Chemistry Sudharani (Dhanpat Rai Publishing Company)

Laboratory Manual:

1. Vogels text book of Quantitative Chemical analysis ,6e,by Mendham, R.C.denney, J.D. Barnes, M.J. K. Thomas, Pearson Education Ltd.
2. Applied Chemistry Theory and Practice ,2e, by O. P. Virmani and A.K. Narula , New age International (P) Ltd.
3. Laboratory manual Engineering Chemistry by Dr. Sudharani (Dhanpat Rai Publishing Company.)

Web Links:

1. www.nptel.ac.in/course/105/04/02-water technology
2. www.nptel.ac.in/syllabus/syllabus.php?subjectId=103/08/00 -electro analytical technique
3. www.nptel.ac.in/courses/113/05028 -polymer
4. www.nptel.ac.in/courses/103/05/10/-fuel & combustion
5. www.nptel.ac.in/courses/113108051/ corrosion science
6. http://nptel.ac.in/course.php?disciplineId=102 – advance materials

BITL104: Programming in C

Teaching Scheme	**Examination Scheme (Theory)**	**Examination Scheme(Lab)**
Lectures:	**Teachers Assessment Exam:** 10 Marks	**Internal (TW) :** 25
2Hrs/Week	**Class Assessment Exam:** 10 Marks	**External (PR) :** 25
Practical: 2Hr/Week	**End Semester Exam:** 30 Marks	**External (OR)** : Nil
Credit	**2**	**1**

Prerequisite :

1. Basic Knowledge of Computer

Course Objective:

1. To make students aware of basics about computers, hardware, software & Operating system.
2. To understand the role of constants, variables, identifiers, operators, type conversion and other building blocks of C Language.
3. To understand the Use of conditional expressions and looping statements to solve problems associated with conditions and repetitions.
4. To understand concept of array and passing array through function
5. To understand the concept of structure and union
6. To develop programming skill in a student to write programs in C language.

Course Outcome:

1. Students are able to understand basic concepts of programming.
2. Students are able to understand the basic terminology used in 'C' programming.
3. Students are able to design programs involving decision structures and loops.
4. Students are able to use different data types in a computer program.
5. Students are able to apply functions and array in program.
6. Students are able to write, compile and debug programs in C language.

Course Contents	**Hrs.**
Unit – I :Basics of Programming	4

Basics of programming: approaches to Problem solving, concept of algorithm and flow charts with e.g., types of computer languages: Machine language, assembly language and high level language, concept of assembler, compiler, loader and linker.

Unit – II : C Programming fundamentals	4

Types of programming language , Introduction to C language, tokens, character set, constants, variables, data types, keywords, expressions, operators in C and its types, standard input-output statements in C, structure of C-program.

Unit –III Conditional Program Execution	4

Conditional Program Execution: Applying if and switch statements, nesting if and else, restrictions on switch values, use of break and default with switch, Uses of while, do and for loops, multiple loop variables, assignment operators, using break and continue.

Unit – IV : Introduction to function and Arrays	4

Standard library functions and user defined functions, function declaration, function definition

and function call - call by value and call by reference, return statement, recursion, **Introduction to array**, One and Two Dimensional Arrays, Initialization, Operations on one & two dimensional arrays.

Unit –V Introduction to String 4

Definition of string, Declaration of string, Reading, Writing, String handling operations using and without using library functions, Examples of stings.

Unit – VI : Structure 4

Introduction to Structure definition. Initializing, Assigning values, passing of structure as arguments, Unions, Programming Examples. **Standard C preprocessors,** defining and calling macros, Storage Classes with types.

Practical/Assignments		**Hrs.**
1.	Study of Operating Systems – Window & Linux with their Commands	2
2.	Write programs to implement simple/basic concepts of C.	2
3.	Write programs to implement decision making and control statements in C – if-else, nested if else, if-else-if and switch-case statement.	2
4.	Write programs to implement loops in C – while, do-while.	2
5.	Write programs to implement for loop in C.	2
6.	Write programs to implement string operations in C – strlen(), strcpy(), strcat(), strrev() etc.	2
7.	Write programs to implement string operations in C without using library functions.	2
8.	Write programs to implement functions in C.	2
9.	Write programs to implement of concept call by value & call by reference in C.	2
10.	Write programs to implement of Array concept (One dimensional)	2
11.	Write programs to implement of Array concept (Two dimensional)	2
12.	Write programs to implement structures in C.	2
13.	Write a programs to implement union in C.	2

Text Books:

1. E.Balagurusamy, “Programming in ANSI C” , Tata McGraw Hill
2. B.W. Kernighan, D.M. Ritchie, “The C Programming Language”, Prentice Hall of India.
3. Yeshwant Kanetkar, “Let Us C”, BPB Publication.

Reference Books:

1. R.G. Dromey, “How to Solve It By Computer”, Pearson Education
2. K. R. Venugopal, Sudeep R. Prasad, “Programming with C”, Tata McGraw Hill.
3. E.Balagurusamy,“Fundamentals of Computers”, Tata McGraw Hill

Web Links

1. www.w3schools.com
2. www.cprogromming.com
3. www.eskimo.com/~scs/cclass /notes/top.html
4. www.cprogrammingexpert.com/

BECL105: Basic Electronics Engineering

Teaching Scheme:	**Examination Scheme (Theory)**	**Examination Scheme (Laboratory)**
Lectures:2Hrs/Week	**Teachers Assessment Examination:** 10 Marks	**Internal(TW):** 25 Marks
Practical: 2 Hrs/Week	**Class Assessment Examination :** 10 Marks	**External(PR) :** 25Marks
	End Semester Examination: 30 Marks	**External(OR) :**Nil
Credit	**2**	**1**

Prerequisite : 12^{th} Physics

Course Objective:

1. To give the basic knowledge of basic components & circuit.
2. To study logic gates and their usages in digital circuits
3. To expose the student to working of power electronic devices and transducers
4. To introduce basic aspect of electronic communication system

Course Outcome ; After completion of this course student will be able to

1. Student can acquire the basic knowledge of electronic components and circuits.
2. To gain the concepts of Semiconductor physics
3. Students will be able to effectively employ basic knowledge for new application
4. To design and analyze basic electronic circuits
5. Students will be able to effectively employ technology for their use.
6. To measure the performance parameters of electronic circuits

Course Contents	**Hrs**
Unit – I : Diode Circuits	
Half wave rectifier, Full wave rectifier, D.C Regulated Power supply, Diode application: clipper, Clamper. LED Diodes and Photodiode.	4
Unit – II : BJT circuits	
BJT structure and its operation with normal biasing, DC operating point, DC load line	6

analysis in various operating region of BJT. Transistor as an amplifier in CE mode and as a switch.

Unit – III : Linear Integrated Circuit

Introduction to Op-Amp, Op-amp input modes and parameters, Op-Amp with negative feedback: summing amplifier, integrator, and differentiator, IC555 as a astable multivibrator. 6

Unit – IV: Basic Digital Electronics

Introduction to logic gates with their truth table, Boolean algebra, D Morgan's Law, Simplification of logical expressions, Sum of product & product of sum, Implementation of SOP (using 3 variable)on Karnaugh map and solving technique. Implementation of expression with basic gates. 6

Unit – V : Digital Electronics Fundamental

Number system: Binary, Gray, octal, Hex, Half adder, Full Adder, Mux, Demux, Flip-flop, Registers, Mod Counter, Sequential and combinational circuits. 4

Unit – VI : Power devices and Transducers

SCR, DIAC, Triac, Transducer like Thermocouple, RTD, thermister, load cell and its application like Digital thermometer, weighing machine. 6

BECP105: Basic Electronics Engineering

Part A :List of Practical(Any Ten)

1. Study of different electronics components.
2. Study of different electronics measuring devices.
3. Study of regulated DC power supply.
4. Study of V-I characteristics of Diode.
5. Study of Clipper circuits.
6. Study of Clamper circuits.
7. Study of single stage BJT common emitter amplifier circuit.
8. Study of Op-Amp circuits as i) Adder ii) Integrator
9. Study of i) MUX ii) Demux
10. Study of IC555 as a timer
11. Study of Half Adder
12. Study of Full Adder
13. Verify the truth tables of different digital ICs like: AND, OR, NAND, NOR.
14. Study of design of AND,OR by universal gate

15. Study of synchronous counter.
16. Study of asynchronous counter.
17. Study of V-I characteristics of SCR.
18. To design electronic circuit for given application
19. Use of PCB for making circuits.
20. Study of function generator to generate various signals like sinusoidal, triangular, ramp observe the waveform on CRO.

Part B-Mini Project Modeling

Every Students has to performed mini project in a group based on curriculum courses

Instructions to Student:

1)Maximum Three Students are permissible in each group

2) Project must be based on the contents of syllabus.

3) Project report has to be prepared and attach in practical file individuallyProject report has to be prepared and attach in practical file individually.

Text Books:

1. Electronic Devices & circuits – Floyd (Pearson Education India)
2. Modern digital Electronics- R.P. Jain(TMH Publication)
3. Electronics Instrumentation- H.S. Kalsi(Tata McGraw Hill)
4. Communication Electronics principle & Application-Frenzel ((Tata McGraw Hill)
5. Electronic Devices & circuits – salivahanan Tata McGraw Hill

Reference Books:

1. Jacob Miliman, C CHalkias, Chetan Parikh- Integrated Electronics.(Tata McGraw Hill)
2. Debashish De, Kamakhya Prasad Ghatak- Basic Electronics(Pearson Education)
3. J R Cogdell- foundation of Electronics(Pearson Education)

Web Links:

Unit I : PN junction diode & Rectifier

1. http://www.electronics-tutorials.ws/diode/diode_1.html
2. http://www.allaboutcircuits.com/textbook/semiconductors/chpt-3/introduction-to-diodes-and-rectifiers/

Clipper & Clamper

http://www.daenotes.com/electronics/devices-circuits/clipper-clamper

Unit II: BJT

1. Applicationhttp://www.electronics-tutorials.ws/transistor/tran_1.html
2. BJT CE Amplifier:http://www.electronics-tutorials.ws/amplifier/amp_2.html
3. BJT as a switch:http://www.electronics-tutorials.ws/transistor/tran_4.html

Unit III: Linear Integrated Circuit

1. Op amp Application:http://www.electronics-tutorials.ws/opamp/opamp_7.html
2. http://www.electronics-tutorials.ws/opamp/opamp_4.html

IC 555:

3. https://electrosome.com/astable-multivibrator-555-timer/

Unit IV: Basic Digital Electronic

http://www.electronics-tutorials.ws/counter/count_3.html

1. **Unit V:: Digital Electronics Fundamental**
2. Half & Full adderhttp://www.circuitstoday.com/half-adder-and-full-adder
3. http://www.radio-electronics.com/info/data/semicond/thyristor/structure-fabrication.php

Unit VI: Power Devices and Transducers

http://www.radio-electronics.com/info/cellulartelecomms/cellular_concepts/mobile-basics-
Transducers:http://www.electronics-tutorials.ws/io/io_1.html

BEEL106: Basic Electrical Engineering

Teaching Scheme	Examination Scheme (Theory)	Examination Scheme(Lab)
Lectures: 3 Hrs/Week	**Teachers Assessment Exam:** 20 Marks	**Continuous**
Tutorials: 1 Hr/Week	**Class Assessment Exam:** 20 Marks	**Assessment:** 25 Marks
Practical: 2 Hrs/Week	**End Semester Exam:** 60 Marks	**External(PR) :** 25 Marks
Credit	**4**	**1**

Course Objective:

1. To expose the undergraduate first-year engineering students to the fundamental laws of electricity and their applications in day-to-day life.
2. To lay a course foundation for the students who would be trained in the related core subjects like electrical, electronics, instrumentation and control, tele-communications etc.
3. Demonstrate the awareness on social issues like conservation of electrical energy, electrical safety etc.
4. Develop abilities to analyze circuits quantitatively.

Course Outcome:

1. Apply basic electric circuit laws to solve electric circuit problems and design basic D.C. electric circuit using circuit analysis techniques.
2. Apply basic A.C. electric circuit laws in solving A.C. circuit problems and able to perform A.C. power calculation.
3. Learner should understand and grasp the analytical treatment of electrical quantities with the help of phasor-algebra.
4. To understand the difference between DC and AC Systems and between Single-phase and three phase utility AC Source.
5. To understand functioning of basic electrical circuits, useful in domestic and industrial power supplies.
6. To train the learner in adequate experimentation related to high power electricity and in measurements of electrical quantities such as voltage, current and power

Course Contents	**Hrs**
Unit – I : D.C. Circuits	
Ohm's law, Simplification of networks using series - parallel combinations, Current and Voltage sources, Kirchhoff's laws, Superposition theorem, Thevenin's theorem, Maximum Power Transfer theorem.	07
Unit – II : Single Phase A.C. Circuits	
Concept of AC quantities, Concepts of cycle, Period, Frequency, Generation of alternating voltage and currents, RMS and Average value, Form factor, Crest factor, Phase and Phasor diagrams, AC through Pure resistance, Inductance &Capacitance, R-L , R-C and R-L-C series circuits, Power and Power factors.	07
Unit – III :Three Phase A.C. Circuits	
Three Phase Circuits:- Concept of three phase supply, Phase sequence, Concepts of line, Phase, Neutral etc., Power relations in a Three phase balanced Star and Delta connections, Three phase phasor diagrams.	06
Unit – IV : Fundamentals of Transformer	
Construction, Working Principle, EMF equation, Rating of transformer, Transformer on no load and on Full load, Transformer losses, Calculation of Efficiency and Regulation.	06
Unit – V : Work , Power and Energy	
Energy conversions from one form to another such as Electrical, Thermal and Mechanical, and Numerical problems based on different energy conversions in real life cases.	04

Unit – VI : Electrical Machines

Fundamentals of DC and AC Machines, DC Series and Shunt Motor, AC Single Phase Induction Motor, Stepper Motor, Servo Motor. 06

BEEP106: Basic Electrical Engineering

Part A:List of Practical/Assignments (Any Six)

1. Study of :
   a) Different wiring components, switches, holders, cables, tube circuit, CFL, Megger.
   b) Energy conservation and safety precautions.
2. Study of :
   a) Control of lamp from two switches.
   b) Study of staircase wiring.
3. Verification of Kirchhoff's laws.
4. Verification of Superposition theorem.
5. Verification of Thevenin's theorem.
6. Study of R. L. C. series circuits.
7. Verification of current relations in three phase balanced star and delta connected loads.
8. Single phase transformer:
   a) Voltage and Current ratio
   b) Efficiency and regulation by direct loading method.
9. Load test on DC series motor.

Part B-Mini Project Modeling

Every Student has to perform mini project in a group based on curriculum courses.

Instructions to Student:

1) Maximum Three Students are permissible in each group
2) Project must be based on the contents of syllabus of subject.
3) Project report has to be prepared and attach in practical file individually .

Text Books:

1. **Electrical Technology** Volume-I–B.L. Theraja, S.Chand and Company Ltd.,New Delhi.
2. **Basic Electrical Engineering**, V. K. Mehta , S. Chand and Company Ltd., New Delhi.
3. **Theory and problems of Basic Electrical Engineering**- I. J. Nagrath and Kothari, Prentice-Hall of India Pvt. Ltd.

Reference Books:

1. **Electrical Technology**- Edward Hughes, Seventh Edition, Pearson Education
2. **Elements of Electrical Technology**- H. Cotton, C.B.S. Publications
3. **Electric Machines** by AshfaqHussain - Dhanpatrai

Web Links:

Unit1: correlation on effect of temperature:

1. http://arxiv.org/ftp/arxiv/papers/0903/0903.1334.pdf

Unit-2: Single phase AC Circuit:

2. http://elearning.vtu.ac.in/13/ENotes/BEE/BasicElectricalNotes.pdf

Unit-3: Three Phase AC Circuit:

3. http://www.allaboutcircuits.com/textbook/alternating-current/chpt-10/three-phase-y-delta-configurations/

Unit4: Core construction of Transformer:

4. wapyoutub.com/download/video/How...**Transformer**.../vh_aCAHThTQ

Problems on Transformer:

5. https://www.youtube.com/watch?v=zg0piCo5ZTA
6. https://www.youtube.com/watch?v=9TTxUY0vNb8

Unit-5: Work , Power , Energy:

7. http://www.efm.leeds.ac.uk/CIVE/CIVE1140/
8. docs/mechanics_sec03_full_notes02.pdf

Unit-6: Electrical Machines:

9. https://www.rockwellautomation.com/resources/downloads/rockwellautomation/che/pdf/
10. Application_basics_operation_three_phase_induction_motors.pdf
11. http://www.solarbotics.net/library/pdflib/pdf/motorbas.pdf
12. http://www.baldor.com/Shared/manuals/1205-394.pdf

http://uotechnology.edu.iq/dep-ee/lectures/3rd/Communication/machine/PART%203.pdf

BCEL107: Engineering Mechanics

Teaching Scheme:	**Examination Scheme (Theory)**	**Examination Scheme(Lab)**
	Teachers Assessment Exam: 20 Marks	**Internal(TW):** 25 Marks
Lectures: 3 Hrs/Week	**Class Assessment Exam:** 20 Marks	**External(PR)** : 25 Marks
Tutorials: 1 Hrs/Week	**End Semester Exam:** 60 Marks	**External(OR)** :- Nil
Practical: 2 Hrs/Week		
Credit	**4**	**1**

Prerequisite: Knowledge of basic physics and geometry of XIIth standard

Course Objective:

1. Basic concepts of Mechanics for Static and Dynamics have to be implanted into the student.
2. To describe and be able to predict the conditions of rest or motion of the bodies under the action of forces
3. To understand the basic concepts of forces moments, couples in two dimensional force syst

Course Outcomes: After Completion of this course student will be able to

1. Understand the principle of work and energy
2. Comprehend the effect of friction on equilibrium.
3. Understand the laws of motion, the kinematics of motion and the interrelationship.

Course Content	Hrs
Unit – I : Coplanar Force System 1.1 System of Coplanar forces:- Resultant of Concurrent forces, Parallel forces, Non Concurrent Non Parallel system of forces, Moment of force about a point, Couples, Lami's Theorem, Varignon's Theorem. Distributed Forces in plane, Resultant of general force system 1.2 Center of Gravity and Centroid for plane Laminas	6
Unit – II :Equilibrium of Force System 2.1 Equilibrium of system of coplanar forces:- Condition of equilibrium for concurrent forces, parallel forces and Non concurrent Non Parallel general forces and Couples. 2.2 Analysis of plane trusses by using Method of joints and Method of sections.	6
Unit – III : Analysis of Beams, Frames & Cables 3.1 Beams: Types of beams, Types of supports, Types of loading. 3.2 Frames : Analysis of Trusses &Frames	6
Unit – IV : Friction 4.1 Friction: Dry Friction, Laws of friction, angle of friction & resultant reaction, wedge friction, ladder friction, belt friction. 4.2 Kinematics- Basic concepts, equation of motion for constant acceleration and motion under gravity. Variable acceleration and motion curves.	6
Unit – V : Dynamics **A] Kinematics of Particle**: - Velocity & acceleration in terms of rectangular co-ordinate system, Rectilinear motion, Motion along plane curved path, Tangential & Normal component of acceleration, Motion curves (a-t, v-t, s-t curves), Projectile motion.	6

B] Kinetics of a Particle: Force and Acceleration:-Introduction to basic concepts, Newton's Second law of motion. D'Alemberts Principle.

Unit – VI : Principle of Work Energy & Impulse Momentum

A] Work energy principle for particle: Work, Power, Energy, conservative forces & Potential Energy, Conservation of Energy, Work energy principle for motion of particle. 6

B] Impulse momentum principle for particle: Linear Impulse & Momentum, Conservation of momentum, Direct central impact & coefficient of restitution, Impulse momentum principle

Assignments :

Analytical solution of at least four problems / question on each unit based on above syllabus

BCEP107: Engineering Mechanics

Part A :List of Experiments (Any Six)

1. Study of law of parallelogram of forces
2. To Determine the Reaction at The Supports of Simply Supported Beam
3. To determine coefficient of Friction using Belt Friction
4. Verification of law of polygon of forces by graphical method.
5. Study of Lami's Theorem
6. To Determine the Moment of Inertia of Fly-Wheel.
7. To study kinematics of curvilinear motion of a particle
8. To find coefficient of restitution

Text Books:

1. F. L. Singer, Engineering Mechanics, Third Edition, Harper Publication, 2012
2. Engineering Mechanics – Statics and Dynamics by A Nelson, Tata McGraw Hill Education private Ltd, New Delhi 2009.

Reference Books:

1. Vector Mechanics for Engineers, Tata McGraw Hill Company Beer & Johnston, 2012, 9th Edition.
2. Engineering Mechanics, Pearson Education Asia Pvt. Ltd., Iriving K. Shames, 2009, 4th Edition.
3. Engineering Mechanics, Prentice Hall, R.C.Hibbler, 2003, Tenth Edition
4. Engineering Mechanics, DhanpatRai Publishing Company, S. Ramamrutham, 2009, 9th Edition.
5. Engineering Mechanics, DhanpatRai Publishing Company, R. K. Rajput, 2011, 3rd Edition
6. Engineering Mechanics, S. Chand Publication , R.S. Khurmi& Gupta,30july 2015.

Web Links:

Unit I : Resultant of concurrent force System

1. http://www.ae.msstate.edu/vlsm/forcesys/concurrent_force_systems/resultant.html
2. http://www.brainchamp.net/parallelogram-law-of-coplanar-concurrent-forces/
3. http://www.slideshare.net/guestb54490/concurrent-forces

Lamis theorem

1. http://me-mechanicalengineering.com/lamis-theorem/
2. http://www.tutorvista.com/content/physics/physics-iii/motion-laws/lamis-theorem.php
3. http://encyclopedia2.thefreedictionary.com/Lami's+theorem

Varignos theorem

1. nptel.ac.in/courses/Webcourse-contents/IIT-%20Guwahati/.../lec1.htm
2. me-mechanicalengineering.com/varignons-theorem
3. fsinet.fsid.cvut.cz/en/u2052/node40.htm

Moment & couple

1. www.mathalino.com/reviewer/engineering-**mechanics**/**moment**-force
2. web.mit.edu/4.441/1_lectures/1_lecture5/1_lecture5.html
3. physicsnet.co.uk/a-level-physics-as-a2/mechanics/moments/

Unit II : Analysis of structure (join method & section method)

1. www.mathalino.com › Engineering Mechanics › Analysis of Structures
2. www.thelearningpoint.net/home/...**mechanics/analysis-of-structure**
3. www.ce.memphis.edu/3121/notes/notes_03b.pd
4. https://en.wikipedia.org/wiki/**Structural_analysis**

Unit III : Beam & types of beam & FBD

1. https://en.wikipedia.org/wiki/**Beam**_(structure)
2. www.ecourses.ou.edu/cgi-bin/ebook.cgi?topic=me&chap_sec
3. https://www.quora.com/What-are-the-**types-of-beams**

Unit IV : Friction

1. study.com/academy/.../what-is-friction-definition-formula-forces.html
2. www.physicsclassroom.com › Physics Tutorial › Newton's Laws

Unit V : Dynamics

1. http://www.real-world-physics-problems.com/curvilinear-motion.html
2. http://nptel.ac.in/courses/122103010/md07_experiment/module2/lectures/lect4/slides/slide1.htm
3. www.iitg.ac.in/kd/Lecture%20Notes/ME101-Lecture27-KD.pdf
4. study.com/academy/lesson/projectile-motion-definition-and-examples.html
5. https://www.khanacademy.org/...newtons-laws/newtons-laws.../ne...
6. www.crackthehack.com/bnd/epress/2012/.../d-alemberts-principle-and-its-applications...

Unit VI : Principle of Work-Energy & Impulse

1. https://www.khanacademy.org/.../work...energy/work...energy.../...
2. www.spumone.org/courses/dynamics-notes/impulse_momentum/
3. https://www.coursera.org/.../module-12-define-coefficient-of-restitution-solve-an-imp...

BMEL108 : Basic Mechanical & Engineering Graphics

Teaching Scheme:	Examination Scheme (Theory)	Examination Scheme(Lab)
Lectures: 2 Hrs/Week	**Teachers Assessment Exam:** 20 Marks	**Internal(TW):** 25 Marks
Practical: 2 Hrs/Week	**Class Assessment Exam:**20 Marks	**External(PR) :** 25Marks
	End Semester Exam: 60 Marks	**External (OR) : Nil**
Credit	**2**	**1**

Prerequisite:

1. XII^{th} Physics and its principles.
2. Basic Geometry and concepts.

Course Objective:

1. To describe the scope of mechanical engineering in multidisciplinary industries.
2. To understand and identify common machine elements with their functions and power transmission devices.
3. To learn conventional machine tools , manufacturing processes and understand the design in mechanical engineering.
4. To develop imagination power of student of physical objects to be represented on paper for engineering communication in technical field.
5. To develop the manual drawing skill, drawing interpretation skill.
6. To develop the physical realization of the dimension of the objects.

Course Outcomes:

1. The students will understand the mechanical engineering in general; they will get information of power transmission shafts, keys, coupling, bush, ball bearing, friction clutches, and brakes.
2. The Students will get information of Individual & group drives, gear train, gear drive etc.
3. The Student will get information of basic Manufacturing processes as well as working principle and types of operations with block diagram of Lathe Machine, Drilling Machine, Grinding Machine.
4. The student will get idea of first & third angle method of projection, projection of lines which are inclined to both planes i.e. H.P & V.P. by first angle method of projection.

5. The student will able to draw Engineering Curves, Projection of Solids, Section of Solids and Development of Solids on sheets with their imagination power; they acquire knowledge of method of drawings adapted all over the world and able to read sheets in engineering field, their dimensioning.
6. The students will get idea of Auto-CAD software which is user friendly to draw 2D and 3D object with uniform dimensioning.

Course Contents **Hrs**

Unit – I : Basic Mechanical Devices

A] Machine Elements : Power transmission shafts, coupling, bush and ball bearing and friction clutches, brakes (Types & application only) 4

B] Drives : Individual and group drives, belt drive, chain drive, rope drive, gear drive and Spur Gear Drive arrangement with gear train (Types & application only)

Unit – II: Manufacturing Processes & Machine Tools

A] Manufacturing Processes

Basic Manufacturing Processes overviews, Sheet metal forming processes : drawing and bending, Sheet metal Cutting processes : Blanking, Piercing ,Metal Joining Processes : Welding , Soldering , Brazing methods and application 6

B] Machine Tools& Operations: Basic Elements, Working Principle, Types of Operations with Block Diagram**:** Lathe Machine, Drilling Machine.

Unit – III : Projection of Lines, Projection of Solids, Development of Solid & Orthographic Projection

A] Introduction to lines and **Engineering Curves** -Ellipse, Parabola, Hyperbola by Focus Directrix and Rectangle Method 8

B] Introduction to projection of solids and section of solids and Development of Solid(Prism and Pyramid Maximum with six sides)

C] Orthographic projections of given pictorial view by First Angle Method of Projections.

Unit – IV : Isometric Projection & Auto-CAD

A] Introduction to Isometric View with the example of Cube Isometric axes, scale, Isometric Projection and Isometric Views. Drawing isometric views of simple solids and objects dimensioning-only Length, width and height of Isometric views. 6

B] Introduction to AutoCAD, Commands, AutoCAD drawing of simple 2D objects

BMEP 108: Elements of Mechanical & Engineering Graphics

Part A- List of Practical/Assignments (Any Eight Out of which 9 & 10 compulsory)	Hrs.
1. Study of power transmitting Elements – Gears, Couplings, Bearings	2
2. Study of Automobile Clutches.	1
3. Study of Mechanical Brakes.	1
4. Study, demonstration & working of Lathe Machine	2
5. Study ,demonstration & working of Drilling Machine	2
6. Four problems on Projection of lines	4
7. Two problems on Projection of Solids	4
8. Four problems on Engineering Curves and Development of Lateral Surfaces.	4
9. AutoCAD Drawing- 2 Problem on orthographic	4
10. AutoCAD Drawing- 2 Problem on Isometric Projection	4

Part B-Mini Project Modeling

Every Students has to performed mini project in a group based on curriculum courses

Instructions to Student:

1. Maximum Three Students are permissible in each group
2. Project must be based on the contents of syllabus.
3. Project report has to be prepared and attach in practical file individually.

Text Books:

1. N. D. Bhatt & V. M. Panchal, Engineering Drawing, Plane and Solid Geometry, Charotor Publication House, Anand, Gujrat, India.
2. Dhananjay A. Jolhe, Engineering Drawing with an Introduction to Auto CAD, Tata Mcgraw- hill Publishing Co. Ltd., New Delhi, India.
3. G. Shanmugam S. Ravindran " Basic Mechanical Engineering",Tata McGraw- Hill Publisher Co. Ltd.
4. R. K. Purohit " Foundation of Mechanical Engineering" , Scientific Publishers.

Reference Books :

1. K. Venugopal, Engineering Drawing and Graphics, New Age Publication.
2. N. B. Shaha and B. C. Rana, Engineering Drawing, Pearson Education.
3. C. Jensen, J. D. Helsel and D. R. Short, "Engineering Drawing and Design", Tata McGraw-Hill Education Pvt. Ltd., New Delhi, 2012
4. Surinder kumar , " Basics of Mechanical Engineering". Ane Books Pvt. Ltd., New Delhi, 2011
5. T. J. Parbhu , V. Jaiganesh and S. Jebaraj, " Basic Mechanical Engineering" , Scitech Publications (India) Pvt. Ltd. Chennai, 2010.

Weblinks :

Unit – I

- https://www.google.co.in/webhp?sourceid=chrome-instant&ion=1&espv=2&ie=UTF-8#q=machine+Elements+Shaft+%2C+keys%2C+Coupling
- http://www.codecogs.com/library/engineering/theory_of_machines/belt-and-rope-drives-brakes.php

Unit – II

- https://en.wikipedia.org/wiki/List_of_manufacturing_processes
- http://www.egr.msu.edu/~pkwon/me478/operations.pdf

Unit – III

- http://nptel.ac.in/courses/112103019/20
- http://www.iitg.ernet.in/rkbc/ME111/Lecture4%20Engineering%20Curves%20and%20Theory%20of%20projections.pdf
- http://nptel.ac.in/courses/112103019/29
- http://www.iitg.ernet.in/rkbc/ME111/Lecture11%20Sections%20of%20solids.pdf
- http://www.engineeringessentials.com/ege/ortho/ortho_page2.htm

Unit – IV

- http://home.iitk.ac.in/~cvrm/TA101_L12_IsometricProjections_Basics.pdf
- http://cms.cerritos.edu/uploads/engt/autocad%20basics.pdf

BHUL109: Environmental Studies and Professional Ethics

Teaching Scheme:	**Examination Scheme (Theory)**	**Examination Scheme (Lab)**
Lectures: 2 Hrs/Week	**Teachers Assessment Exam:** Nil	**Internal(TW):** Nil
Tutorial: Nil	**Class Assessment Exam:** Nil	**External(PR) :**Nil
	End Semester Exam: Nil	**External(OR) :** Nil
Credit	**Audit Course**	

Course Objective: After completing the course students wil be able to

1. Understand fundamental concepts of Environmental systems
2. Understand fundamental concepts from the social sciences and humanities underlying environmental thought and governance.

Course Outcome: At the end of the course the student shall be able to:

1. Understand the concepts and methods and their applications in environmental problem-solving.
2. To get knowledge about impact of different types of pollutions.
3. To get knowledge about effect of water pollution on health and different energy recourses.
4. Demonstrate self confidence and self esteem.
5. Present appropriate etiquettes, style, manners and graceful personality.

Course Contents	Hrs
Unit – I : Environmental Science, Climate Change and need of public awareness	
Definition, scope importance and objectives, guiding principle of Environmental studies, climate change and Need for public awareness. Concept of ecosystem biotic & abiotic components, types of ecosystems. Explain different ecosystems- forest, grassland, desert, aquatic.	4
Unit – II : Pollution and Waste Management	
Air Pollution & Automobile Pollution: Definition, Effects – Global Warming, Acid rain & Ozone layer depletion, Animal husbandry, controlling measures. **Solid Waste Management** - E-Waste Management & Biomedical Waste Management - Sources, Characteristics & Disposal methods.	4
Unit – III : Natural Resources, Material Cycles and Energy	
Natural Resources - Water resources – Availability & Quality aspects, Water borne diseases &water induced diseases, Fluoride problem in drinking water. **Wealth Material Cycles –** Phosphorous Cycle, Carbon Cycle, Nitrogen Cycle & Sulphur Cycle. **Energy** – Different types of energy, Conventional sources & Non-Conventional sources of energy. with examples such as Solar energy and Hydro electric energy.	4
UNIT-IV: Ethics, Value System & Value Education	
Ethics: Behavioral Values, Code of Conduct in College Premises, Addiction, Patriotism – Building respect for the Country, National Anthem and National Flag, Ragging, Respect for Individuals & Environment, Peer – Pressure & Support, Moral Uprightness, Importance of Altruism, Living by the Rules. **Value System & Value Education:** Understanding how value system affects behavior and perception, Difference between Values, Moral & Ethics, Concept of Equality, Acceptance, Humility. Importance of Value education for College Student, Understanding the meaning of Vishwas : Differentiating between intention and competence, How to resolve ethical dilemma, “Right” and “Wrong” Action	4
UNIT-V: Copyrights, Corruption & Integrity and Goal Setting ,Self Improvement and Self Analysis	8
Introduction, Moral Obligations, Copyright Infringement, Patent Law, Case Study Analysis **Goal Setting:** - The importance and benefits of proper goal setting is explained to the students. The following topics are covered: S.M.A.R.T. Goals, Principles of Goal Setting, Steps for Goal	

- Setting Activity. Grooming & Body Language: The students are trained on various aspects of self-grooming and body-language.
- Attitude Development: Types of Attitude, How society affects attitude, Importance of right attitude, Activity.
- Vocabulary Building, Public Speaking & Extempore: Vocabulary Building, Crosswords, Word & Meaning, Spellings, Conversation Practice, Extempore Practice, Intonation, Speech Anxiety.

Self Analysis:

- Self Awareness& Mindfulness: Being Self Aware, Self Awareness in relationships, SWOT, Developing Self Awareness, Self Mastery, JoHari Window.

Mini Project Modeling

Every Students has to performed mini project or a survey report in a group based on following topics.

1.Air pollution

2.Noice pollution

3. water treatment

4.Sewage treatment

5.Human Rights ACTs.(right to equality, education, own a private land, other constitutional rights)

6.Recent studies on minimization of solid waste.(electronic waste, biomedical waste, plastic waste etc)

7. Latest existing status regarding rural development. (sanitary, agricultural, lifestyle, use of technical knowledge for improving different perspects of life, health awareness of both humans and animals)

8. Green building

9. Effects of Global warming

10. Impacts of climate change

Instructions to Students

1. Maximum Three Students are permissible in each group
2. Project must be based on the contents of syllabus.
3. Project report has to be prepared and attach in practical file individually.

Reference Books:

1. A textbook of Environment and Ecology – by Shashi Chawla
2. Textbook for Enviornmental Studies for Undergraduate Courses of all Branches of Higher Education by eran barucha.
3. Solid waste management- by chandrappa, Ramesh, Brown and Jeff.
4. A Textbook of Environmental Chemistry & Pollution Control: S SDara, S. Chand & Company, New

Delhi (2002).

5. "Essentials of Ecology & Environment Science" by Rana. S.V.S.; EPI Publications.
6. Gleick, H.P.1993. Water in crisis, Pacifics Institute for Studies in Dev., Environment & Security. Stockholm Env. Institute. Oxford Univ. Press.473p
7. Robert Schuller, Success Never Ends, Failure is Never Final, Revised Edition, Paperback, 1990 Page 14 of 323
8. Allen Pease, Body Language b, First Edition, Paperback, 2005

BMEP111: Workshop

Teaching Scheme:	Examination Scheme: (Theory)	Examination Scheme:(Lab)
Lectures: Nil	**Teachers Assessment Exam:** Nil	**Continuous Assessment:**
Practical: 2Hr/Week	**Class Assessment Exam:** Nil	50 Marks
Tutorial: Nil	**End Semester Exam:** Nil	

Credit _ **1**

Course Objective:

1. To introduce to names, uses and setting of hand tools for Fitting, Carpentry and Welding used in mechanical engineering workshop.
2. To introduce students to components and PCB making so as to be able to do work related to Mini-Model making in Electronics workshop.

Course Outcome: At the end of this course student are able to

1. Understand and demonstrate workshop safety regulations.
2. Use tools and processes in fitting, carpentry and welding operations.
3. Demonstrate knowledge of component identification and PCB making.

Course Contents	Hrs
Unit – I : Utility Tools	
Carpentry – 1 Job	
Introduction to wood working, kinds of woods, hand tools and machines. Types of joints, wood turning. Pattern making, types of patterns, contraction, draft and machining allowances.	4
Term work to include one job involving joint and woodturning.	
Fitting – 1 Job	
Types of fits, concepts of interchangeability, datum selection, location layout, marking, cutting, shearing, chipping, sizing of metals, drilling and tapping.	4

Term work to include one job involving fitting to size, male-female fitting with drilling and tapping. 4

Sheet Metal Practice – 1 Job

Introduction to primary technology processes involving bending, punching and drawing various sheet metal joints, development of joints.

Term work to include a utility job in sheet metal.

Joining – 1 Job

Includes making temporary and permanent joints between similar and dissimilar material by processes of chemical bonding, mechanical fasteners and fusion technologies. 4

Term work includes one job involving various joining processes like riveting. Joining of plastics, welding, brazing etc.

Unit – II : Demonstrations (Any Four)

Assembly and Inspection

Assembly and Disassembly of some products, tools etc. Videos of advancement in manufacturing technology. Inspection of various components using different measuring instruments. Introduction to measuring equipment used in Quality Control.

Safety in Workshop

Fire hazards, electric short circuit- causes and remedies. Machine protection, Human protection, Accident prevention methods, developing ability to observe safe working habits.

Forging

Hot working, cold working processes, forging materials, hand tools and appliances, hand forging, power forging. 2

Moulding

Principles of moulding, methods, core & core boxes, preparation of foundry sand, casting, plastic moulding.

Plumbing

Types of pipe joints, threading dies, Pipe fitting.

PCB Making

Layout drawing, positive and negative film marking, PCB etching and drilling.

Machine Tools

Turing, Milling, Grinding, Planning – Machines, Tools and Accessories.

Note: All demonstrations to be engaged by teaching faculty and corresponding teaching load be shown in the time table for respective teaching faculty.

Submissions :

Two jobs as mentioned above.

Brief write-up with illustration / sketches on the demonstration (not more than 3 pages for each demonstration.)

Text Books:

Chaudhary, Hazra, "Elements of Workshop Technology,: Volume I & II Media Promoters and Publishers, Mumbai.

Course in Workshop Technology Volume-I, B. S. Raghuwanshi, Laxmi Publication-Revised Edition

BFYP112: MINI MODELING

Teaching Scheme	**Examination Scheme: (Theory)**	**Examination Scheme: (Laboratory)**
Lectures: Nil	**Teachers Assessment Examination:** Nil	**Continuous Assessment:** 50 Marks
Practicals: 2 Hrs./Week	**Class Assessment Examination:** Nil	
Tutorials: Nil	**End Semester Examination :**Nil	
Credit	**----**	**1**

Prerequisite: 12th Science Basics

Course Objective : After completing this course student will able

1. To understand different phase of model development.
2. To learn various techniques of model development.

Course Outcome: student shall be able to:

1. Developing the skills of planning and designing to develop a working Mini Model.
2. Implement knowledge of concepts learnt and workshop practices to prepare a model.
3. Use innovative ideas and convert these into physical models.

Sr. No Themes for Mini Modeling (value addition Venture)

1 Mechatronics

2 Modeling

a) AutoCAD/Autodesk

b) Nx4/Ansys/CATIA/Uni Graphics

c) Metro Rail/Automobiles

3 Transducers and sensors
   a) Simulink
   b) Lab view
4 Energy conversion and conservation
5 Renewable energy sources
6 Energy Audit
7 Alternate fuels
8 Environmental issues related projects
9 Environmental Audit
10 Designing application based projects PCB Fabrication
11 Agriculture Based Projects
12 Design of web page
13 Bio-Engineering

BHUL113 : Communication Skill

Teaching Scheme:	**Examination Scheme (Theory)**	**Examination Scheme (Lab)**
Lectures: 2Hr/Week	**Teachers Assessment Exam:**10 Marks	**Internal(TW):** Nil
Tutorials: Nil	**Class Assessment Exam:**10 Marks	**External(PR) :**Nil
	End Semester Exam: 30 Marks	**External(OR) :** Nil
Credit	**2**	_

Course Objective:

1. To develop an understanding in the students regarding communication skills
2. To develop the four essential communication skills in the students i.e. reading, writing, listening and speaking
3. To develop the vocabulary and English proficiency of the students
4. Train students to common words, phrases relevant to the immediate communication tasks
5. Enable students to comprehend the concept of communication.
6. Teach students the four basic communication skills – Listening, Speaking, Reading and Writing

Course Outcome: At the end of the course the student shall be able to:

1. The students will develop an understanding regarding communication skills.
2. Development of the four essential communication skills in i.e. –reading, writing, Listening and speaking in students.
3. Enhancement of vocabulary and English proficiency of the students.

Course Contents	Hrs
Unit – I : INTRODUCTION TO COMMUNICATION	
Importance of Communication; Importance of Communicating effectively in English; Communication Process , Channels of communication; Barriers to effective communication, Need of communication skills for Engineers.	2
Unit – II : TECHNICAL COMMUNICATION	
Introduction to Technical Communication; differences between General and Technical Communication; importance of Technical Communication; Technical Communication Skills – Listening, Speaking, Reading, Writing	2
Unit – III : LISTENING SKILLS	
Listening Process; Hearing and Listening; Poor listening habits; Traits of a good listener; Types of Listening Principles of Communication – Communication as coding and decoding – signs and symbols – verbal and non –verbal symbols – Language AND communication; language VS communication – media/channels for communication.	4
Unit – IV : SPEAKING SKILLS	
Phonetics and Diction – Theory and Practical; Body Language; Miscellaneous tips and techniques on speaking. Articles reading.	3
Unit – V : READING SKILLS	
Reading Comprehension Techniques for good comprehension, Interpreting charts and tables, Practical Exercises; Developing reading speed – Theory and Practical; Loud Reading – Practical Exercises in class	3
Unit – VI : TECHNICAL WRITING	
Characteristics of Technical Writing – introduction, characteristics, techniques; Choice of right words, phrases and sentences; Principles of paragraph writing	2
Unit – VII : WRITING BUSINESS LETTERS AND EMAILS	
Business Letters – The 7 Cs of Letter Writing, structure of business letters, writing business letters (applications, enquiry, quotations, complaints, cover letters); Writing professional emails	2
Unit – VIII: OTHER WRITTEN COMMUNICATION	
Writing reports, proposals, press release, articles, essays; drafting of Notices and Advertisements (for newspapers); note-making	2
Unit – IX: VOCABULARY DEVELOPMENT	2

Effective use of dictionary; etymology; homophones and homonyms; synonyms and antonyms; words frequently confused or miss spelt, idioms and phrases

Unit – X: BASICS OF FUNCTIONAL ENGLISH GRAMMAR 2

Parts of Speech – introduction, prepositions; articles; tenses; narration; punctuation; voice

Text Books:

1. Mason, Margaret M. Examine Your English, Hyderabad: Orient Longman, 1980
2. Sharma, R.S. Technical Writing. Delhi: Radha Publication, 1999
3. Sudarsanam, R. Understanding Technical English. Delhi: Sterling Publishers Pvt. Ltd., 1992
4. Gannon, Robert, Edt. Best Science Writing: Readings and Insights. Hyderabad: University Press (India) Limited, 1991
5. M. Ashraf Rizvi, Effective Technical Communication, First Edition, Tata McGraw Hill, 2012
6. P C Wren and H Martin, High School English Grammar and Composition, Revised First Edition, S Chand, 2005
7. Meenakshi Raman & Sangeeta Sharma, Communication – Principles & Practice, First Edition, Oxford University Press, 2011

Web Reference Links:

- http://www.youtube.com/watch?v=egeyiUpFsaw
- http://www.youtube.com/watch?v=8Oos1qoYe4o
- http://www.youtube.com/watch?v=9Y88Zw7eWZc
- http://www.youtube.com/watch?v=_pFTsGzGuOk
- http://www.youtube.com/watch?v=eB9Bq3YJGcA
- http://www.youtube.com/watch?v=UWBSlMaplT0
- http://www.youtube.com/watch?v=VFrp9ROB44c&feature=pyv&ad=4735114004&kw=success
- http://www.youtube.com/watch?v=e4g0op2P_yY
- http://www.youtube.com/watch?v=AFGNKJruxdg

BIDL101: Bio Systems in Engineering

Teaching Scheme	Examination Scheme (Theory)	Examination Scheme (Lab)
Lectures: 2Hrs/Week	**Teachers Assessment Exam :** Nil	**Continuous Assessment:** Nil
Tutorials: Nil	**Class Assessment Exam:** Nil	**External(PR) :** Nil
	End Semester Exam: Nil	

Credit **Audit Course** **-------**

Course Objective :

This course introduces general biological concepts

1. It helps students to understand importance of biological concepts in engineering fields.
2. To understand application of engineering concepts in medical instrumentation.

Course Outcome:

Upon successful completion of the course, students will be able to

1. Use bioinstrumentation, required in cellular or molecular biology investigations.
2. Apply the concepts of engineering in different streams of biomedical field.

Course Contents	Hrs
Basics of Biology: Introduction to Human Anatomy and Physiology, The Nervous System, Cardiovascular System. **Biomedical Instrumentation:** Bioelectric Signals, Biomedical Instrumentation System, Biomedical transducers, Electrodes and Their Characteristics. Bio-imaging techniques, ECG, Computer aided ECG, X-Ray, MRI, CT Scan, Blood pressure measurement instrument. **Applications of Biomedical Engineering.**	24

Text Books:

1. “Joseph J. Carr and John M. Brown, “**Introduction to Biomedical Equipment Technology**”, 4 th Edition, Prentice Hall, 2000.
2. R. Rangayan, “**Biomedical Signal Analysis**”, Wiley 2002**.**

Reference Books:

1. R.S.Khandpur, “**Handbook of Biomedical Instrumentation**”, Tata McGraw Hill, New Delhi, 2003, Edition-II.

2. Sörnmo, “**Bioelectrical Signal Processing in Cardiac & Neurological Applications**”, Elsevier.

3. “**Biomedical Instrumentation** Arumugam,Anuradha Publishers,2002,First Edition

****

Department of

Electronics and Telecommunication Engineering

(NBA Accredited)

S. Y. B. Tech. Course Book

(2016 Pattern)

Engineering Management Law Schools Other Courses
NAGPUR PUNE JALGAON AMRAVATI AHMEDNAGAR CHHINDWARA
RAISONI GROUP OF INSTITUTIONS

Department of
Electronics and Telecommunication Engineering

(NBA Accredited)

Under Graduate (UG) Course Book

S.Y. B.Tech (E&TC)

Semester- III/IV

Engineering Management Law Schools Other Courses
NAGPUR PUNE JALGAON AMRAVATI AHMEDNAGAR CHHINDWARA
RAISONI GROUP OF INSTITUTIONS

INDEX

Engineering Management Law Schools Other Courses
NAGPUR PUNE JALGAON AMRAVATI AHMEDNAGAR CHHINDWARA
RAISONI GROUP OF INSTITUTIONS

About E&TC Department

- NBA Accredited Electronics and Telecommunication Programme
- Involvement of Experts from IITs, NITs, Govt. Colleges, Reputed Industries, Alumni and Students in development of curriculum
- Choice Based Credit System (CBCS)
- Choice of Electives
- Remedial Teaching
- Sponsorship for Publications and IPR
- Research Mentorship
- Industry Internship
- Provision of Credit Transfer Scheme (CTS)
- Peer Teaching Scheme
- Teacher Guardian Scheme (TGS)
- Various Clubs and Hobby Modules
- Proficiency Courses
- Recognized Research Centre under Savitribai Phule Pune University (Ph. D. Program) as well as An Autonomous Ph. D. Programme in E&TC Engineering.
- Industry Supported Labs.
- MOUs with Industries.

Engineering Management Law Schools Other Courses
NAGPUR PUNE JALGAON AMRAVATI AHMEDNAGAR CHHINDWARA
RAISONI GROUP OF INSTITUTIONS

INSTITUTE VISION AND MISSION

VISION

To achieve excellent standards of quality education by keeping pace with rapidly changing technologies and create technical manpower of global standards with capabilities of accepting new challenges

MISSION

Our efforts are dedicated to impart quality and value based education to raise satisfaction level of all stake-holders. Our strength is directed to create competent professionals. Our endeavor is to provide all possible support to promote research and development activities

DEPARTMENT VISION AND MISSION

VISION

To create globally competent and acceptable technical manpower in the ever-changing domain of Electronics & Telecommunication with attributes of self and lifelong learning, thereby transforming challenges into contributions to rapidly changing technologies.

MISSION

M1: To impart quality and value based education to the learners by strengthening teaching learning process from innovative curriculum to its rigorous implementation.

M2: To create competent professionals with a feature of life long contributors to technology and mankind.

M3: To engage faculty and students into relevant and outcome oriented R&D activities.

Engineering Management Law Schools Other Courses
NAGPUR PUNE JALGAON AMRAVATI AHMEDNAGAR CHHINDWARA
RAISONI GROUP OF INSTITUTIONS

Programme Educational Objectives (PEOs)

A graduate in E&TC will be able to demonstrate:

PEO1: Ability to grasp, comprehend and apply the knowledge acquired from basic sciences, mathematics, program specific core and elective courses to solve real life technical problems.

PEO2: As a self and lifelong learner, ability to deliver and contribute applications, products, services dealing with usage of modern software tools and hardware platforms.

PEO3: Ability to work as cohesive team members to exhibit professional ethics, human values and social awareness in their career.

PEO4: Competencies, excellence in higher education and employability in diversified areas of Electronics and Telecommunication Engineering.

Program Specific Objectives (PSOs)

At the end of the programme students will be able to demonstrate:

PSO1: An in-depth understanding of fundamental and application oriented courses in communication systems, signal processing, embedded systems and electronic devices.

PSO2: A rigorous hands-on skills of modelling and simulation by using broad range of programming languages and open source platform.

PSO3: Behaviour as a responsible team member contributing to development of prototype, application, product as a part of his/her mini and main project in the field of Electronics and communication systems.

Engineering Management Law Schools Other Courses
NAGPUR PUNE JALGAON AMRAVATI AHMEDNAGAR CHHINDWARA
RAISONI GROUP OF INSTITUTIONS

Program Outcomes (POs)

Engineering Graduates will be able to:

1. **Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
2. **Problem analysis**: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
3. **Design/development of solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
4. **Conduct investigations of complex problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
5. **Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.
6. **The engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
7. **Environment and sustainability**: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
8. **Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
9. **Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
10. **Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
11. **Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one’s own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
12. **Life-long learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

Engineering Management Law Schools Other Courses
NAGPUR PUNE JALGAON AMRAVATI AHMEDNAGAR CHHINDWARA
RAISONI GROUP OF INSTITUTIONS

Department of Electronics and Telecommunication Engineering

S.Y BTech

Course Code Details

S.N.	Code	Course Name	Sem	Scheme	Subject	Elective	Offer
1	BEML201	Engineering Mathematics –III	III	UG Electronics & Telecommunication 2017-18 (AUTONOMOUS)	Theory	NO	YES
2	BECL201	Electronic Devices & Circuits	III	UG Electronics & Telecommunication 2017-18 (AUTONOMOUS)	Theory	NO	YES
3	BECP201	Electronic Devices & Circuits	III	UG Electronics & Telecommunication 2017-18 (AUTONOMOUS)	Practica l	NO	YES
4	BECL202	Power Electronics	III	UG Electronics & Telecommunication 2017-18 (AUTONOMOUS)	Theory	NO	YES
5	BECP202	Power Electronics	III	UG Electronics & Telecommunication 2017-18 (AUTONOMOUS)	Practica l	NO	YES
6	BCOL201	Data Structures	III	UG Electronics & Telecommunication 2017-18 (AUTONOMOUS)	Theory	NO	YES
7	BCOP201	Data Structures	III	UG Electronics & Telecommunication 2017-18 (AUTONOMOUS)	Practica l	NO	YES
8	BECL203	Network Theory	III	UG Electronics & Telecommunication 2017-18 (AUTONOMOUS)	Theory	NO	YES
9	MBL102 / MBL103	GENERAL PROFICIENCY:-II :Foreign Language/ GENERAL PROFICIENCY-III: Hobby classes	III/ IV	UG Electronics & Telecommunication 2017-18 (AUTONOMOUS)	Theory	NO	YES
10	BECL204	Digital System Design	IV	UG Electronics & Telecommunication	Theory	NO	YES

Engineering Management Law Schools Other Courses
NAGPUR PUNE JALGAON AMRAVATI AHMEDNAGAR CHHINDWARA
RAISONI GROUP OF INSTITUTIONS

				2017-18(AUTONOMOUS)			
11	BECP204	Digital System Design	IV	UG Electronics & Telecommunication 2017-18(AUTONOMOUS)	Practical	NO	YES
12	BECL205	Field Theory	IV	UG Electronics & Telecommunication 2017-18(AUTONOMOUS)	Theory	NO	YES
13	BECL206	Analog Systems &Design	IV	UG Electronics &Telecommunication 2017-18(AUTONOMOUS)	Theory	NO	YES
14	BECP206	Analog Systems & Design	IV	UG Electronics & Telecommunication 2017-18(AUTONOMOUS)	Practical	NO	YES
15	BECL207	Communication Electronics	IV	UG Electronics & Telecommunication 2017-18(AUTONOMOUS)	Theory	NO	YES
16	BECP207	Communication Electronics	IV	UG Electronics & Telecommunication 2017-18(AUTONOMOUS)	Practical	NO	YES
17	BCOL203	Computer Architecture& Organization	IV	UG Electronics & Telecommunication 2017-18(AUTONOMOUS)	Theory	NO	YES
18	BECP208	Modelling& Simulation	IV	UG Electronics & Telecommunication 2017-18(AUTONOMOUS)	Practical	NO	YES

Engineering Management Law Schools Other Courses
NAGPUR PUNE JALGAON AMRAVATI AHMEDNAGAR CHHINDWARA
RAISONI GROUP OF INSTITUTIONS

B.Tech. Electronics and Telecommunication

Course Structure

Scheme for S.Y. B.Tech.													
SEMESTER-III													
Subject Code	Name of the Course	Teaching Scheme				Credits	Evaluation Scheme						Duration of Paper/ Practical (Hrs.)
							Theory			Practical		Total	
		Th	Tu	Pr	Total		TAE (20)	CAE (20)	ESE (60)	Cont. Ass.	Ext.		
BEML201	Engineering Mathematics –III	3	1	-	4	4	20	20	60	-	-	100	3
BECL201	Electronic Devices & Circuits	3	1	-	4	4	20	20	60	-	-	100	3
BECP 201	Electronic Devices & Circuits	-	-	2	2	1	-	-	-	25	25	50	3
BECL203	Network Theory	3	1	-	4	4	20	20	60	-	-	100	3
BECL202/ BECL207	Power Electronics / Communication Electronics	3	1	-	4	4	20	20	60	-	-	100	3
BECP202 / BECP207	Power Electronics / Communication Electronics	-	-	2	2	1	-	-	-	25	-	25	-
BCOL201 / BCOL203	Data Structures / Computer Architecture & Organization	3	1	-	4	4	20	20	60	-	-	100	3
		3	-	-	3	3	20	20	60	-	-	100	3
BCOP201	Data Structures	-	-	4	4	2	-	-	-	25	25	50	-
MBL102 / MBL103	GENERAL PROFICIENCY:-II :Foreign Language / GENERAL PROFICIENCY-III: Hobby classes	1	-	2	3	Audit Course	-	-	-	G	-	-	-
	Total	16	5/4	10	31/26	24/21	100	100	300	75/50	50/25	625/575	

Engineering Management Law Schools Other Courses
NAGPUR PUNE JALGAON AMRAVATI AHMEDNAGAR CHHINDWARA
RAISONI GROUP OF INSTITUTIONS

B.Tech. Electronics and Telecommunication

Course Structure

Group A

Scheme for S.Y. B.Tech.													
SEMESTER-III													
Subject Code	**Name of the Course**	**Teaching Scheme**				**Credits**	**Evaluation Scheme**						**Duration of Paper/ Practical (Hrs.)**
							Theory			**Practical**		**Total**	
		Th	**Tu**	**Pr**	**Total**		**TAE (20)**	**CAE (20)**	**ESE (60)**	**Cont. Ass.**	**Ext.**		
BEML201	Engineering Mathematics –III	3	1	-	4	4	20	20	60	-	-	100	3
BECL201	Electronic Devices & Circuits	3	1	-	4	4	20	20	60	-	-	100	3
BECP 201	Electronic Devices & Circuits	-	-	2	2	1	-	-	-	25	25	50	3
BECL203	Network Theory	3	1	-	4	4	20	20	60	-	-	100	3
BECL202	Power Electronics	3	1	-	4	4	20	20	60	-	-	100	3
BECP202	Power Electronics	-	-	2	2	1	-	-	-	25	-	25	-
BCOL201	Data Structures	3	1	-	4	4	20	20	60	-	-	100	3
BCOP201	Data Structures	-	-	4	4	2	-	-	-	25	25	50	-
MBL102	GENERAL PROFICIENCY:-II :Foreign Language	1	-	2	3	Audit Cou	-	-	-	G	-	-	-

Engineering Management Law Schools Other Courses
NAGPUR PUNE JALGAON AMRAVATI AHMEDNAGAR CHHINDWARA
RAISONI GROUP OF INSTITUTIONS

						rs e							
	Total	16	5	10	31	24	100	100	300	75	50	625	

Group B

Scheme for S.Y. B.Tech.													
SEMESTER-III													
Subject Code	**Name of the Course**	**Teaching Scheme**				**Credits**	**Evaluation Scheme**						**Duration of Paper / Practical (Hrs.)**
							Theory			**Practical**		**Total**	
		Th	**Tu**	**Pr**	**Total**		**TAE (20)**	**CAE (20)**	**ESE (60)**	**Cont. Ass.**	**Ext.**		
BEML201	Engineering Mathematics –III	3	1	-	4	4	20	20	60	-	-	100	3
BECL201	Electronic Devices & Circuits	3	1	-	4	4	20	20	60	-	-	100	3
BECP201	Electronic Devices & Circuits	-	-	2	2	1	-	-	-	25	25	50	3
BECL203	Network Theory	3	1	-	4	4	20	20	60	-	-	100	3
BECL207	Communication Electronics	3	1	-	4	4	20	20	60	-	-	100	3
BECP207	Communication Electronics	-	-	2	2	1	-	-	-	25	-	25	-
BCOL203	Computer Architecture& Organization	3	-	-	3	3	20	20	60	-	-	100	3
MBL103	GENERAL PROFICIENCY-III: Hobby classes	1	-	2	3	Audit Co	-	-	-	G	-	-	-

Engineering Management Law Schools Other Courses
NAGPUR PUNE JALGAON AMRAVATI AHMEDNAGAR CHHINDWARA
RAISONI GROUP OF INSTITUTIONS

						u rs e							
	Total	16	4	6	26	21	100	100	300	50	25	57 5	

SEMESTER IV

Scheme for S.Y													
SEMESTER-IV													
Sub. Code	**Name of the Course**	**Teaching Scheme**				**Cr ed its**	**Evaluation Scheme**						**Durat ion of Paper / Practi cal (Hrs.)**
							Theory			**Practical**		**Total**	
		Th	**Tu**	**Pr**	**To tal**		**TA E (20)**	**CA E (20)**	**ESE (60)**	**Cont Ass.**	**Ext. (PR)**		
BECL204	Digital System Design	3	1	-	4	4	20	2 0	60	-	-	100	3
BECP204	Digital System Design	-	-	2	2	1	-	-	-	25	25	50	3
BECL205	Field Theory	3	1	-	4	4	20	2 0	60	--	-	100	3
BECL206	Analog Systems & Design	3	1	-	4	4	20	2 0	60	-	-	100	3
BECP206	Analog Systems & Design	-	-	2	2	1	-	-	-	25	25	50	3
BECP208	Modeling & Simulation	-	-	2	2	1	-	-	-	25	-	25	3
BECL202/ BECL207	Power Electronics / Communicatio n Electronics	3	1	-	4	4	20	2 0	60	-	-	100	3
BECP202 / BECP207	Power Electronics / Communicatio n Electronics	-	-	2	2	1	-	-	-	25	-	25	-
BCOL201 / BCOL203	Data Structures / Computer Architecture &	3	1	-	4	4	20	2 0	60	-	-	100	3

Engineering Management Law Schools Other Courses
NAGPUR PUNE JALGAON AMRAVATI AHMEDNAGAR CHHINDWARA
RAISONI GROUP OF INSTITUTIONS

	Organization	3	-	-	3	3	20	20	60	-	-	100	3
BCOP201	Data Structures	-	-	4	4	2	-	-	-	25	25	50	-
MBL102 / MBL103	GENERAL PROFICIENCY:-II :Foreign Language / GENERAL PROFICIENCY-III: Hobby classes	1	-	2	3	Audit Course	-	-	-	G	-	-	-
	Total	**16**	**5/4**	**14/10**	**35/30**	**26/23**	**100**	**100**	**300**	**125/ 100**	**75/ 50**	**700/650**	-

SEMESTER IV

Group A

Scheme for S.Y													
SEMESTER-IV													
Sub. Code	**Name of the Course**	**Teaching Scheme**				**Credits**	**Evaluation Scheme**						**Duration of Paper / Practical (Hrs.)**
							Theory			**Practical**		**Total**	
		Th	**Tu**	**Pr**	**Total**		**TAE (20)**	**CAE (20)**	**ESE (60)**	**ContAss.**	**Ext. (PR)**		
BECL204	Digital System Design	3	1	-	4	4	20	20	60	-	-	100	3
BECP204	Digital System Design	-	-	2	2	1	-	-	-	25	25	50	3
BECL205	Field Theory	3	1	-	4	4	20	20	60	-	-	100	3
BECL206	Analog Systems & Design	3	1	-	4	4	20	20	60	-	-	100	3
BECP206	Analog Systems & Design	-	-	2	2	1	-	-	-	25	25	50	3
BECP208	Modeling & Simulation	-	-	2	2	1	-	-	-	25	-	25	3
BECL207	Communication Electronics	3	1	-	4	4	20	20	60	-	-	100	3

Engineering Management Law Schools Other Courses
NAGPUR PUNE JALGAON AMRAVATI AHMEDNAGAR CHHINDWARA
RAISONI GROUP OF INSTITUTIONS

BECP207	Communication Electronics	-	-	2	2	1	-	-	-	25	-	25	-
BCOL203	Computer Architecture& Organization	3	-	-	3	3	20	20	60	-	-	100	3
MBL103	GENERAL PROFICIENCY-III: Hobby classes	1	-	2	3	Audit Course	-	-	-	G	-	0	-
	Total	**16**	**4**	**10**	**30**	**23**	**100**	**100**	**300**	**100**	**50**	**650**	**-**

Group B

Scheme for S.Y													
SEMESTER-IV													
Sub. Code	**Name of the Course**	**Teaching Scheme**				**Credits**	**Evaluation Scheme**						**Duration of Paper / Practical (Hrs.)**
							Theory			**Practical**		**Total**	
		Th	**Tu**	**Pr**	**Total**		**TAE (20)**	**CAE (20)**	**ESE (60)**	**Cont Ass.**	**Ext. (PR)**		
BECL204	Digital System Design	3	1	-	4	4	20	20	60	-	-	100	3
BECP204	Digital System Design	-	-	2	2	1	-	-	-	25	25	50	3
BECL205	Field Theory	3	1	-	4	4	20	20	60	-	-	100	3
BECL206	Analog Systems & Design	3	1	-	4	4	20	20	60	-	-	100	3

Engineering Management Law Schools Other Courses
NAGPUR PUNE JALGAON AMRAVATI AHMEDNAGAR CHHINDWARA
RAISONI GROUP OF INSTITUTIONS

BECP206	Analog Systems & Design	-	-	2	2	1	-	-	-	25	25	50	3
BECP208	Modeling & Simulation	-	-	2	2	1	-	-	-	25	-	25	3
BECL202	Power Electronics	3	1	-	4	4	20	20	60	-	-	100	3
BECP202	Power Electronics	-	-	2	2	1	-	-	-	25	-	25	-
BCOL201	Data Structures	3	1	-	4	4	20	20	60	-	-	100	3
BCOP201	Data Structures	-	-	4	4	2	-	-	-	25	25	50	-
MBL102	GENERAL PROFICIENCY:-II :Foreign Language	1	-	2	3	Audit Course	-	-	-	G	-	0	-
	Total	**16**	**5**	**14**	**35**	**26**	**100**	**100**	**300**	**125**	**75**	**700**	**-**

G. H. RAISONI COLLEGE OF ENGINEERING & MANAGEMENT
PUNE

Engineering Management Law Schools Other Courses
NAGPUR PUNE JALGAON AMRAVATI AHMEDNAGAR CHHINDWARA
RAISONI GROUP OF INSTITUTIONS

B.Tech.(Electronics and Telecommunication)
Syllabus of Semester-III

BEML201: ENGINEERING MATHEMATICS – III		
Teaching Scheme:	**Examination Scheme (Theory)**	**Examination Scheme(Laboratory)**
Lectures: 3 Hrs/Week **Tutorials:** 1 Hr/Week **Practical:** Nil	**TAE:** 20 Marks **CAE :** 20 Marks **ESE :** 60 Marks	**Cont. Ass.:** Nil **Practical:** Nil
Credit	**4**	

Prerequisite(If any): Engineering Mathematics-I (BEML101), Engineering Mathematics-II (BEML110)

Course Objectives:

1. To introduce Partial Differential Equations and its applications in the field of Electronics and Telecommunication engineering
2. To develop skills to use Laplace Transform and its applications in the field of Electronics and Telecommunication engineering.
3. To develop skills to use Fourier Transform and its applications in the field of Electronics and Telecommunication engineering.
4. To develop skills to use Z- Transform and its applications in the field of Electronics and Telecommunication engineering
5. To introduce Vector differentiation and integration required in Electro-Magnetics and Wave theory

Course Outcome: student shall be able to

1. Identify the various methods in Partial Differential equations, Vector Calculus and Transforms that applies to the problems in Electronics engineering
2. Interpret the root concepts of mathematics required for the analysis of problems in Electronics engineering field
3. Solve the problems in Electronics engineering field using above concepts .
4. Analyze complex problems in practice, categorize it into parts and infer the relation between them

Course Contents	Hrs
Unit –I: Partial Differential Equation	

Engineering Management Law Schools Other Courses
NAGPUR PUNE JALGAON AMRAVATI AHMEDNAGAR CHHINDWARA
RAISONI GROUP OF INSTITUTIONS

Partial Differential equation of first order first degree i.e. Lagrange's form. Linear non homogeneous Partial Differential equation of nth order with constant coefficient, method of separation of variables. Application to transmission lines.	6
Unit –II : Laplace Transform	
Laplace transform: definition and their properties, transform of derivatives and integrals, evaluation of integrals by L.T. ,inverse L.T. & its properties , convolution theorem, Laplace transforms of periodic function & Unit step function, applications of Laplace transforms to solve ordinary differential equations	8
Unit –III : Fourier Transform (FT)	
Fourier Transform (FT): Complex exponential form of Fourier series, Fourier integral theorem, Fourier Sine &Cosine integrals, Fourier transform, Fourier Sine and Cosine transforms and their inverses.	6
Unit –IV: Z-Transform (ZT)	6
Z-Transform (ZT): Introduction, Definition, Standard properties, Z T of standard sequences and their inverses Solution of difference equations.	
Unit V-:Vector Differentiation	
Physical Interpretation of Vector Differentiation, Vector Differential Operator: Gradient, Divergence& curl, Directional Derivative, Solenoidal, Irrotational and Conservative Fields, Scalar Potential.	6
Unit - VI: Vector Integration	
Line, Surface and Volume integrals, Work-done, Green's Lemma , Gauss's Divergence Theorem, Stokes Theorem, Applications to Problems in Electromagnetic Field.	6
Text Books:	
1. B. S. Grewal, "Higher Engineering Mathematics" Khanna Publication, 43edition.	
Reference Books:	
1. Jain, R.K. and Iyengar, S.R.K, Advanced Engineering Mathematics, Third Edition, New Delhi, Narosa Publishers, 2007	
2. M. D. Greenberg, "Advanced Engineering Mathematics", 2e, Pearson Education	
3. PeterV. O'Neil, "Advanced Engineering Mathematics", 7e, Cengage Learning	
4. Erwin Kreyszig, "Advanced Engineering Mathematics", 9e, Wiley India	

BECL201: ELECTRONIC DEVICES & CIRCUITS

Teaching Scheme:	Examination Scheme (Theory)	Examination Scheme (Laboratory)
Lectures: 3Hrs/Week	**TAE:**20 Marks	**Cont. Ass.:** 25 Marks

Engineering Management Law Schools Other Courses
NAGPUR PUNE JALGAON AMRAVATI AHMEDNAGAR CHHINDWARA
RAISONI GROUP OF INSTITUTIONS

Tutorials: 1Hr/Week **Practical:** 2Hrs/Week	**CAE :**20 Marks **ESE:**60 Marks	**Practical:** 25 Marks
Credit	**4**	**1**

Course-Prerequisite: Engineering Physics (BPHL102), Basic Electronics Engineering (BECL105)

Course- Co requisite: Network Theory (BECL203)

Course Objective:

1. To gain knowledge of electronics devices and semiconductor physics.
2. To study need of electronics devices and its applications.
3. To familiarize the student with the analysis and design of analog circuits.

Course Outcome:

At the end of the course the student shall be able:

1. Understand the operation of solid state devices
2. Apply the knowledge of operation of diodes,transistor in order to design basic circuits
3. Analyze dc circuits and relate ac models of semiconductor devices with their physical operation
4. Analyze the characteristics of different electronic devices such as diode,transistors,JFET,MOSFET etc and simple circuit like rectifiers,amplifiers etc.
5. Create small signal model for single stage amplifier

Course Contents	**Hrs**
Unit I: RECTIFIERS & FILTERS Half and full wave & bridge rectifiers with filters, all circuits with details working, analysis, Problems, designs of those rectifiers.	8
Unit II: BI-POLAR JUNCTION TRANSISTORS Theory of operation, Static Characteristics, Break down voltages, Current voltage, Power Limitations, Ebers-moll Model, Continuity Equation, Biasing BJT, Different Biasing arrangement, Stability factor, thermal runaway, Power Transistors. CE, CB, CC Classification and Characteristics, Small Signal Analysis, Regulators: Design of Shunt & Series regulators, Introduction to SMPS.	8
Unit III: FEEDBACK AMPLIFIERS & OSCILLATORS Feedback Amplifiers, Classification of Oscillators, Stability, Bark Hausen Criteria, Design of RC, LC and Crystal Oscillators.	8
Unit IV: POWER AMPLIFIER	8

Engineering Management Law Schools Other Courses
NAGPUR PUNE JALGAON AMRAVATI AHMEDNAGAR CHHINDWARA
RAISONI GROUP OF INSTITUTIONS

Classification A, B, AB, C, Efficiency, Push Pull Configuration (A, B, AB) Complementary symmetry, Second Harmonic and Cross over Distortion, Design of Power Amplifiers (Class A and Class AB), Design of class A Small signal amplifiers, Emitter follower, Applications.	
Unit V: UNIPOLAR DEVICES	7
Field Effect Transistor, MOSFET, NMOS, PMOS Principles of operation and characteristics, Biasing arrangement, small signal analysis of CG, CB and CD	
Unit VI: CMOS Circuits	7
An introduction to CMOS, Diode and MOSFET , Transistors, MOSFET Switches, Transmission Gate, Inverter - DC, AC Analysis. Advance topics on the subject.	

Text Books:
1. Christos C Halkias, Jacob Millman,Christos C.Halkias, McGraw-Hill Education - Europe; 1St Edition edition
2. Satyabrata, Millman's Electronic Devices and Circuits, 2nd Edition, The McGraw-Hill Company, 2011
3. S Salivahanan, N Suresh Kumar, Electronics Devices and Circuits, 3rd Edition, McGraw Hill, 2008
4. Millman and Halkies, 'Integrated Electronics', 2nd Edition, McGraw-Hill Inc, 2009
Reference Books:
1. Robert L. Boylestad, Louis Nashelsky,
2. Electronics devices and Circuits and Theory, 10th Edition, Pearson India, 2009
3. Nagrath I J, Electronics Devices and Circuits, 3rd Edition, Phi Learning Pvt Ltd, 2009
4. One reference book need to add.
5. Sung MO Kang Leblebici, 4 th Edition
6. CMOS Digital Integrated circuits, McGraw Hill Inc.

PUNE

BECP201: ELECTRONIC DEVICES & CIRCUITS	**Total Hrs: 30**
LIST OF EXPERIMENTS:	
Note: Perform any 10 experiments from the given list.	
1. To calculate ripple factor of full wave rectifier with and without filter.	

Engineering Management Law Schools Other Courses
NAGPUR PUNE JALGAON AMRAVATI AHMEDNAGAR CHHINDWARA
RAISONI GROUP OF INSTITUTIONS

2.	To plot the characteristics of clipper circuit & to perform simulation on Multisim
3.	To plot the characteristics of clamper circuit & to perform simulation on Multisim.
4.	To design Zener Diode as a Voltage Regulator & to perform simulation on Multisim.
5.	To design a transistor shunt voltage regulator on Multisim.
6.	To design emitter follower type of voltage regulator using darlington pair and simulate it on Multisim
7.	To design pushpull class A power amplifier and simulate it on Multisim
8.	To design class AB audio power amplifier and simulate it on Multisim
9.	To design Hartley oscillator and simulate it on Multisim.
10.	To design a Wein Bridge Oscillator and simulate it on Multisim.
11.	To design RC Phase Shift Oscillator and simulate it on Multisim.
12.	To plot the drain & transfer characteristics of FET in CS mode & to perform simulation on Multisim.
13.	To verify frequency response of single stage RC coupled amplifier & to perform simulation on Multisim.
14.	To design a CMOS inverter using microwind.
15.	Open Ended experiments.

Engineering Management Law Schools Other Courses
NAGPUR PUNE JALGAON AMRAVATI AHMEDNAGAR CHHINDWARA
RAISONI GROUP OF INSTITUTIONS

BECL202: POWER ELECTRONICS		
Teaching Scheme:	**Examination Scheme (Theory)**	**Examination Scheme(Laboratory)**
Lectures:3 Hrs/Week **Tutorials:** 1Hr/Week **Practical:** 2Hr/Week	**TAE:**20 Marks **CAE :**20 Marks **ESE:** 60 Marks	**Cont. Ass.:** 25 Marks **Practical:** Nil
Credit	**4**	**1**
Course-Prerequisites: Basic Electrical Engineering (BEEL106), Basic Electronics Engineering (BECL105)		
Course Objectives:		
1. To study characteristics & working of modern power electronic devices.		
2. To study the working & applications of controlled converters &Inverters for different loads.		
3. To study DC motors &its working using controlled converters.		
4. To study cyclo converters.		
Course Outcomes:		
At the end of the course the student shall be able to:		
1. To Understand various Power Electronic devices		
2. To be able to Analyze Power Electronic Converters & Inverters		
3. To design ,build .& troubleshoot various Power Electronic circuits		
4. Applying the knowledge of Power Electronic Circuits for Industrial & Commercial based applications		

Course Contents	**Hrs**
Unit I: Thyristors and Its characteristics	
Construction & steady characteristics of SCR, SCR ratings, Triac its construction & its working, Unijunction Transistors, Triggering circuits for SCR	6
Unit II: Line commutated converters with R and RL load	
Concept of line & forced communication, 1ϕsemi & full converters (R-RL load) in details & effect of Free wheeling diode.	8
Unit III: Line commutated converters with motor load	
Dc Motors construction &its working, 1ϕ semi and full converters for speed control of DC motors. Single phase cyclo converters.	8

Engineering Management Law Schools Other Courses
NAGPUR PUNE JALGAON AMRAVATI AHMEDNAGAR CHHINDWARA
RAISONI GROUP OF INSTITUTIONS

Unit IV: Static controllable switches	8
Characteristic and working of MOSFET, IGBT, over voltage and over current protection, snubber circuit.	
Unit V: D.C. Choppers	6
Step down chopper & step up chopper for R & RL, 2 Quad & 4 Quad Choppers, and Applications of choppers.	
Unit VI: Single phase and three phase inverters	6
Single phase bridge inverters with R & RL Load, Single phase PWM Inverters, Three Phase voltage source Inverters with balanced R Load, Advance topics on the subject	

Text Books:
1. M.H. Rashid, Power Electronics Circuits , Devices and Applications, 4th Edition, Pearson Education Publication, 2013
2. C. W. Lander, Power Electronics, 3rd Edition, Paper Back Publication, 1993
3. Dr. P. S. Bimbhra, Power Electronics, 4th Edition, Khanna Publishers, 2012
4. M.S. Jamil Asghar, ”Power Electronics”, PHI 2004,New Delhi.
Reference Books:
1. P.C.Sen, Power Electronics, 30th reprint, 30th Reprint Tata McGraw Hill, 2001
2. Dr. M. Ramamoorthy, An Introduction to Thyristors and their Applications, 2nd Edition, East-West Press, 1991
3. Ned Mohan,T.Undeland & W. Robbins,”Power Electronic Converters applications & design” 2nd edition, John Wiley &sons,Singapore.

Engineering Management Law Schools Other Courses
NAGPUR PUNE JALGAON AMRAVATI AHMEDNAGAR CHHINDWARA
RAISONI GROUP OF INSTITUTIONS

BECP202 POWER ELECTRONICS	Total Hrs: 30
LIST OF EXPERIMENTS:	
Note: Perform any 8 experiments from the given list.	
1. To study and plot V-I characteristics of SCR	
2. To study and plot V-I characteristics of MOSFET	
3. To study and plot V-I characteristics of IGBT	
4. To study Triggering ckts for SCR.	
5. To study and plot the characteristics of single-phase converter	
6. To study & plot the characteristics of Inverters	
7. To study and plot characteristics of DC chopper	
8. To Plot the characteristics of single phase Semi/Full converter in PSim Software.	
9. To Plot the characteristics of single phase Inverter in PSim Software.	

BCOL201: DATA STRUCTURES

Engineering Management Law Schools Other Courses
NAGPUR PUNE JALGAON AMRAVATI AHMEDNAGAR CHHINDWARA
RAISONI GROUP OF INSTITUTIONS

Teaching Scheme:	Examination Scheme (Theory)	Examination Scheme (Laboratory)
Lectures:3 Hrs/Week **Tutorials:** 1 Hr/Week **Practical:**4Hr/Week	**TAE:**20 Marks **CAE :**20 Marks **ESE:**60 Marks	**Cont. Ass:** 25 Marks **Ext. :** 25 Marks
Credit :	**4**	**2**

Pre-requisite: Programming in C (BITL104)

Course Objective:

1. To gain knowledge about basic concepts of data structures.
2. To learn the representation, implementation and applications of linear data structures
3. To acquire knowledge of stacks and queues with their applications
4. To aware about the concepts of trees with their applications.
5. To learn and design the algorithm for graphs with their applications.
6. To get the knowledge of tables and multi-way trees.

Course Outcome:

Graduates shall be able to:

1. Describe concepts of data structures.
2. Know the concepts of linked list
3. Apply the knowledge to implement the algorithms for stacks and queues..
4. Describe the applications of trees
5. Describe the concepts of graphs and its applications.
6. Apply the knowledge of tables and multi way trees in different applications.

Course Contents	Hrs
Unit I: Review of C	7
Functions: Parameter passing call by value and call by reference, scope rules, functions and pointers, function returning pointer and pointer to function, String manipulations using arrays, pointer to pointer. Structure and Union: Passing and returning structure as parameter for function, structure and pointer, Recursion: Definition, writing recursive functions & how recursion works.	
Unit II: Sorting and searching techniques	7

Engineering Management Law Schools Other Courses
NAGPUR PUNE JALGAON AMRAVATI AHMEDNAGAR CHHINDWARA
RAISONI GROUP OF INSTITUTIONS

Need of sorting and searching, sorting order & stability in sorting. **Sorting Techniques:** Algorithms for Bubble sort, Selection sort, Insertion sort, Shell sort, Radix sort, Quick sort and Merge sort. Analysis of Bubble, Insertion and Quick sorting technique for best, worst and average case, Concept of Internal & External sorting. **Searching Techniques:** Algorithms for Sequential search, Binary search, Fibonacci search & concept of Index Sequential search, analysis of sequential and binary searching technique for best, worst and average case.	
Unit III: Linear Data Structures using Link List Organization	8
Limitations of static memory allocation. Dynamic memory allocation in C. Concept of linked organization, Singly linked list, Doubly linked list, Circular linked list. Operations like insertion, deletion, traversal & other operations on these data structures. **Applications:** Representation & manipulation of polynomials using circular linked lists, Application of doubly linked list in dynamic storage management.	
Unit IV: Stacks and Queue	8
Stacks: Concept of stack as ADT, Representation and implementation of stack using sequential & linked organization. Applications of Stacks:, Arithmetic expression conversion & evaluation, reversing a string, parsing: well- formed parenthesis checking. **Queues:** Concept of queue as ADT, Representation and implementation of linear queue & circular queue using sequential organization. Applications of Queues: Job scheduling, Queue simulation, Categorizing data, **Types of Queue:** Priority Queue, DEQUE.	
Unit V: Trees	9
Basic tree concepts, binary trees and their properties, representation using linked organization, full and complete binary trees, converting tree to a binary tree, binary tree traversals, Binary search trees & operations. BST as an ADT, Threaded binary trees, Insertion and deletion of nodes in in-order threaded binary tree, pre-order, in-order and post order traversals of in-order threaded binary tree, AVL tree, and applications of trees: Gaming and Expression trees.	
Unit VI: Graphs	**7**
Graph as an ADT, operations, graphs storage structures: Adjacency list, Adjacency Matrix,	

Engineering Management Law Schools Other Courses
NAGPUR PUNE JALGAON AMRAVATI AHMEDNAGAR CHHINDWARA
RAISONI GROUP OF INSTITUTIONS

Traversals: DFS, BFS, Minimum spanning trees: Kruskal's and Prim's. Algorithm for shortest path and topological sorting.	

Text Books:
1. Horowitz, Sahani, "Fundamentals of Data Structures in C" second edition, Universities Press.
Reference Books:
1. Thomos H. Corman, Charls E. Leiserson, Ronald E. Rivest, Clifford Stein,"Introduction to Algorithms", Third Edition, Prentice Hall India Learning Pvt. Ltd.
2. Data Structures using c,Aron M. Tanenbaum, Pearson Education, 1 Edition(2003).

BCOP201: DATA STRUCTURES	Total : 20 Hrs
Guidelines for Instructor's Manual	
The instructor's manual is to be developed as a hands-on resource and reference. The instructor's manual need to include prologue (about University/program/ institute/ department/foreword/ preface etc), University syllabus, conduction & Assessment guidelines, topics under consideration-concept, objectives, outcomes.	
Guidelines for Student's Lab Journal	
The laboratory assignments are to be submitted by student in the form of journal. Journal consists of prologue, Certificate, table of contents, and handwritten write-up of each assignment (Title, Objectives, Problem Statement, Outcomes, software & Hardware requirements, Date of Completion, Assessment grade/marks and assessor's sign, Theory- Concept, conclusion/analysis). As a conscious effort and little contribution towards Green IT and environment awareness, attaching printed papers as part of write-ups and program listing to journal may be avoided.	
Guidelines for Lab /TW Assessment	
Continuous assessment of laboratory work is done based on overall performance and lab performance of student. Each lab assignment assessment should assign grade/marks based on parameters with appropriate weightage. Suggested parameters for overall assessment as well as each lab assignment assessment include- timely completion, performance, innovation, efficiency, punctuality and neatness.	
Guidelines for Laboratory Conduction	
The instructor is expected to frame the assignments by understanding the prerequisites, technological aspects, utility and recent trends related to the topic. The assignment framing policy need to address the average students and inclusive of an element to attract and promote the intelligent students. The instructor	

Engineering Management Law Schools Other Courses
NAGPUR PUNE JALGAON AMRAVATI AHMEDNAGAR CHHINDWARA
RAISONI GROUP OF INSTITUTIONS

may set multiple sets of assignments and distribute among batches of students. It is appreciated if the assignments are based on real world problems/applications.
Guidelines for Practical Examination
Both internal and external examiners should jointly set problem statements. During practical assessment, the expert evaluator should give the maximum weightage to the satisfactory implementation of the problem statement. The supplementary and relevant questions may be asked at the time of evaluation to test the student's for advanced learning, understanding of the fundamentals, effective and efficient implementation. So encouraging efforts, transparent evaluation and fair approach of the evaluator will not create any uncertainty or doubt in the minds of the students. So adhering to these principles will consummate our team efforts to the promising start of the student's academics.

LIST OF EXPERIMENTS:
1. Write a program to perform Set operations - Union, Intersection, Difference, and Symmetric Difference.
2. Write a program to perform various string operations such as Copy, Length, Reversing, Palindrome, and Concatenation and to find occurrence substring with and without using library functions.
3. Implement Sorting Methods using functions- Bubble Sort, Selection Sort and Quick Sort.
4. Implement Sorting Methods using Insertion Sort, and Shell Sort, and Merge Sort.
5. Implement Searching Methods-Sequential Search, Binary Search.
6. Write a menu driven program to perform following operations on SLL: Create, Insert – Start, end, between, Search & delete -- Start, end, between, Reverse without creating temporary list, Display.
7. Perform polynomial addition using a CLL.
8. Implement Stack using an array and use this stack to perform conversion of an expression from infix to postfix form.
9. Implement Stack using a linked list. Use this stack to perform evaluation of a postfix expression.
10. Implement binary tree using linked list and perform recursive and non-recursive traversals.
11. Implement in-order threaded binary tree using linked list and perform traversals.
12. Implement graph using adjacency list or matrix and perform DFS and BFS.
13. Implement graph using adjacency matrix and generate minimum spanning tree using Prim's algorithm.
14. Determine single source shortest paths for a graph represented using adjacency matrix.
15. Mini Project - Implement the Mini Project of Student Database using Linked list for following

Engineering Management Law Schools Other Courses
NAGPUR PUNE JALGAON AMRAVATI AHMEDNAGAR CHHINDWARA
RAISONI GROUP OF INSTITUTIONS

requirements: a. Creation of Student Database in memory containing student ID, Name, Name Initials, Address, Contact No and Date of Birth . b. Insertion, Deletion, Modification of student record for a given student ID. c. Sorting on name initials and searching a particular student record on name initials.

BECL203: NETWORK THEORY		
Teaching Scheme:	**Examination Scheme (Theory)**	**Examination Scheme (Laboratory)**
Lectures:3 Hrs/Week **Tutorials:** 1Hr/Week **Practical:** Nil	**TAE:**20 Marks **CAE :**20 Marks **ESE:**60 Marks	**Practical:**Nil
Credit :	**4**	
Course-Prerequisite: Basic Electrical Engineering (BEEL106)		
Course-Co requisite: Electronic Devices & Circuits BECL 201), Engineering Mathematics –III (BEML201)		
Course Objective:		
1. To introduce the concept of circuit elements lumped circuits, circuit laws and reduction.		
2. To study the loop and nodal analysis of networks in ac and dc systems.		
3. To study the transient response of series and parallel A.C. circuits.		
4. To study the concept of coupled circuits and two port networks.		
Course Outcome:		
At the end of the course the student shall be able to:		
1. Understand network theorems to calculate various network parameters.		
2. Analyze the performance of a system in time and frequency domain.		
3. Evaluate a given circuit with and without initial conditions.		
4. Design a network based on driving point functions and transfer functions.		

Course Contents	**Hrs**
Unit I: Nodal & Mesh Analysis	7
Nodal and Mesh analysis basic equilibrium equations, matrix approach for complicated network, containing voltage, current sources, Mutual Inductances, source Transformations, Duality.	
Unit II: Network Theorems	7

Engineering Management Law Schools Other Courses
NAGPUR PUNE JALGAON AMRAVATI AHMEDNAGAR CHHINDWARA
RAISONI GROUP OF INSTITUTIONS

Superposition, Reciprocity, Thevenin's, Norton's, maximum power transfer, compensation, Tellegen's theorem as applied to A.C. circuits.	
Unit III: Fourier Analysis	7
Trigonometric and exponential Fourier series. Discrete spectra and symmetry of waveforms, synthesis, steady state response of a network to non-sinusoidal periodic inputs. Fourier transforms and continuous spectra.	
Unit IV: Laplace Transformation	7
Laplace transformation and its properties, partial fractions, singularity functions, waveform synthesis. Analysis of RC& RL network with and without initial conditions with Laplace transformation, evaluation of initial & final conditions.	
Unit V: Network Function	
Transient behaviors, concept of complex frequency, Driving points and transfer functions, poles, zeros of admittance function, their properties, sinusoidal response from Pole-zero locations, convolution theorem and integral solution.	7
Unit VI: Two Port Network	7
Two port network parameters and inter connections study of series and parallel resonance in A.C. Three phase unbalanced circuits and power calculations. Advance topics on the subject	

Text Books:
1. Van Valkenburg, 'Network Analysis, 3rd Edition, Prentice Hall of India, 2001
2. Kelkar and Pandit, Linear Network Theory, 1st Edition, Pratibha Publication, 1995
Reference Books:
1. Sudhakar and S.P. Shyam Mohan, Circuit and Network, 2nd Edition, Tata McGraw Hill, 2002
1. D. Roy Choudhary, Network and System, 1st Edition, New Age International Publication, 1998
2. G.K. Mittal, Network Analysis, 11th Edition, Khanna Publication, 2003
3. B.R. Gupta, Network Systems & Analysis, 2nd Edition, S. Chand publication, 2005

Engineering Management Law Schools Other Courses
NAGPUR PUNE JALGAON AMRAVATI AHMEDNAGAR CHHINDWARA
RAISONI GROUP OF INSTITUTIONS

BECGP202:GENERAL PROFICIENCY-II: Foreign Language		
Teaching Scheme:	**Examination Scheme (Theory)**	**Examination Scheme (Laboratory)**
Lectures:1Hrs/Week **Tutorials:** Nil **Practical:** 2Hr/Week	**TAE:** Nil **CAE :** Nil **ESE:** Nil	**Cont. Ass.: Grade** **Practical:** Nil
Credit :	**Audit Course**	
Prerequisite (If any): Nil		
Course Objective:		
1. To learn foreign languages to improve inter personal skills.		
2. To enable improving business communications and having access to literature in globally recognized languages.		
3. To help communicate at international forums and explore opportunities for employment.		
Course Outcome:		
Upon successful completion of the course, students will be able to:		
1. Have basic communication and insight into their own language and culture.		
2. To have the knowledge of language script.		
3. Communicate effectively in more than one globally recognized languages like French, Spanish, German, Japanese, etc.		
4. Interact with technical and business communities at international forums.		
5. Act with greater awareness of self, of other cultures, and their own relationship to those cultures.		
6. Gain direct access to additional bodies of knowledge.		

Topic	Learning Goals	Activities
The Alphabets and accents	Pronunciations techniques	Worksheet and charts
Number 1 to 20		
Greetings & Salutations,	Articles , Personal Pronoun Day timing	Daily routines forms of respects , Vocabulary
Family and relations	Shapes and colors , Possessive Pronouns , Gender , Negative Sentence	Relations, Day of week
Weather and Seasons	Climate , Fabrics & Clothes , sizes , interrogatives , Basic verbs	Group Activities , Paragraph writing including , Names of months , Seasons, Sky , Stars

Engineering Management Law Schools Other Courses
NAGPUR PUNE JALGAON AMRAVATI AHMEDNAGAR CHHINDWARA
RAISONI GROUP OF INSTITUTIONS

House & Household things.	Describing neighborhood Present Tense	Furniture , Household articles, Colors
Visit to supermarket	Learning the shopping etiquettes , vocabulary of food items , conversing with shopkeepers etc , Plurals	Project on vocabulary of vegetables and fruits , Bakery products , Group Activity / Role play
Timing , Telephonic Conversions	How to Ask time , converse on telephone	Timing and clock (Hours & Minutes)
Visit to city , Prominent places and park	Nature, Directions, Means of transportations, Tenses contd….	Self introductions , Role-play , preparing charts
In Restaurant/Hotel	Ordering eatables , Table manner .Verbs	Enhancing vocabulary of food Dishes , cutlery
Visit to Doctor.	Health matters, illness. Commonly used verbs contd.	Worksheets , projects
French / German /Spanish culture – monuments , delicacies , wines visa vis Indian culture Diwali festival	Vocabulary of clothes , Accessories , Cuisines , Beverages , Adjectives	Presentations by students , situation based conversations
Receiving Guests/ Entertaining people / Good Bye's	Customs , Traditions , Manners , welcome & Audieu's	Activities , Role play , Assignments

G. H. RAISONI COLLEGE OF ENGINEERING & MANAGEMENT PUNE

Engineering Management Law Schools Other Courses
NAGPUR PUNE JALGAON AMRAVATI AHMEDNAGAR CHHINDWARA
RAISONI GROUP OF INSTITUTIONS

Syllabus of Semester-IV

BECL204: DIGITAL SYSTEM DESIGN

Teaching Scheme:	Examination Scheme (Theory)	Examination Scheme (Laboratory)
Lectures:3 Hrs/Week **Tutorials:** 1Hr/Week **Practical:** 2 Hr/Week	**TAE:**20 Marks **CAE :**20 Marks **ESE:**60 Marks	**Practical:** Nil
Credit	**4**	**1**

Course-Prerequisite: Basic Electronics Engineering (BECL105), Electronic Devices & Circuits (BECL201)

Course-Co requisite: Computer Architecture & Organization (BCOL203)

Course Objective:

1. To impart fundamentals of digital system design
2. To study system modelling using VHDL.
3. To study CPLD and FPGA Architecture.

Course Outcome:

At the end of the course the student shall be able to:

1. Understand the fundamentals of Hardware description Language
2. Model digital systems using VHDL and demonstrate it using a front end tool..
3. Analyze delays introduced in any model to investigate technical issues in digital system
4. Design and Build combinational and sequential digital circuits.

Course Contents	Hrs
Unit I: Introduction Introduction to VHDL, Methodologies, design Units, data objects, VHDL data types, Attributes.	6
Unit II: VHDL Statements and concept of delays Concurrent and sequential statements, inertial and transport delays, delta delay, signal drivers.	6
Unit III: Programming concepts Subprograms – Functions, Procedures, generic, generate, package, IEEE standard logic library, file I/O, test bench, component declaration, instantiation, configuration.	8
Unit IV: Combinational System Design Combinational logic circuit design and VHDL implementation of following circuits – fast adder, Subtractor, decoder, encoder, multiplexer, ALU, barrel shifter, 4X4 keyboard encoder, multiplier, divider, Hamming code encoder and correction circuits.	8
Unit V: sequential System Design	8

Engineering Management Law Schools Other Courses
NAGPUR PUNE JALGAON AMRAVATI AHMEDNAGAR CHHINDWARA
RAISONI GROUP OF INSTITUTIONS

Synchronous sequential circuits design – finite state machines, Mealy and Moore, state assignments, design and VHDL implementation of FSMs, Linear feedback shift register.	
Unit VI: Introduction to PLDS	6
Introduction to place & route process, Introduction to ROM, PLA, PAL, Architecture of FPGA(Xilinx / Altera). Advanced trends in digital system design.	

Text Books:
1. Stephen Brown, Zvonko Vranesic, Fundamentals of Digital Logic with VHDL design, 4th Edition, TMH, 2006
2. S.S. Limaye, 'VHDL A Design Oriented Approach', 4th Edition, The McGraw Hill, 2009
3. Manjita Shrivastava, Digital Design HDL-based approach, 2nd Edition, Cenage Learning, 2011
Reference Books:
1. J Bhasker, VHDL Primer, 3rd Edition, Pearson Education, 2007
2. Douglas Perry, VHDL, 3rd Edition, TMH, 2008
3. Zainalabedin Navabbi, VHDL, 3rd Edition,
4. McGraw-Hill professional, 2007

Engineering Management Law Schools Other Courses
NAGPUR PUNE JALGAON AMRAVATI AHMEDNAGAR CHHINDWARA
RAISONI GROUP OF INSTITUTIONS

BECP204: DIGITAL SYSTEM DESIGN	
LIST OF EXPERIMENTS	**30 Hrs**
Note: Perform any 10 experiments from given list	
1. Write a VHDL code for different logic gates.	
2. Design 4:1 multiplexer and write a VHDL code for same using data flow style of modelling.	
3. Design 4-to-16 decoder by combining two 3-to-decoders and write a VHDL code for same using behavioural style of modelling.	
4. Design BCD to & segment decoder and write a VHDL code for same using behavioural style of modelling.	
5. Design of F/F and write a VHDL code for same using behavioural style of modelling.	
6. Design half adder and full adder and write a VHDL code for same using dataflow style of modelling..	
7. Design a 9-bit Parity generator circuit and write a VHDL code for the same using structural style of modelling.	
8. Design a Decade Counter using J-K flip-flops and write a VHDL code for the same using structural style of modelling.	
9. Design Three –bit up-down counter and write a VHDL code for the same using structural style of modelling.	
10. Design of Finite state machine to detect a sequence “1011” using Mealy model .and write VHDL code for the same.	
11. Implementation & Testing of Counter on Xilinx FPGA	
12. Implementation & Testing of Clock circuits on Xilinx FPGA.	
13. Design a 4 bit comparator	
14. Design 16:1 MUX using 4:1 MUX using structural style of modeling.	
15. Design Arithmetic and Logic Unit.	
16. Open ended experiments.	

Engineering Management Law Schools Other Courses
NAGPUR PUNE JALGAON AMRAVATI AHMEDNAGAR CHHINDWARA
RAISONI GROUP OF INSTITUTIONS

BECL205: FIELD THEORY		
Teaching Scheme:	**Examination Scheme (Theory)**	**Examination Scheme (Laboratory)**
Lectures:3Hrs/Week **Tutorials:** 1 Hrs/Week **Practical:** Nil	**TAE:** 20 Marks **CAE :** 20 Marks **ESE:** 60 Marks	**Cont. Ass.: Nil** **Practical: Nil**
Credit	**4**	

Course-Prerequisite: Engineering Mathematics-I (BEML101) Engineering Mathematics-II (BEML 102), Engineering Mathematics –III (BEML 201)

Course Objective:

1. To study electric and magnetic fields from stationary and dynamic charge and current distributions.
2. To study and understand properties of waves, its propagation and waveguides.
3. To impart knowledge of radiations, dipoles and potentials in electromagnetic fields.
4. To inculcate the fundamentals of antennas and its parameters

Course Outcome:

At the end of the course the student shall be able to:

1. Classify the concepts of Vector calculus for understanding the behaviour of electric and magnetic fields
2. Summarize the concepts of Maxwell's equations for static and time-varying fields
3. Illustrate simplified solutions to electromagnetic wave propagation and wave guide problems
4. Design Fundamental concepts of antenna to solve basic problems of antenna based on radiations

Course Contents

Unit I: ELECTROSTATICS	8
Introduction to Cartesian, cylindrical and spherical coordinate systems, Concept of Gradient Divergence and curl, Electric field intensity, flux density, Gauss's law, divergence, divergence theorem, Electric potential and potential gradient.	
Unit II: MAGNETOSTATICS	6
Current density and continuity equation, B-S law, Ampere's circuital law and applications, Magnetic flux and Flux density, Scalar and Vector magnetic potentials.	
Unit III: MAXWELL'S EQUATIONS AND BOUNDARY CONDITIONS	6
Maxwell's equations for steady fields. Maxwell's equations for time varying fields. Electric and magnetic boundary conditions.	
Unit IV: ELECTROMAGNETIC WAVES	8

Engineering Management Law Schools Other Courses
NAGPUR PUNE JALGAON AMRAVATI AHMEDNAGAR CHHINDWARA
RAISONI GROUP OF INSTITUTIONS

Electromagnetic wave equation, wave propagation in free space, in a perfect dielectric, and perfect conductor, skin effect, Poynting vector and Poynting theorem, reflection and refraction of uniform plane wave at normal incidence plane, reflection at oblique incident angle	
Unit V: WAVEGUIDES	6
Introduction, wave equation in Cartesian coordinates, Rectangular waveguide, TE, TM,TEM waves in rectangular guides, wave impedance, losses in waveguide, introduction to circular waveguide.	
Unit VI: RADIATION	6
Retarded potential, Electric and magnetic fields due to oscillating dipole (alternating current element), power radiated and radiation resistance, application to short monopole and dipole. Antenna Efficiency, Beam width, Radiation Intensity, Directive Gain Power Gain and Front To Back Ratio. Advance topics on the subject	

Text Books:
1. W.H Hayt. and J.A. Buck, Engineering Electromagnetics, 7th Edition, Tata Mc-Graw Hill, 2006
2. A.U.Tinguria, Fundamentals of Electromagnetic Fields, 3rd Edition, Denett& Co., 2010
Reference Books:
1. K. D. Prasad, Antenna & wave propagation, 3rd Edition, PHI Publication, 2009
2. E.C. Jordan and K.C. Balamin, Electromagnetic
3. Waves and Radiating System, 2nd Edition, Prentice Hall of India Private Limited, 1985
4. J.D Krauss, Electromagnetics, 3rd Edition, Mc-Graw Hill, 1984
5. Rao, Elements of Engineering Electromagnetics, 6th Edition, Pearson education, 2006

Assignment:

Students have to submit 5 assignments out of 7 assignments.(Assignment questions given during semester)

Engineering Management Law Schools Other Courses
NAGPUR PUNE JALGAON AMRAVATI AHMEDNAGAR CHHINDWARA
RAISONI GROUP OF INSTITUTIONS

BECL206: ANALOG SYSTEMS AND DESIGN		
Teaching Scheme:	**Examination Scheme (Theory)**	**Examination Scheme(Laboratory)**
Lectures:3 Hrs/Week **Tutorials:** 1Hr/Week **Practical:** 2Hr/Week	**TAE:**20 Marks **CAE :**20 Marks **ESE:**60 Marks	**Cont. Ass.: 25 Marks** **Practical: 25 Marks**
Credit	**4**	**1**

Course-Prerequisite: Basic Electronics Engineering (BECL105)

Course-Co requisite: Digital System Design (BECL204)

Course Objective:

1. To understand analog circuits and systems.
2. To know linear and nonlinear applications of operational amplifier ICs.
3. To study frequency response of different circuits based on operational amplifier applications.
4. To study and use different ICs such as timers for applications.

Course Outcome:

At the end of the course the student shall be able to:

1. Identify the scope of analog opamp circuits/devices in industrial engineering practices
2. Summarize performance of PLL and its applications
3. Apply knowledge of multivibrator using IC555 to design complex hardware
4. Classify linear and non-linear applications of op-amp and IC555

Course Contents	**Hrs**
Unit I: OPERATIONAL AMPLIFIER FUNDAMENTALS Operational Amplifier, Basic Op-Amp Configuration, an Op-Amp with Negative Feedback, Voltage Series and Voltage Shunt Configurations, Difference amplifiers, Instrumentation Amplifier, Specification of an Op-Amp, Offset Voltages and Currents, CMRR, Slew Rate	8
Unit II: GENERAL LINEAR APPLICATIONS Constant Current Source and Voltage Source, Summing, Scaling and Averaging Amplifiers, Voltage To Current Converter with Floating And Grounded Load, Current To Voltage Converter, Integrator and Differentiator	**7**
Unit III: STRUCTURE OF OP-AMP Differential Amplifier, Cascaded Differential Amplifier Stages and Level Translator, AC and DC Analysis of Cascade Amplifier, Design of two stage direct-coupled amplifier.	**7**
Unit IV: ACTIVE FILTERS AND OSCILLATORS	8

Engineering Management Law Schools Other Courses
NAGPUR PUNE JALGAON AMRAVATI AHMEDNAGAR CHHINDWARA
RAISONI GROUP OF INSTITUTIONS

Classification of Filters , Active Filters, First to Sixth – Order Butterworth filter , Multiple–Feedback Filters (Band Pass And Band Reject Filters) IGMF configuration, All Pass Filter, Cascade Design Of Filters, Classification of Oscillators, Design of Op-amp based Phase Shift And Wein Bridge Oscillators, Square, Triangular And Saw Tooth Wave Generators	
Unit V: NON-LINEAR CIRCUITS	6
Schmitt Trigger, Voltage Comparator, Voltage Limiters And Window Detector, Clippers And Clampers, Peak Detector, Precision Rectifiers, Analog Switches	
Unit VI: SPECIAL ICs APPLICATIONS	6
The 555 Timer, Phase Locked Loops IC565, ICL8038 & XR2206 Function Generator, Voltage Controlled Oscillator Basic Operation, IC based Voltage Regulator Circuits, Dual Track Voltage Regulator, Three - Terminal Regulator(Fixed Regulator) Voltage Adjustment AndCurrent Boosting of Fixed Regulator, Merits and Drawbacks of Linear Regulators, Advance topics on the subject	

Text Books:
1. RamakantGayawad., Op-Amps And Linear Integrated Circuits, 3rd Edition, PHI, 1993
2. K.R.Botkar, Integrated Electronics, Khanna Publishers,1996
Reference Books:
1. Franco, ‘Design With Operational Amplifiers And Analog Integrated Circuits’, 2nd Edition, McGraw-Hill., 1992
2. Coughlin and Driscol, Op-Amps And Linear Integrated Circuits’, 5th Edition, PHI,1998
3. Sedra and Smith, ‘Microelectronic Circuits’, 4th Edition, Oxford University Press, 1996

Engineering Management Law Schools Other Courses
NAGPUR PUNE JALGAON AMRAVATI AHMEDNAGAR CHHINDWARA
RAISONI GROUP OF INSTITUTIONS

BECP206: ANALOG SYSTEMS AND DESIGN	
LIST OF EXPERIMENTS	**30 Hrs**
1. Design and verify gain and frequency response of Inverting and Non-inverting amplifier using IC 741. Show its simulation results on multisim.	
2. Design and verify gain and frequency response of Integrator and Differentiator ckt. Using IC 741. Show its simulation results on multisim.	
3. Verify Op-amp parameters (a) CMRR (b) Slew Rate.	
4. Design and verify Multi vibrator circuits using IC	
5. To design 2nd order Low Pass Filter.	
6. To study the frequency Vs gain characteristic of Low Pass Filter using multisim.	
7. Design of Low Voltage Regulator using IC 723. Simulate and observe the regulated waveform on multisim.	
8. To design RC-phase shift oscillator and simulate using multisim.	
9. Design ,built and test square wave generator	
10. Design, built and test Schmitt trigger.	
11. Design built, test half, full, bridge precision rectifier.	
12. Design & simulate zener shunt regulator using multisim.	
13. Design any IC regulator application using multisim.	
14. Open ended experiment.	
15. Open ended experiments.	

Engineering Management Law Schools Other Courses
NAGPUR PUNE JALGAON AMRAVATI AHMEDNAGAR CHHINDWARA
RAISONI GROUP OF INSTITUTIONS

BECL207:COMMUNICATION ELECTRONICS		
Teaching Scheme:	**Examination Scheme(Theory)**	**Examination Scheme (Laboratory)**
Lectures: 3Hrs/Week **Tutorials:** 1 Hr/Week **Practical:** 2Hr/Week	**TAE:**20 Marks **CAE :**20 Marks **ESE:**60 Marks	**Cont. Ass.:** 25 Marks **Practical:** Nil
Credit	**4**	**1**

Course-Prerequisite: Basic Electronics Engineering (BECL105), Engineering Mathematics – III (BEML201), Electronic Devices & Circuits (BECL201)

Course Co-requisites: Field Theory (BECL205)

Course Objective:

1. To understand the basic concept of communication and different modulation systems
2. To understand the concept of multiplexing.
3. To understand theory of digital modulation.
4. To understand working of radio receivers.

Course Outcome:

At the end of the course the student shall be able to:

1. Understand the fundamentals of communication systems.
2. Compare different analog modulation systems.
3. Design analog modulation based systems.
4. Analyse various modulation techniques and demonstrate it with hardware and software

Course Contents	**Hrs**
Unit I: INTRODUCTION TO COMMUNICATION, RADIATION AND PROPAGATION	
Block Schematic of Communication System, Base Band Signals and their bandwidth requirements, RF Bands, Carrier signals, Concept of Radiation and Electromagnetic waves, Mechanism of Propagations: Ground Wave, Sky Wave, Space Wave, Concept of Fading and diversity reception.	6
Unit II: AMPLITUDE MODULATION AND DETECTION	
Generation of AM (DSBFC) and its spectrum ,AM Modulators (DSBFC & DSBSC) & power calculations , modulation index, SSB modulation , SSB-SC modulation, AM demodulators, Block Diagram of AM Receiver, AM Detection methods.	8
Unit III: FREQUENCY MODULATION AND RADIO RECEIVERS	8

Engineering Management Law Schools Other Courses
NAGPUR PUNE JALGAON AMRAVATI AHMEDNAGAR CHHINDWARA
RAISONI GROUP OF INSTITUTIONS

Angle modulation, Narrow band & wide band FM, Modulation index, Bandwidth frequency modulation spectrum, Bessel's Function and its mathematical analysis, Phase Modulation, Generation of FM (Direct & Indirect Method),FM transmitters, FM detection using Phase lock loop(PLL) ,Slope detector, Balanced Slope detector etc.	
Unit IV: PULSE MODULATION TECHNIQUES	**6**
Introduction to Sampling, Sampling theorem, Nyquist criteria, sampling Techniques, Types of sampling- ideal, natural, flat top, Aliasing & Aperture effect. PAM, PWM & PPM.	
Unit V: DIGITAL MULTIPLEXERS	
Frequency Division multiplexing, Time Division Multiplexing. Introduction to Digital multiplexers and their classification, Introduction to PCM, Delta modulation, ADPCM	**6**
Unit VI: DIGITAL MODULATION TECHNIQUES	
PSK, FSK, QPSK, MSK, and DPSK. Advance topics on the subject	

G. H. RAISONI COLLEGE OF ENGINEERING & MANAGEMENT PUNE

Engineering Management Law Schools Other Courses
NAGPUR PUNE JALGAON AMRAVATI AHMEDNAGAR CHHINDWARA
RAISONI GROUP OF INSTITUTIONS

BECP207: COMMUNICATION ELECTRONICS	
LIST OF EXPERIMENTS:	**30Hrs**
Note: Transmitter and Receiver experiments are mandatory and to be carried out at radio Frequency (preferably above 500 KHz).	
Perform any 10 experiments from the given list	
1. AM Generation (DSB-FC): Calculation of modulation index by graphical method.	
2. Envelop Detector-Practical diode detector, Observe effect of change in RC time constant.	
3. Generation of DSB-SC with the help of balanced Modulator IC1496 &1596 & its detection.	
4. SSB modulator using Filter method / phase shift method & its detection.	
5. AM transmitter: Measure total power of transmitter with the help of Spectrum Analyzer or Wattmeter, Observe variation in total power by varying modulating signal level	
6. Frequency modulator using varactor diode and NE 566 VCO, calculation of modulation index	
7. FM demodulator using such as IC565 (PLL based)	
8. Measurement of performance characteristics of Receiver: Sensitivity, selectivity, Fidelity.	
9. Generation of PWM/PPM signal using IC on breadboard.	
10. Experimental study of Generation & detection of PSK/FSK/QPSK signals.	
11. Mini Project: Build & test AM/FM transmitter (Mandatory)	
Following assignments may be performed using suitable software(Any two)	
12. Generate AM waveform for given modulation index, signal frequency and carrier frequency.	
13. Generate FM waveform for given signal amplitude, signal frequency and carrier frequency.	
14. Prove sampling Theorem. Reconstruct the analog signal from its samples. Observe aliasing effect by varying sampling frequency.	

Text Books:
1. Kennedy, Davis, Electronics Communication System, 4th Edition, TMH, 2010
2. Roddy & Coolen, Communication Electronics, 4th Edition, PHI, 2010
3. Frenzel, Communication Electronics Principles and Applications, 3rd Ed, TATA McGraw-Hill, 2011
4. U.A.Bakshi, A.P.Godse, Communication Engineering, 3rd Edition, Technical Publications, 2009
Reference Books:
1. B.P.Lathi, Modern Digital & Systems, 3rd Edition, Oxford Press Publication, 1998
2. Simon Haykin, Digital Communication, 3rd Edition, Wiley and sons, 2003
3. John G.Prokis, Digital Communication, 3rd Edition, TMG, 2002
4. Shanmugham, Digital Communication, 4th Edition, Wiley student, 2009

BCOL203: COMPUTER ARCHITECTURE & ORGANIZATION

Engineering Management Law Schools Other Courses
NAGPUR PUNE JALGAON AMRAVATI AHMEDNAGAR CHHINDWARA
RAISONI GROUP OF INSTITUTIONS

Teaching Scheme:	Examination Scheme (Theory)	Examination Scheme (Laboratory)
Lectures:3Hrs/Week **Tutorials:** Nil **Practical:** Nil	**TAE:**20 Marks **CAE :**20 Marks **ESE:**60 Marks	**Practical:** Nil
Credit :	**3**	

Course-Prerequisite: Basic Electronics Engineering (BECL105)

Course Objective:

1. To introduce basic fundamental units of a computer system.
2. To perform arithmetic operations using various algorithms.
3. To develop skills to understand control unit design.
4. To build concepts of memory system.
5. To study communication of I/O devices.
6. To enhance knowledge of parallel system.

Course Outcome:

Upon successful completion of the course, students will be able to

1. Describe fundamental units of computer system.
2. Apply concept of fixed and floating point arithmetic.
3. Identify different types of control unit.
4. Analyze organization and design of memory system.
5. Identify different ways of communicating with I/O devices and interfaces.
6. Describe working of parallel systems.

Course Contents	Hrs
Unit I: Basic Structure of Computers	
The Evolution of Computers, Functional Units, Basic operational concepts , Bus Structure, Performance Measures , System Architecture, VLSI Era, Von Neumann Architecture. Addressing modes, Execution of a Complete Instruction.	7
UNIT II: DATA PATH UNIT	
Data Representation, Fixed and Floating point numbers, Signed numbers,Fixed-Point Arithmetic, Booths Algorithm, Division: Restoring and Non Restoring algorithms, Arithmetic Logic unit, Floating point representations, IEEE standards, Floating point arithmetic.	8
UNIT III: PROCESSING UNIT	
Basic Concept, Hardwired control, Micro programmed Control, Coprocessor, Pipeline Control, Pipeline Performance.	6

Engineering Management Law Schools Other Courses
NAGPUR PUNE JALGAON AMRAVATI AHMEDNAGAR CHHINDWARA
RAISONI GROUP OF INSTITUTIONS

UNIT IV: MEMORY ORGANIZATION	
Characteristics of memory, Internal and External Memory, Types of memory: RAM: SRAM, DRAM, SDRAM,RDRAM ROM: PROM, EPROM, EEPROM, Cache Memory, Virtual Memory, Associative Memory, Secondary Memory, Performance	8
UNIT V: INPUT /OUTPUT ORGANIZATION	
I/O mapped I/O and memory mapped I/O, interrupts and interrupts Handling Mechanisms,Direct Access Memory, Buses: synchronous vs. asynchronous, Interface Circuits, Standard I/O Interface: PCI,SCSI,USB. Computer Peripheral: I/O devices such as magnetic disk, magnetic tape, CDROM, USB systems.	7
UNIT VI: PARALLEL ORGANIZATIONS	
Superscalar Processors, Multiple Processor Organizations, Symmetric Multiprocessors, Clusters, Non -uniform Memory Access, Vector Computations, Bus allocation Schemes. RISC: Instruction execution characteristics, use of large register file, compiler based register optimization, RISC architecture and pipelining. RISC Vs CISC.	7
Text Books:	
1. John Hayes, ‘Computer Architecture and Organization”, McGraw Hill, 3rd Edition.	
2. V.C.Hamacher, Z.G. Vranesic and S.G.Zaky, ‘Computer Organization’, McGraw Hill, 5th edition, 2002.	
Reference Books:	
1. S. Tanenbaum, “Structured Computer Organization” 4th Edition, Pearson Education.	
2. M. Mano, “Computer System and Architecture”, Pearson Education.	
3. W. Stallings, “Computer Organization & Architecture”, Pearson Education.	

BECP208: MODELING&SIMULATION		
Teaching Scheme:	**Examination Scheme (Theory)**	**Examination Scheme(Laboratory)**
Lectures: Nil **Tutorials:** Nil **Practical:** 2 Hrs/Week	**TAE:** Nil **CAE :** Nil **ESE :** Nil	**Cont. Ass.:** 25 **Practical:** Nil
Credit	**0**	**1**
Prerequisites: Basic Electronics Engineering (BECL105), Electronics Devices & Circuits(BECL201] **Course-co requisite :** Analog Systems Design (BECL206)		

Engineering Management Law Schools Other Courses
NAGPUR PUNE JALGAON AMRAVATI AHMEDNAGAR CHHINDWARA
RAISONI GROUP OF INSTITUTIONS

Course Objectives:
1. To select and apply appropriate simulation tools and techniques.
2. To study the modeling of systems using various tools.
3. To obtain and study the results of models designed on advanced simulation tools
Course Outcome: student shall be able to
1. Identify scope of Op-amp circuits .
2. Summarize performance of Op-amp parameters using Op-amp circuit
3. Determine and demonstrate performance of Waveform generator circuit
4. Evaluate performance of Integrator and Differentiator Circuit
5. Design, Simulate and Build Timer, ADC application using Op-amp

List of Experiments [Any 10 Experiments]	
1. Introduction of T Spice & Tanner/Mentor Graphics.	
2. Design current mirror using tanner/Mentor Graphics.	
3. Design sample and hold circuit using tanner/Mentor Graphics.	
4. Design cascade current mirror using tanner/Mentor Graphics.	
5. Design Differential amplifier using tanner/Mentor Graphics.	
6. Design Three MOSFET voltage divider using tanner/Mentor Graphics	
7. Design common source amplifier using tanner/Mentor Graphics.	
8. Design Feedback amplifiers using Tanner/Mentor Graphics.	
9. Design a Pulse Code Modulation System usingsimulink	
10. Design of Signal processing blocksetusing MATLAB	
11. Design of multi-order system using MATLAB	
12. Open Ended modeling experiments	

Text Books:
1. Allen Holberg, "Analog CMOS Design", Oxford University Press
Reference Books:
1. Rudra Pratap, "MATLAB7", Oxford University Press, 2006.
2. Modelling and Simulation using MATLAB-Simulink by Dr. Shailendra Jain, Wiley Publication January 2015.

Engineering Management Law Schools Other Courses
NAGPUR PUNE JALGAON AMRAVATI AHMEDNAGAR CHHINDWARA
RAISONI GROUP OF INSTITUTIONS

	BECGP203: GENERAL PROFICIENCY-III: Hobby Classes		
	Teaching Scheme:	**Examination Scheme (Theory)**	**Examination Scheme (Laboratory)**
	Lectures:1Hrs/Week **Tutorials:** Nil **Practical:** 2Hrs/Week	**TAE:** Nil **CAE :** Nil **ESE:** Nil	**Cont. Ass.: Grade**
	Credit	**Audit Course**	
	Prerequisite: Nil		
	Course Objective:		
	1. To enhance the inherent qualities of oneself and provide a platform to show hidden talents.		
	2. To nurture one's special capability and interest in activities like sports, drama, singing etc.		
	3. To help express oneself and be more compatible with outer world in the hobby domain.		
	4. To enhance creativity & imagination to flow freely.		
	Course Outcome: Upon successful completion of the course students will be able to:		
	1. To explore and demonstrate the inherent talents within		
	2. To fruitfully engage themselves in creative activities during spare time.		
	3. To create balance between academic & work life.		
	4. Acts as a stress buster in the stressed life.		
	5. Students are guided to develop self-expression and communication skills.		
	6. To help one learn a new skill and increase self-confidence and boosts self esteem.		

Topics	Activities
Stress management sessions	Yoga, pranayam, meditation, relaxation techniques
Outdoor activities	Nature walks, treks, cycling, horse riding
Painting	Canvas, fabric , Sketching, knife, glass
Music (vocals and instrument)	Singing, Guitar, Synthesizer, Harmonium, Piano, Flute
Dance	Bharatnatyam, Kathak
Indoor sports	Chess, carom, table tennis
Movie club	Motivational movies and documentaries to be shown
Other creative skills	Embroidery , knitting, use of making things from waste materials, photography, puzzle solving

Savitribai Phule University of Pune, Pune

Third Year E&TC Engineering (2015 Course)

(With effect from Academic Year 2017-18)

Semester I

Course Code	Course	Teaching Scheme Hours / Week			Semester Examination Scheme of Marks						Credits	
		Theory	Tutorials	Practicals	In-Sem	End-Sem	TW	PR	OR	Total	Th+Tut	PR/OR/TW
304181	Digital Communication	3	--	--	30	70	--	--	--	100	3	--
304182	Digital Signal Processing	3	--	--	30	70	--	--	--	100	3	--
304183	Electromagnetics	3	1	--	30	70	--	--	--	100	4	--
304184	Microcontrollers	3	--	--	30	70	--	--	--	100	3	--
304185	Mechatronics	3	--	--	30	70	--	--	--	100	3	--
304191	Signal Processing and Communications Lab (DC/DSP)	--	--	4	--	--	50	50		100	--	2
304192	Microcontrollers and Mechatronics Lab	--	--	4	--	--	50	50		100	-	2
304193	Electronics System Design	2	--	2	--	--	-	--	50	50	2	1
	Audit Course 3	--	--	--	--	--	--	--	--	--	----	
	Total	17	01	10	150	350	100	100	50	750	18	5
										Total Credits	**23**	

Third Year E&TC Engineering (2015 Course)

(With effect from Academic Year 2017-18)

Semester II

Course Code	Course	Teaching Scheme Hours / Week			Semester Examination Scheme of Marks						Credit	
		Theory	Tutorials	Practicals	In-Sem	End-Sem	TW	PR	OR	Total	Th+Tut	PR/OR/TW
304186	Power Electronics	3	--	--	30	70	--	--	--	100	3	--
304187	Information Theory, Coding and Communication Networks	4	--	--	30	70	--	--	--	100	4	--
304188	Business Management	3	--	--	30	70	--	--	--	100	3	--
306189	Advanced Processors	3	--	--	30	70	--	--	--	100	3	--
304190	System Programming and Operating Systems	3	--	--	30	70		--	--	100	3	--
304194	Power and ITCT Lab	--	--	4	--	--	50	50	--	100	--	2
304195	Advanced Processors and System Programming Lab	--	--	4	--	--	50	50	--	100	--	2
304196	Employability Skills and Mini Project	2	--	2	--	--	--	--	50	50	2	1
	Audit Course 4	--	--	--	--	--	--	--	--	--		
	Total	18	---	10	150	350	100	100	50	750	18	5
										Total Credits	23	

304185 Mechatronics

Credits: TH-03

Teaching Scheme: **Examination Scheme:**

Lecture : 03 hr/week **In-Sem : 30 Marks**

End-Sem : 70 Marks

Course Objectives:

- To understand the concept and key elements of Mechatronics system, representation into block diagram
- To understand principles of sensors their characteristics
- To Understand of various data presentation and data logging systems
- To Understand concept of actuator
- To Understand various case studies of Mechatronics systems

Course Outcomes:

On completion of the course, student will be able to

1 Identification of key elements of mechatronics system and its representation in terms of block diagram

2 Understanding basic principal of Sensors and Transducer.

3. Able to prepare case study of the system given.

Course Contents

Unit I :Introduction to Mechatronics (6 Hrs)

Basics of Mechatronics Systems : Definition of Mechatronics, Key elements of Mechatronics Systems, Levels of mechatronics systems,Measurement Characteristics,Examples of Mechatronics systems in daily life as ,WashingMachines, Digital Cameras,CD Players, camcorders, Mechatronics design process,phases of mechatronics design process, integrated design approach. **Mechanical Components and Servo mechanism :**Mechanical System and Motion, Mass Inertia and Dashpot, Gears, types of Gears, Servomechanism(Concepts and Theory, Problems).Case study Mechatronics Design of Coin Counter/Coin Separator

Unit II :Overview of Sensors, Transducers and their Characteristics Specifications (8Hrs)

Specifications related to selection criterion for force, pressure, temperature and motion (Rotary and

Linear).

Classification and selection of transducers:

Force: Load Cell, Cantilever Beam (Design aspect example)

Pressure: Strain Gauge, Piezoelectric

Motion: Rotary and Linear motions, Proximity sensors Inductive, Capacitive and Magnetic, sources detectors in optical proximity sensors.Comparison of Various proximity sensors

Temperature: Optical Fibre and its use in temperature measurement**,** Fibre Optic Temperature sensors,Ultrasonic Transducersfor applications as position, level, flow measurement.

Gas sensors, Wind sensors:Gyroscope, Accelerometer, Magnetometer (As used in smart phones)

Smart Sensors: Concept, Radiation Sensors - Smart Sensors - Film sensor, IR- temperature sensors

Introduction to MEMS& Nano Sensors . Rotary Optical Encoder

Unit III : Hydraulic Systems (6 Hrs)

Introduction to Hydraulic Actuators

Fluid Power systems:Concept of Actuators, Classification of Actuators: Pneumatic, Hydraulic and Electrical Actuators, Fluid Power systems

Hydraulic Systems: Physical Components of a Hydraulic systems, Hydraulic Pumps (e.g. Gear Pumps, Vane Pumps, Piston Pumps and Axial Piston Pumps) , Filters and Pressure Regulation, Relief Valve, Accumulator.

Unit IV : Pneumatic Systems (6 hrs)

Introduction to Pneumatic a Actuators

Physical Components of a Pneumatic Systems, Pneumatic Cylinders, Pneumatic Actuators (e.g. Spring Actuator and Spring Actuator with positioner), Air compressor ,Air Receiver, Air Dryer

Air Service Treatment: Air Filter, air regulator and Gauge, Air Lubricator and Pressure regulation Intake and Air Filter.Case study of Robotic Pick and Place robot

Unit V : Electrical Actuators, Electron-Mechanical Actuators (6 Hrs)

Electrical-Actuation system: Selection criteria and specifications of stepper motors, solenoid valves,relays (Solid State relays and Electromechanical relays).

Selection Criterionofcontrol valve, Single acting and Double acting Cylinders.

Electro-Pneumatic: Pneumatic Motors, Valves: Electro Hydraulic: 3/2 Valves, 4/2 Valves, 5/3 Valves

Cables: Power cable and Signal cables

Unit VI :Mechatronics Systems in Automobile (6Hrs)

(Treatment with Block Diagram Approach)

Boat Autopilot,High Speed tilting trains, Automatic car parking systems, Engine Management systems, Antilock Brake systems (ABS) ,CNC Machines(Only Black Diagram and explaination)

Text Books:

1) W. Boltan "Mechatronics: Electronic Control Systems in Mechanical and Electrical Engineering" 6th Edition, Pearson Education, 2016

2)David Alciatore and MaichaelB Histand, "Introduction to Mechatronics and Measurement Systems",4th Edition, Tata McGraw Hill 2013.

3) K.P.Ramachandran, G.K.Vijayaraghavan and M.S. Balasundaram, "Mechatronics-Integrated Mechanical Electronic Systems", Willey Publication 2008

Reference Books:

1) Nitaigour P. Mahalik ," Mechatronics-Principles, Concepts and Applications", Tata McGraw Hill, Eleventh reprint 2011.

2) DevdasShetty and Richard A.Kolk, "Mechatronics System Design", Thomson India Edition 2007.

3) HMT Limited, " Mechatronics", Tata McGraw-Hill Publishing Hous

Savitribai Phule Pune University, Pune

BE(Electronics & Telecommunication)

(2012 course revised syllabus)

(w.e.f. June 2015)

BE (E & TC) Structure
2012 Course w.e.f. June 2015
Semester-I

Subject Code	Subject	Teaching Scheme			Examination Scheme					Marks
		LECT	TUT	PR	In Semester Assessment Phase I	PR	OR	TW	End Semester Examination Phase II	Total
404181	VLSI Design & Technology	3			30				70	100
404182	Computer Networks	3			30				70	100
404183	Microwave Engineering	4			30				70	100
404184	Elective I	3			30				70	100
404185	Elective II	3			30				70	100
404186	Lab Practice I (CN & MWE)			4			50	50		100
404187	Lab Practice II (VLSI &Elective I)			4		50		50		100
404188	Project Phase I		2				50			50
	Total	**16**	2	8	150	50	100	100	350	750

Elective I

1. Digital Image Processing
2. Embedded Systems & RTOS
3. Software Defined Radio
4. Industrial Drives and Control

Elective II

1. Multi rate & Adaptive Signal Processing
2. Electronic Product Design
3. PLCs and Automation
4. Artificial Intelligence

Semester-II

Subject Code	Subject	Teaching Scheme			Examination Scheme					Marks
		LECT	TUT	PR	In Semester Assessment Phase I	PR	OR	TW	End Semester Examination Phase II	Total
404189	Mobile Communication	4			30				70	100
404190	Broadband Communication Systems	4			30				70	100
404191	Elective III	3			30				70	100
404192	Elective IV	3			30				70	100
404193	Lab Practice III(MC & BCS)			4			50	50		100
404194	Lab Practice IV(Elective III)			2		50		50		100
404195	Project Phase II		6			50		100		150
	Total	**14**	**6**	**6**	**120**	**100**	**50**	**200**	**280**	**750**

Elective III
1. Speech & Audio Signal Processing
2. RF Circuit Design
3. Audio Video Engineering
4. Soft Computing

Elective IV
1. Biomedical Signal Processing
2. Nano Electronics & MEMS
3. Detection & Estimation Theory
4. Wireless Networks
5. Open Elective*

***Any one subject from the list of Elective IV of computer/IT/Electrical/Instrumentation or Institute can offer elective IV based on any industry need with prior approval from BoS(Electronics). Repetition of subjects or topics is to be avoided.**

Dr. D. S. Bormane
Chairman, BOS(Electronics)

VLSI Design & Technology(404181)

Teaching Scheme: Lectures: 3 Hrs/ Week		**Examination Scheme:** In Semester Assessment: Phase I : 30 End Semester Examination: Phase II: 70

Course Objectives:

- To study HDL based design approach.
- To learn digital CMOS logic design.
- To nurture students with CMOS analog circuit designs.
- To realize importance of testability in logic circuit design.
- To overview SoC issues and understand PLD architectures with advanced features.

Course Outcomes:

Aftersuccessfully completing the course, students will be able to

- Model digital circuit with HDL, simulate, synthesis and prototype in PLDs.
- Understand chip level issues and need of testability.
- Design analog & digital CMOS circuits for specified applications.

Unit I: VHDL Modeling 7L

Data objects, Data types, Entity, Architecture & types of modeling, Sequential statements, Concurrent statements, Packages, Sub programs, Attributes, VHDL Test bench, Test benches using text files. VHDL modeling of Combinational, Sequential logics & FSM, Meta-stability.

Unit II: PLD Architectures 7L

PROM, PLA, PAL: Architectures and applications. Software Design Flow. CPLD Architecture, Features, Specifications, Applications. FPGA Architecture, Features, Specifications, Applications.

Unit III: SoC& Interconnect 6L

Clock skew, Clock distribution techniques, clock jitter. Supply and ground bounce, power distribution techniques. Power optimization. Interconnect routing techniques; wire parasitic, Signal integrity issues. I/O architecture, pad design. Architectures for low power.

Unit IV: Digital CMOS Circuits 7L

MOS Capacitor, MOS Transistor theory, C-V characteristics, Non ideal I-V effects, Technology

Scaling. CMOS inverters, DC transfer characteristics, Power components, Power delay product. Transmission gate. CMOS combo logic design. Delays: RC delay model, Effective resistance, Gate and diffusion capacitance, Equivalent RC circuits; Linear delay model, Logical effort, Parasitic delay, Delay in a logic gate, Path logical efforts.

Unit V: Analog CMOS Design 7L

Current sink and source, Current mirror. Active load, Current source and Push-pull inverters. Common source, Common drain, Common gate amplifiers. Cascode amplifier, Differential amplifier, Operational amplifier.

Unit VI: Testability6L

Types of fault, Need of Design for Testability (DFT), Testability, Fault models, Path sensitizing, Sequential circuit test, BIST, Test pattern generation, JTAG & Boundary scan, TAP Controller.

Text Books

1. Charles H. Roth, "Digital systems design using VHDL", PWS.
2. Wyane Wolf, "Modern VLSI Design (System on Chip)", PHI Publication.

Reference Books

1. Allen Holberg, "Analog CMOS Design", Oxford University Press.
2. Neil H. E. Weste, David Money Harris, "CMOS VLSI Design: A Circuit & System Perspective", Pearson Publication

Computer Networks(404182)

Teaching Scheme: Lectures:3 Hrs/ Week		**Examination Scheme:** In Semester Assessment: Phase I : 30 End Semester Examination: Phase II: 70

Course Objectives:

- Understand state-of-the-art in network protocols, architectures, and applications
- To provide students with a theoretical and practical base in computer networks issues
- Define the basic terminology of computer networks
- Recognize the individual components of the big picture of computer networks
- Outline the basic network configurations
- List the layers of the TCP/IP and OSI model and describe the duties of each layer
- Understand the transmission methods underlying LAN and WAN technologies.

Course Outcomes:

After successfully completing the course students will be able to

- Understand fundamental underlying principles of computer networking
- Describe and analyze the hardware, software, components of a network and the interrelations.
- Analyze the requirements for a given organizational structure and select the most appropriate networking architecture and technologies;
- Have a basic knowledge of the use of cryptography and network security;
- Have a basic knowledge of installing and configuring networking applications.
- Specify and identify deficiencies in existing protocols, and then go onto select new and better protocols.

Unit I: Physical Layer 6L

Data Communications, Networks, Network types, Protocol layering, OSI model, Layers in OSI model, TCP / IP protocol suite, Addressing, Guided and Unguided Transmission media. Switching: Circuit switched networks, Packet Switching, Structure of a switch.

Unit II: Data Link Layer 6L

Introduction to Data link Layer, DLC Services, DLL protocols, HDLC, PPP, Media Access Control: Random Access, Controlled Access, Channelization. Wired LAN:Ethernet Protocol, Standard Ethernet, Fast Ethernet, Giagabit Ethernet, 10 Gigabit Ethernet.

Unit III:Wireless LANS & Virtual Circuit Networks 6L

Introduction, Wireless LANS: IEEE 802.11 project, Bluetooth, Zigbee, Connecting devices and Virtual LANS: Connecting devices, Virtual LANS.

Unit IV:Network Layer6L

Network Layer Services, Packet Switching, Network layer performance, IPv4, addresses, Forwarding of IP packets, Network layer protocols: IP, ICMPv4, Mobile IP, Unicast Routing: Introduction, Routing Algorithms, Unicast Routing protocols, Multicast Routing Introduction, Next Generation IP:IPv6 Addressing, The IPv6 protocol, ICMPv6, Transition from IPv4 to IPv6.

Unit V:Transport Layer 6L

Introduction, Transport layer protocols and services, Port numbers User Datagram Protocol (UDP), Transmission Control protocol (TCP), SCTP, Quality of services: Dataflow characteristics, Flow Control.

Unit VI:Application Layer 6L

Introduction, World Wide Web and HTTP, FTP, Electronic mail, Telnet, Name System (DNS), Cryptography and Network Security: Introduction, Symmetric key ciphers and Asymmetric key Ciphers**,** Introduction to network security.

Text Books

1. Behrouz A. Foruzan, “Data communication and Networking”, Tata McGraw-Hill,5th Edition
2. James F. Kurouse& W. Rouse, “Computer Networking: A Top down Approach”, 6th Edition, Pearson Education.

Reference Books

1. Andrew S. Tannenbaum, “Computer Networks”, Pearson Education, Fourth Edition,2003
2. Wayne Tomasi, “Introduction to Data Communication and Networking”, 1/e, Pearson Education
3. Greg Tomsho, Ed Tittel, David Johnson. “Guide to Networking Essentials”, fifth edition, Thomson India Learning, 2007.

Microwave Engineering(404183)

Teaching Scheme: Lectures: 4 Hrs/ Week		**Examination Scheme:** In Semester Assessment: Phase I : 30 End Semester Examination: Phase II: 70

Course Objectives:

- To lay the foundation for microwave engineering
- To understand the applications of microwave engineering
- Carryout the microwave network analysis.

Course Outcomes:

Aftersuccessfully completing the course students will be able to

- Formulate the wave equation in wave guide for analysis.
- Identify the use of microwave components and devices in microwave applications.
- Understand the working principles of all the microwave tubes
- Understand the working principles of all the solid state devices
- Choose a suitable microwave tube and solid state device for a particular application
- Carry out the microwave network analysis
- Choose a suitable microwave measurement instruments and carry out the required measurements.

Unit I : Transmission Lines and Waveguides 8L

Introduction to Microwaves engineering: History of Microwaves, Microwave Frequency bands. Applications of Microwave.

General solution for TEM, TE and TM waves,Parallel plate waveguide, and rectangular waveguide. Wave guide parameters. Introduction tocoaxial line, Rectangular waveguide cavity resonators, Circular waveguide cavity resonators

Unit II : Microwave Components 8L

Multi port junctions: Construction and operation of E-plane, H-plane, Magic Tee and Directional couplers.

Ferrites components: - Ferrite Composition and characteristics, Faraday rotation, Construction and operation of Gyrator, Isolator and Circulator.

Striplines: Structural details and applications of Striplines, Microstrip line, Parallel Strip line, Coplanar Strip line, Shielded Strip Line.

Unit III : Microwave Network Analysis 6L
Introduction and applications of Impedance and Equivalent voltages and currents, Impedance and Admittance matrices, The Transmission (ABCD) matrix **Scattering Matrix**:-Significance, formulation and properties. S-Matrix calculations for-2 port network junction, E plane, H-plane and E-H (Magic Tee) Tees, Directional coupler, Isolator and Circulator. Related problems.
Unit IV : Microwave Tubes 8L
Limitations of conventional tubes, O and M type classification of microwave tubes, reentrant cavity, velocity modulation. **O type tubes** **Two cavity Klystron**: Construction and principle of operation, velocity modulation and bunching process Applegate diagram. **Reflex Klystron**: Construction and principle of operation, velocity modulation and bunching process, Applegate diagram, Oscillating modes, o/p characteristics, efficiency, electronic & mechanical tuning. **M-type tubes** **Magnetron**: Construction and Principle of operation of 8 cavity cylindrical travelling wave magnetron, hull cutoff condition, modes of resonance, PI mode operation, o/p characteristics, Applications. **Slow wave devices** Advantages of slow wave devices, **Helix TWT**: Construction and principle of operation, Applications.
Unit V :Microwave Solid State Devices8L
Microwave bipolar transistor, FET, MESFET, Varactor Diode, PIN Diode, Shottky Barrier Diode, Tunnel Diode, TEDs, Gunn Diodes, IMPATT diode and TRAPATT diode. Structural details, Principle of operation, various modes, specifications, and applications of all these devices.
Unit VI : Microwave Measurements 6L
Measurement devices: Slotted line, Tunable detector, VSWR meter, Power Meter, S-parameter measurement, frequency measurements, Power measurement, Attenuation measurement, Phase shift measurement, VSWR measurement, Impedance measurement, Q of cavity resonator measurement

Text Books

1. Samuel Y. Liao, “Microwave Devices and Circuits”, 3rd edition, Pearson
2. David M. Pozar, “Microwave Engineering", Fourth edition, Wiley.

Reference Books

1. M. Kulkarni, “Microwave and Radar engineering”, 3rd edition, Umesh Publications
2. ML Sisodia& GS Raghuvamshi, “Microwave Circuits and Passive Devices”Wiley, 1987
3. M L Sisodia& G S Raghuvanshi, “Basic Microwave Techniques and Laboratory Manual”, New Age International (P) Limited, Publishers.

Digital Image Processing(404184)

Teaching Scheme:		Examination Scheme:
Lectures:3 Hrs/ Week		In Semester Assessment: Phase I : 30 End Semester Examination: Phase II: 70

Course Objectives:

- To learn the fundamental concepts of Digital Image Processing.
- To study basic image processing operations.
- To understand image analysis algorithms.
- To expose students to current applications in the field of digital image processing.

Course Outcomes:

After successfully completing the course students will be able to

- Develop and implement algorithms for digital image processing.
- Apply image processing algorithms for practical object recognition applications.

Unit I : Fundamentals of Image Processing 6L

Steps in image processing, Human visual system, Sampling & quantization, Representing digital images, Spatial & gray-level resolution, Image file formats, Basic relationships between pixels, Distance Measures. Basic operations on images-image addition, subtraction, logical operations, scaling, translation, rotation. Image Histogram. Color fundamentals & models – RGB, HSI YIQ.

Unit II: Image Enhancement and Restoration 6L

Spatial domain enhancement: Point operations-Log transformation, Power-law transformation, Piecewise linear transformations, Histogram equalization. Filtering operations- Image smoothing, Image sharpening.

Frequency domain enhancement: 2D DFT, Smoothing and Sharpening in frequency domain.Homomorphic filtering.

Restoration: Noise models, Restoration using Inverse filtering and Wiener filtering

Unit III: Image Compression 6L

Types of redundancy, Fidelity criteria, Lossless compression – Runlength coding, Huffman coding, Bit-plane coding, Arithmetic coding. Introduction to DCT, Wavelet transform. Lossy compression – DCT based compression, Wavelet based compression. Image and Video Compression Standards – JPEG, MPEG.

Unit IV: Image Segmentation and Morphological Operations 6L

Image Segmentation: Point Detections, Line detection, Edge Detection-First order derivative – Prewitt and Sobel. Second order derivative – LoG, DoG, Canny. Edge linking, Hough Transform, Thresholding – Global, Adaptive. Otsu’s Method. Region Growing, Region Splitting and Merging. Morphological Operations: Dilation, Erosion, Opening, Closing, Hit-or-Miss transform, Boundary Detection, Thinning, Thickening, Skeleton.

Unit V: Representation and Description 6L

Representation – Chain codes, Polygonal approximation, Signatures. Boundary Descriptors – Shape numbers, Fourier Descriptors, Statistical moments. Regional Descriptors – Topological, Texture. Principal Components for Description.

Unit VI: Object Recognition and Applications 6L

Feature extraction, Patterns and Pattern Classes, Representation of Pattern classes, Types of classification algorithms, Minimum distance classifier, Correlation based classifier, Bayes classifier. Applications: Biometric Authentication, Character Recognition, Content based Image Retrieval, Remote Sensing, Medical application of Image processing

Text Books

1. Rafael C. Gonzalez and Richard E. Woods, “Digital Image Processing”, Third Edition, - Pearson Education
2. S Sridhar, “Digital Image Processing”, Oxford University Press.

Reference Books

1. Rafael C. Gonzalez, Richard E. Woods, and Steven L. Eddins, “Digital Image Processing Using MATLAB”, Second Edition, - Tata McGraw Hill Publication
2. S Jayaraman, S Esakkirajan, T Veerakumar, “Digital Image Processing”, Tata McGraw Hill Publication

List of Experiments:

Note: Experiments are to be performed using software preferably open source.

1. To perform basic operations on images.
2. To perform conversion between color spaces.
3. To perform histogram equalization.
4. To perform image filtering in spatial domain.
5. To perform image filtering in frequency domain.
6. To perform image restoration.
7. To perform image compression using DCT / Wavelet transform.
8. To perform edge detection using various masks.
9. To perform global and adaptive thresholding.
10. To apply morphological operators on an image.
11. To obtain boundary / regional descriptors of an image.
12. To perform image classification / recognition

Embedded Systems & RTOS(404184)

Teaching Scheme:		Examination Scheme:
Lectures: 3 Hrs/ Week		In Semester Assessment: Phase I : 30 End Semester Examination: Phase II: 70

Course Objectives:

- To understand the Embedded system design issues.
- To learn real time operating system concepts.
- To understand the Embedded Linux environment
- To learn Embedded software development and testing process.

Course Outcomes:

Aftersuccessfully completing the course students will be able to

- Get insight of design metrics of Embedded systems to design real time applications to match recent trends in technology.
- Understand Real time systems concepts.
- Understand Linux operating system and device drivers.
- Get to know the hardware – software co design issues and testing methodology for Embedded system.

Unit I:Introduction to Embedded Systems 6L

Introduction to Embedded Systems, Architecture, Classification and Characteristics of Embedded System, Design Process, Design Metrics and optimization of various parameters of embedded system. Embedded processor technology, IC technology, Design technology. Software development life cycle. Various models like waterfall, spiral, V , Rapid Prototyping models and Comparison

Unit II: Real Time Systems Concepts 6L

Foreground/ Background systems, Critical section of code, Resource, Shared resource, multitasking, Task, Context switch, Kernel, Scheduler, Non-Preemptive Kernel , Preemptive Kernel, Reentrancy, Round robin scheduling, Task Priorities, Static & Dynamic Priority, Priority Inversion, Assigning task priorities, Mutual Exclusion, Deadlock, Clock Tick, Memory requirements, Advantages & disadvantages of real time kernels.

Unit III: µCOS II 6L

Features of µCOS II. Kernel structure. µCOS II RTOS services:Task management, Time management, Intertask Communication and Synchronization.

Unit IV: Embedded Linux Development Environment 6L

Need of Linux, Embedded Linux Today, Open Source and the GPL, BIOS Versus Boot loader, Anatomy of an Embedded System, Storage Considerations, Embedded Linux Distributions. Embedded Development Environment, Cross-Development Environment, Host System Requirements, Hosting Target Boards. Development Tools, GNU Debugger, Tracing and Profiling Tools, Binary Utilities.

Unit V: Linux Kernel Construction 6L

Linux Kernel Background, Linux Kernel Construction, Kernel Build System, Kernel Configuration. Role of a Bootloader, Bootloader Challenges. A Universal Bootloader: Das U-Boot. Porting U-Boot. Device Driver Concepts, Module Utilities, Driver Methods. Linux File System & Concepts

Unit VI : Embedded Software Development, Testing Process and Tools 6L

Embedded Software development process and tools, Host and Target Machines, linking and Locating Software, Getting Embedded Software into the Target System, Issues in Harware-Software Design and Co-design. Testing on Host Machine, Simulators, Laboratory Tools. Case study of Embedded system like Automatic Chocolate Vending Machine, Mobile Phone.

Text Books

1. Jean J.Labrosse, "MicroC OS II, The Real-Time Kernel", 2nd edition, CMP Books.
2. Christopher Hallinan, "Embedded Linux Primer -A Practical, Real-World Approach "2nd edition, Prentice Hall.

Reference Books

1. Raj Kamal, "Embedded Systems – Architecture, Programming and Design" 2nd edition, McGraw Hill.
2. Frank Vahid and Tony Givargis, " Embedded System Design – A Unified hardware/ Software introduction " 3rd edition, Wiley.

List of Experiments:

Group A: ARM7/ ARM Cortex- M3&µCOS - II Based Experiments (any four)

1. Multitasking in µCOS II RTOS using minimum 3 tasks on ARM7/ ARM Cortex- M3.

2. Semaphore as signaling & Synchronizing on ARM7/ ARM Cortex- M3.
3. Mailbox implementation for message passing on ARM7/ ARM Cortex- M3.
4. Queue implementation for message passing on ARM7/ ARM Cortex- M3.
5 Implementation of MUTEXusing minimum 3 tasks on ARM7/ ARM Cortex- M3.

Group B: ARM9 & LINUX Based Experiments (any four)

6. Download pre-configured Kernel Image, File System, bootloader to target device- ARM9.
7. Writing simple application using embedded Linux on ARM9.
8. Writing “Hello World” device Driver. Loading into & removing from Kernel on ARM9 board.
9. Write a program for I2C based RTC using embedded Linux on ARM9.
10. Using Device driver for GPIO, write a program to blink LED onARM9.
11. Write a program for External InterruptonARM9.

Software Defined Radio(404184)

Teaching Scheme:		**Examination Scheme:**
Lectures: 3 Hrs/ Week		In Semester Assessment: Phase I : 30 End Semester Examination: Phase II: 70

Course Objectives:

- To understand "Modern Radio Communication System " that can be reconfigured
- To understand GNU Radio
- To understand how SDR platform provides easy access to wireless network system
- To understand how unlike simulation in Communication Projects, SDR allows easy access to both PHY and MAC layer
- To understand the concept of Cognitive Radio and Spectrum sharing

Course Outcomes:

Aftersuccessfully completing the course students will be able to

- Compare SDR with traditional Hardware Radio HDR
- Implement modern wireless system based on OFDM, MIMO & Smart Antenna
- Build experiment with real wireless waveform and applications, accessing both PHY and MAC, Compare SDR versus MATLAB and Hardware Radio
- Work on open projects and explore their capability to build their own communication system.

Unit I : Software Defined Radio fundamentals 6L

Introduction to SDR, Need of SDR, Principles of SDR , Basic Principle and difference in Analog radio and SDR , SDR characteristics, required hardware specifications, Software/Hardware platform, GNU radio -What is GNU radio, GNU Radio Architecture, Hardware Block of GNU, GNU software , MATLAB in SDR , Radio Frequency Implementation issues, Purpose of RF front End, Dynamic Range ,RF receiver Front End topologies, Flexibility of RF chain with software radio, Duplexer ,Diplexer ,RF filter ,LNA ,Image reject filters , IF filters , RF Mixers Local Oscillator , AGC, Transmitter Architecture and their issues,Sampling theorem in ADC, Noise and distortion in RF chain, Pre-distortion

Case study : AM/FM/BPSK/QPSK/OFDM Simulation in Matlab

Unit II : SDR Architecture 6L

Architecture of SDR-Open Architecture, Software Communication Architecture, Transmitter

Receiver Homodyne/heterodyne architecture, RF front End, ADC, DAC, DAC/ADC Noise Budget, ADC and DAC Distortion, Role of FPGA/CPU/GPU in SDR, Applications of FPGA in SDR, Design Principles using FPGA, Trade –offs in using DSP, FPGA and ASIC, Power Management Issues in DSP,ASIC,FPGA
Case Study : JTRS –Goals of SCA ,Architectural details ,SDR forum Architecture

Unit III : Multi Rate Signal Processing 6L

Sample timing algorithms, Frequency offset estimation and correction, Channel Estimation, Basics of Multi Rate, Multi Rate DSP, Multi Rate Algorithm, DSP techniques in SDR, OFDM in SDR

Unit IV : Smart/MIMO Antennas using Software Radio 6L

Smart Antenna Architecture, Vector Channel Modeling , Benefits of Smart Antenna Phased Antenna Array Theory, Adaptive Arrays, DOA Arrays, Applying Software Radio Principles to Antenna Systems, Beam forming for systems-Multiple Fixed Beam Antenna Array, Fully Adaptive Array , Relative Benefits and Trade-offs OF Switched Beam and Adaptive Array, Smart Antenna Algorithms , Hardware Implementation of Smart Antennas, MIMO -frequency, time, sample Synchronization, Space time block coding-Space Time Filtering, Space Time Trellis Coding .
Case Study : Principles of MIMO-OFDM

Unit V : Cognitive Radio 6L

Cognitive Radio Architecture, Dynamic Access Spectrum, Spectrum Efficiency, Spectrum Efficiency gain in SDR and CR ,Spectrum Usage, SDR as a platform for CR, OFDM as PHY layer ,OFDM Modulator, OFDM Demodulator, OFDM Bandwidth, Benefits of OFDM in CR, Spectrum Sensing in CR, CR Network

Unit VI : Applications of SDR 6L

Application of SDR in Advance Communication System-Case Study, Challenges and Issues, Implementation, Parameter Estimation –Environment, Location, other factors, Vertical Handoff, Network Interoperability.
Case Study : 1)CR for Public Safety –PSCR , Modes of PSCR, Architecture of PSCR
2)Beagle board based SDR 3)Embedded PCSR using GNU radio

Text Books:

1. Jeffrey.H.Reed ,Software Radio : A Modern Approach to Radio Engineering , Pearson , LPE

Reference Books:

1. Markus Dillinger , KambizMadani ,Nancy Alonistioti, Software Defined Radio : Architectures , Systems and Functions ,Wiley
2. Tony .J. Rouphael , RF and DSP for SDR, Elsevier Newness Press ,2008
3. Dr.TajStruman ,Evaluation of SDR –Main Document
4. SDR –Handbook , 8^{th} Edition , PENTEK
5. Bruce a. Fette , Cognitive Radio Technology, Newness, Elsevier

List of the Experiments(Minimum 8 experiments are to be performed):

1. Introduction to GNU Radio
2. Introduction to Software Defined Radio Systems
3. Implementation of AM using SDR
4. Implementation of FM using SDR with application such as transfer of files
5. Implementation of M-PSK transmitter using SDR
6. Implementation of M-PSK receiver using SDR
7. Implementation of M-QAM transmitter using SDR
8. Implementation of M-QAM receiver using SDR
9. Implementation of Transmission of files on Wireless media using SDR
10. Implementation of OFDM using SDR
11. Implementation of Cognitive radio using SDR

Industrial Drives and Control(404184)

Teaching Scheme:		**Examination Scheme:**
Lectures: 3 Hrs/ Week Practical: 2 Hrs/ Week		In Semester Assessment: Phase I : 30 End Semester Examination: Phase II: 70

Course Objectives:

- Describe the structure of Electric Drive systems and their role in various applications such as flexible production systems, energy conservation, renewable energy, transportation etc., making Electric Drives an enabling technology.
- Study and understand the operation of electric motor drives controlled from a power electronic converter and to introduce the design concepts of controllers for closed loop operation
- Study DC, AC, special machines like stepper motor, servo motor and brushless motor and their control.

Course Outcomes:

- Understand the basic principles of power electronics in drives and its control, types of drives and basic requirements placed by mechanical systems on electric drives.
- Understand the operation of 1ϕ & 3ϕ converter drives for separately excited & series DC motors, dual converter drives, 2 quadrant and 4 quadrant DC chopper drives, Open-loop & closed-loop control of DC drives with transfer function, Dynamic and regenerative braking. Protection circuits for DC drives.
- Learn speed control of induction motor drives in an energy efficient manner using power electronics. To study and understand the operation of both classical and modern induction motor drives.
- Learn and understand working of cylindrical-rotor motor, salient-pole motor, reluctance motor, and permanent-magnet motors.
- Learn closed loop V/f control and load-commutated inverter (LCI) control. Variable reluctance & permanent magnet stepper motors & drives, switched reluctance motors & drives, brushless DC and AC motors & drives.

Unit I: DC Drives 6L

Basic characteristics of DC motors, Operating modes, Motor performance parameters, 1ϕ & 3ϕ converter drives for separately excited & series DC motors for continuous & discontinuous operations. Chopper fed DC drives, Comparison of converter fed drive & chopper fed drive. Open loop & closed loop control of dc drives with transfer function

PLL control, Microprocessor based control of dc drives, Dynamic and regenerative braking of DC motors

Unit II: Induction Motor Drives & Control 6L

Induction motor characteristics, Control strategies like stator voltage control, v/f control, rotor resistance control, Variable frequency Square wave VSI Drives, Variable frequency PWM VSI Drives, Variable frequency CSI Drives, Closed loop control of Induction motors, v/f control of three phase IM using PWM inverter, Vector Control (Field oriented Control): Basic principle of vector control, Direct vector control & indirect vector control, DQ Transformation, Braking of induction motor, soft acceleration and deceleration, various protections.

Unit III: Special Motor Drives I 6L

Cylindrical rotor motor Drive, Salient pole motor Drive, Switched reluctance motor (SRM) drive, Synchronous Reluctance motor drive, self-controlled synchronous motor drives

Unit IV: Special Motor Drives II 6L

Permanent magnet Brushless DC motor drive, Permanent magnet AC synchronous motor drive, Variable reluctance & permanent magnet stepper motor, Stepper motor drives, Servo motor Drives.

Unit V: Drive Applications in Renewable Energy 6L

Power Electronics for wind power systems

Wind power system: System component, Turbine rating, Electrical load matching, fixed speed and variable speed operation, System design features, Maximum power operations and System control requirement

WECS: Principle of WECS, role of power electronics in WECS, Drive selection criteria for fixed speed and variable speed WECS, Stand-alone PV systems, Grid connected PV systems.

Power Electronics for Photovoltaic Power Systems

Basics of Photovoltaic: The PV cell, Module and array, I-V and P-V curves, PV system component, Stand-alone PV systems, Grid connected PV systems.

Unit VI: Applications of Artificial neural network and fuzzy logic in Drives 6L

Fuzzy logic Principle and applications: Introduction, Fuzzy sets, Fuzzy system, Fuzzy control, Fuzzy logic based induction motor speed control.

Neural network principle and applications: Introduction, Neural network in identification and control, AI Applications in electrical machines and drives, Neural network based PWM controller

Text Books

1. Fundamental of Electrical Drives, Gopal K. Dubey, Narosa Publishing House
2. Modern Power Electronics and AC Drives, Bimal K. Bose, Pearson

Reference Books
1. Wind & Solar Power system, Mukund Patel , CRC Press 2. Thyristor DC drives, P. C Sen, John Wiley. 3. Power Electronics, Converters, Applications and Design, N. Mohan, T. M. Undeland& W. P. Robbins, John Wiley and Sons, 3rd Edition
List of Experiments (Minimum 8 experiments are to be performed): 1. DC motor control using semi/full 1-Φ /3-Φ converter. (Open loop and closed loop) 2. 4-Quadrant chopper fed reversible DC drive 3. Dual converter fed DC Drive (Single phase/ Three phase) 4. V/f controlled AC induction motor drive 5. Speed Control of Universal Motor. 6. Stepper motor drive. 7. BLDC Motor drive. 8. Three phase brushless generator for wind energy applications. 9. Simulation of closed loop controlled DC drive using PSIM/Matlab/MathCad 10. Simulation of Closed loop controlled AC motor drive using PSIM / Matlab/MathCad/ open source software .

Multi-rate and Adaptive Signal Processing(404185)

Teaching Scheme:		**Examination Scheme:**
Lectures: 3Hrs/ Week		In Semester Assessment: Phase I : 30 End Semester Examination: Phase II: 70

Course Objectives:

1. To extend students understanding of DSP concepts for designing filters and filter-banks
2. To understand various Multirate DSP applications
3. To extend MultirateconceptsintoMultiresolution analysis.
4. To make student learn the need of adaptive-ness in digital filters

Course Outcomes:

1. The student will use theory of multirate processing for design of basic systems.
2. The student will be able to performmultiresolutionanalysis using Haar wavelet.
3. The student will show skills for design of adaptive filter for Wiener filter.

Unit I: Basics Signal Processing 6L

Review of Fourier Transform ,Time and frequency averages, Time Bandwidth product, Stationary and Non-stationary signals. Limitations of Fourier Transform.

Review of Correlation: Auto and Cross, Covariance: Auto and Cross, Energy and Power signals, Spectral Density: Energy and Power, Parsevals Theorem. Concept of Function Space. Definition of Harr scaling and wavelet function. Difference between Fourier basis and Harr basis functions. Finding orthogonal projections of energy signals with finite support using Harr scaling and wavelet function.

Unit II: Multi-rate DSP6L

Need for Multi-rate DSP, Decimation by factor D , Interpolation by factor I, Sampling rate conversion by rational factor I/D, Design of practical sampling rate converters, software implementation of sampling rate converters (Decimators and Interpolators), sample rate conversion using poly-phase filter structures

Unit III: Time Frequency Representation of signals 6L

Time Frequency description of signals, Concept of Instantaneous frequency and Complex signal, Uncertainty principle, need for joint time frequency representation ,tiling diagrams. Short

Time Fourier Transform, Wigner Ville distribution, Continuous Wavelet Transform, Discretization of STFT & CWT, Spectrograms and Scalograms

Unit IV:Time-Frequency (Wavelet) Analysis of signals 6L

Discrete Wavelet Transform and its relation to multi-rate filter banks. Decomposition of signals using Harr two band filter bank structure. Perfect reconstruction conditions.Axiomatic definition of Multi Resolution Analysis (MRA).Wavelet Packet Analysis versus Wavelet analysis.Problems on Wavelet analysis and Wavelet packet analysis.

Unit V: Adaptive Filters 6L

Need of adaptive filters, adaptive filters as noise cancellation, configuration of adaptive filters, main components of adaptive filters, Basic Wiener filter theory-Wiener-Hopf Equation, Adaptive Algorithms: LMS basic adaptive algorithm, Implementation of basic LMS algorithm. Recursive least square algorithms (RLS).

Unit VI:Applications of Multi- rate and adaptive signal processing techniques 6L

Efficient D/A conversion in Hi-fi systems. Subband coding of speech signals. Adaptive telephone echo cancellation. Application of wavelets in compression and de-noising. Advantages of Harr Lifting scheme in signal filtering. Problems on Harr Lifting scheme and de-noising.

Text Books:

1. John G. Proakis, Manolakis, "Digital Signal Processing, Principles, Algorithms and Applications", Pearson education, Fourth Edition, 2007.
2. E. C. Ifeachor and B. W. Jervis, "Digital Signal Processing- A Practical Approach", 2^{nd} Edition, Pearson education. 2007.
3. Leon Cohen, "Time-Frequency Analysis", Prentice Hall,1995.

Reference Books:

1. S. D. Apte, "Advanced Digital Signal Processing," Wiley Publications, 2014.
2. K.P Soman, K.I Ramchandran, N.G.Reshmi , "Insight into Wavelets- from theory to Practice," PHI Learning Private Limited, Third Edition, 2010.

Electronic Product Design(404185)

Teaching Scheme: Lectures: 3 Hrs./ Week		**Examination Scheme:** In Semester Assessment: Phase I : 30 End Semester Examination: Phase II: 70

Course Objectives:

- To understand the stages of product (hardware/ software) design and development.
- To learn the different considerations of analog, digital and mixed circuit design.
- To be acquainted with methods of PCB design and different tools used for PCB Design.
- To understand the importance of testing in product design cycle. `
- To understand the processes and importance of documentation.

Course Outcomes:

Aftersuccessfully completing the course students will be able to

- Understand various stages of hardware, software and PCB design.
- Importance of product test & test specifications.
- Special design considerations and importance of documentation.

Unit I: Introduction to Electronic Product Design 6L

Man machine dialog and Industrial design, user-centered design, five element of successful design, cognition, ergonomics. Packaging and factors, design for manufacture, assembly and disassembly, wiring, temperature, vibration and shock. Safety, noise, energy coupling, grounding, filtering and shielding.

Unit II: Hardware Design & testing methods 6L

Design process. Identifying the requirements, formulating specifications, design specifications, Specifications verses requirements, System partitioning, Functional design, architectural design, Functional model verses architectural model. Prototyping. Performance and Efficiency measures. Formulating a test plan, writing specifications, Test procedure and test cases, Egoless design, design reviews. Module debug and test: black box test, white box test, grey box test.

Unit III:Software Design and Testing methods 6L

Types of Software. Waterfall model of software development. Models, metrics and software limitations. Risk abatement and failure preventions. Software bugs and testing. Good programming practice. User interface .Embedded, Real time software.

Unit IV: PCB design 6L

Fundamental Definitions, Standards. Routing Topology Configurations, Layer Stack up assignment, Grounding Methodologies, Aspect Ratio, Image Planes, Functional Partitioning, Critical frequencies, Bypassing and decoupling. Design techniques for ESD Protection, Guard Band implementation.

Unit V: Product Debugging and testing 6L

Steps of Debugging, Techniques for troubleshooting, characterization, Electromechanical components, passive components, active components, active devices, operational amplifier, Analog-Digital Conversion, Digital Components, Inspection and test of components, Simulation, Prototyping and testing, Integration, validation and verification. EMI & EMC issues.

Unit VI : Documentation6L

Definition, need, and types of documentation. Records, Accountability, and Liability. Audience. Preparation, Presentation, and Preservation of documents. Methods of documentation, Visual techniques, Layout of documentation, Bill of material.

Text Books

1. Kim Fowler," Electronic Instrument Design" Oxford university press.
2. Robert J. Herrick, "Printed Circuit board design Techniques for EMC Compliance", Second edition, IEEE press.

Reference Books

1. James K. Peckol, "Embedded Systems – A Contemporary Design Tool", Wiley publication
2. J C Whitakar," The Electronics Handbook", CRC press.

PLC&Automation(404185)		
Teaching Scheme: Lectures: 3 Hrs/ Week		**Examination Scheme:** In Semester Assessment: Phase I : 30 End Semester Examination: Phase II: 70

Course Objectives:

- Ability to recognize industrial control problems suitable for PLC control
- An over view of technology of advanced topics such as SCADA, DCS Systems, Digital Controller, CNC Machines.
- The ability to select the essential elements and practices needed to develop and implement the Engineering Automation using PLC approach.

Course Outcomes:

Aftersuccessfully completing the course students will be able to

- Understand PLC architecture, PLC addressing concepts.
- Develop PLC ladder programs for simple industrial applications.
- Design Automation systems for industrial applications.

Unit I: Process Control & Automation 6L

Process control principles, Servomechanisms, Control System Evaluation, Analog control, Digital control, Types of Automation; Architecture of Industrial Automation Systems,Advantages and limitations of Automation, Effects of modern developments in automation on global competitiveness.

Unit II: Transmitters and Signal Conditioning 6L

Need of transmitters, Standardization of signals, Current, Voltage and Pneumatic signal standards, 2-Wire & 3-Wire transmitters, Analog and Digital signal conditioning for RTD, Thermocouple, DPT etc , Smart and Intelligent transmitters

Unit III: Controllers and Actuators 6L

PID Controller, Cascade PID control, Microprocessor Based control, PAC (Programmable automation controller), Mechanical switches, Solid state switches,Electrical actuators: Solenoids, Relays and Contactors, AC Motor, VFD, energy conservation schemes through VFD, DC Motor, BLDC Motor, Stepper Motor, Servo Motor, Pneumatic and hydraulic actuators.

Unit IV: PLC and Human Machine Interface (HMI) 6L

Functions of PLC, Advantages, Architecture, working of PLC, Selection of PLC, Networking of PLCs, Ladder Programming, Interfacing Input and Output devices with PLC, PLC based automated systems. High frequency inputs. PLC programming standard IEC61131, Soft PLC techniques. **IT Interfaces required:** for ERP, MIS, MES. **Supporting Applications interfaces**: RFID, Barcode, Vision Systems**. HMI:** Block Diagram, Types, Advantages, Applications.

Unit V: SCADA & Distributed control system 6L

Elements of SCADA, Features of SCADA, MTU- functions of MTU, RTU- Functions of RTU, Applications of SCADA, Communications in SCADA- types & methods used, Mediums used for communication, Introduction to DCS, Architecture of DCS, Input and output modules, communication module, Specifications of DCS.

Unit VI: Automation and CNC (Computer Numeric Control) Machines 6L

Introduction of CNC Machines: Basics and need of CNC machines, NC, CNC and DNC (Direct NC) systems, Structure of NC systems, Applications of CNC machines in manufacturing, Advantages of CNC machines.

Industrial Communication:Devicenet, Interbus , Device network: Foundation Fieldbus -H 1, HART, CAN, PROFIBUS-PA, Control network: ControlNet, FF-HSE, PROFIBUS-DP, Ethernet, TCP/IP.Panel Engineering for Automation

Text Books

1. Curtis Johnson, “Process Control Instrumentation Technology”; 8th Edition, Pearson Education
2. MadhuchhandaMitra, SamarjitSen Gupta, “Programmable Logic controllers and Industrial Automation”; Penram International Publishing India Pvt. Ltd
3. Stuart A. Boyer, SCADA supervisory control and data acquisition, ISA Publication

Reference Books

1. John W. Webb, Ronold A Reis, “Programmable Logic Controllers, Principles and Applications”; 5th Edition, Prentice Hall of India Pvt. Ltd
2. Kilian, “Modern control technology: components & systems, Delmar 2nd edition.
3. Bela G Liptak, *Process software and digital networks,* 3rd edition, 2002.
4. Pollack. Herman, W & Robinson., T. “Computer Numerical Control”, Prentice Hall. NJ.
5. Pabla, B.S. &Adithan, M. “CNC Machines”, New Age Publishers, New Delhi

Artificial Intelligence(404185)

Teaching Scheme: Lectures: 3Hrs/ Week		**Examination Scheme:** In Semester Assessment: Phase I : 30 End Semester Examination: Phase II: 70

Course Objectives:

- To learn various types of algorithms useful in Artificial Intelligence (AI).
- To convey the ideas in AI research and programming language related to emerging technology.
- To understand the concepts of machine learning, probabilistic reasoning, robotics, computer vision, and natural language processing.
- To understand the numerous applications and huge possibilities in the field of AI that go beyond the normal human imagination.

Course Outcomes:

After successfully completing the course students will be able to

- Design and implement key components of intelligent agents and expert systems.
- To apply knowledge representation techniques and problem solving strategies to common AI applications.
- Applyand integrate various artificial intelligence techniques in intelligent system development as well as understand the importance of maintaining intelligent systems.
- Build rule-based and other knowledge-intensive problem solvers.

Unit I : Foundation 6L

Intelligent Agents, Agents and environments, Good behavior, The nature of environments, structure of agents, Problem Solving, problem solving agents, example problems, Searching for solutions, uniformed search strategies, avoiding repeated states, searching with partial information.

Unit II : Searching 7L

Search and exploration, Informed search strategies, heuristic function, local search algorithms and optimistic problems, local search in continuous spaces, online search agents and unknown environments, Constraint satisfaction problems (CSP), Backtracking search and Local search for

CSP, Structure of problems, Games: Optimal decisions in games, Alpha- Beta Pruning, imperfect real-time decision, games that include an element of chance.

Unit III : Knowledge Representation 6L

First order logic, representation revisited, Syntax and semantics for first order logic, Using first order logic, Knowledge engineering in first order logic, Inference in First order logic, prepositional versus first order logic, unification and lifting, forward chaining, backward chaining, Resolution, Knowledge representation, Ontological Engineering, Categories and objects, Actions - Simulation and events, Mental events and mental objects.

Unit IV : Learning 6L

Learning from observations: forms of learning, Inductive learning, Learning decision trees, Ensemble learning, Knowledge in learning, Logical formulation of learning, Explanation based learning, Learning using relevant information, Inductive logic programming, Statistical learning methods, Learning with complete data, Learning with hidden variable, EM algorithm, Instance based learning, Neural networks - Reinforcement learning, Passive reinforcement learning, Active reinforcement learning, Generalization in reinforcement learning.

Unit V : Perception and Expert System 5L

Visual perception-Waltz's algorithm, Introduction to Expert System, Architecture and functionality, Example Expert system

Unit VI : Natural Language Understanding 6L

Why NL, Formal grammar for a fragment of English, Syntactic analysis, Augmented grammars, Semantic interpretation, Ambiguity and disambiguation, Discourse understanding, Grammar induction, Probabilistic language processing, Probabilistic language models

Text Books

1. Stuart Russell, Peter Norvig, "Artificial Intelligence", A Modern Approach, Pearson Education/Prentice Hall of India.
2. Elaine Rich and Kevin Knight, "Artificial Intelligence", Tata McGraw-Hill.

Reference Books

1. Nils J. Nilsson, "Artificial Intelligence: A new Synthesis", Harcourt Asia Pvt. Ltd.
2. George F. Luger, "Artificial Intelligence-Structures and Strategies for Complex Problem Solving", Pearson Education/ PHI.

Lab Practice - I (404186)

CN and MWE

Teaching Scheme:		Examination Scheme:
Practical: 4 Hrs/week		OR: 50Marks TW:50Marks

Computer Networks

List of the Experiments(Minimum 8 experiments are to be performed).

1. Implementation of LAN using suitable multiuser Windows operating System and demonstrating client-server and peer to peer mode of configuration.
2. Installation and configuration of Web server.
3. Installation and configuration of FTP Server.
4. Study of DNS, SMTP & POP3 Determine the local host address, Ping to a host using its NetBIOS name Add IP addresses/host name mappings to the local host file Configure DNS service on Windows 2000 server Use Domain Name Service to resolve hostnames into IP addresses. Interact with an Email server using SMTP and POP3 protocols commands.
5. Socket Programming for client/Server application using Linux OS.
6. Installation and configuration of Telnet server for Telnet communication.
7. Installation and configuration of Proxy server.
8. Installation and configuration of DHCP server.
9. Study of IP Addresses subnetting and CIDR
10. Study of Network Protocol Analyzer tool/software.
11. Study of network monitoring tool/software.
12. Configuration of router & study of routing between LAN's
13. Simulating LAN or WAN using suitable network simulator.
14. Write a program for Encryption and Decryption
15. Write a program for implementation of Shortest Path algorithm.
16. Simulating LAN or WAN using suitable network simulator.
17. Study of wireless LANs (Demonstrating Data communication with Wi-Fi, Bluetooth networking etc).

Microwave Engineering

List of the Experiments(Minimum 8 experiments are to be performed):

1. Study of microwave components and equipments.
2. Reflex Klystron as a Microwave source in laboratory and plot its mode characteristics.
3. Measurement of the free space wavelength of the microwave (for TE 10 mode) with the help of the X-band microwave test bench and verify with its theoretical calculation.
4. Study of Gunn Diode & PIN Modulator as a Microwave source. Plot the V-I characteristics.

5. Verification of Port Characteristics of Microwave Tees (E, H, E-H Planes).
6. Verification of Port Characteristics of Directional Coupler. Calculation of coupling factor, insertion loss and directivity.
7. Verification of Port Characteristics of Isolator and Circulator. Also calculation of insertion loss and isolation in dB.
8. Study of slotted section with probe carriage. Measure the VSWR for various values of terminating impedances (open/short/matched termination).
9. Study the Network Analyzer, Carry out the measurements of s-parameter measurement for the various microstrip components.
10. Explain in detail the concept of RF power measurement. Carry out the RF power measurement using microwave bench
11. To test and verify Microwave Integrated Circuits using Microstrip trainer kit and finds parameters, and plot the frequency response.

Lab Practice - II (404187)

VLSI and Elective I

Teaching Scheme:		Examination Scheme:
Practical: 4 Hrs/week		PR: 50Marks TW:50Marks

VLSI

List of Experiments:

A. To write VHDL code, simulate with test bench, synthesis, implement on PLD. [Any 4].

1. 4 bit ALU for add, subtract, AND, NAND, XOR, XNOR, OR, & ALU pass.
2. Universal shift register with mode selection input for SISO, SIPO, PISO, & PIPO modes.
3. FIFO memory.
4. LCD interface.
5. Keypad interface.

B. To prepare CMOS layout in selected technology, simulate with and without capacitive load, comment on rise, and fall times.

1. Inverter, NAND, NOR gates, Half Adder
2. 2:1 Multiplexer using logic gates and transmission gates.
3. Single bit SRAM cell.
4. D flip-flop.

Elective I

Experiments to be chosen based on Elective I(Minimum 8 experiments are to be performed)

Project Phase-I (404188)		
Teaching Scheme: Tutorial: 2Hrs/week		**Examination Scheme:** TW:50Marks

Note:

1. Term work assessment is based on the project topic. It consists of Literature Survey and basic project work. The abstract of the project should be submitted before Term work assessment.

2. The report consists of the Literature Survey, basic project work and the size of the report should be maximum of 40 pages.

3. The examination is conducted by two examiners (internal and external) appointed by the university. The examiners appointed must have minimum 5 years of experience with UG qualification or 2 years with PG qualification.

4. The assessment is based on Innovative Idea, Depth of understanding, Applications, Individual contributions, presentation, and the grade given by the internal guide based on the work carried out in a semester.

5. A certified copy of report is required to be presented to external examiner at the time of final examination.

Mobile Communication(404189)

Teaching Scheme: Lectures: 4Hrs/ Week		**Examination Scheme:** In Semester Assessment: Phase I : 30 End Semester Examination: Phase II: 70

Course Objectives:

- To learn and understand the basic principles of Telecommunication switching, traffic and networks
- To learn and understand basic concepts of cellular system, wireless propagation and the techniques used to maximize the capacity of cellular network.
- To learn and understand architecture of GSM and CDMA system.
- To understand mobile management, voice signal processing and coding in GSM and CDMA system

Course Outcomes:

Aftersuccessfully completing the course students will be able to

- Explain and apply the concepts telecommunication switching, traffic and networks
- Analyze the telecommunication traffic.
- Analyze radio channel and cellular capacity.
- Explain and apply concepts of GSM and CDMA system.

Unit I : Telecommunication Switching & Traffic 8L

Telecommunication switching: Message switching, Circuit switching, Manual System, Electronic Switching. Digital switching: Switching functions, Telecommunication Traffic: Unit of Traffic, Traffic measurement, A mathematical model, Lost- call systems: Theory, traffic performance, loss systems in tandem, traffic tables. Queuing systems: Erlang Distribution, probability of delay, Finite queue capacity, Systems with a single server, Queues in tandem, delay tables and application of Delay formulae.

Unit II: Switching Networksand Signaling 8L

Single Stage Networks, Gradings, Link Systems, Grades of service of link systems. Time Division Switching: Space and time switching, Time division switching networks, Synchronization, Call processing Functions, Common Control, Reliability, Availability and Security. Signaling: Customer line signaling. FDM carrier systems, PCM signaling, Inter-register signaling, Common channel signaling principles, CCITT signaling No. 6, CCITT signaling No. 7, Digital customer line signaling.

Unit III: Cellular Concepts6L
Evolution of Wireless systems, Introduction to cellular telephone system, Frequency reuse, Channel Assignment, Handoff strategies, Cell Splitting, Propagation Mechanism: Free space loss, Reflection, Diffraction, Scattering. Fading and Multipath: Small scale multipath propagation, Impulse response model of multipath channel. Multiple Access Techniques-TDMA, FDMA, CDMA
Unit IV: First and Second Generation Mobile Systems6L
First Generation Cellular Systems, AMPS, GSM Cellular Telephony: Introduction, Basic GSM Architecture, Basic radio transmission parameters in GSM system, Logical Channels, GSM time hierarchy, GSM burst structure, Description of call setup procedure, Handover, Modifications and derivatives of GSM.
Unit V: GSM Services 8L
GSM Physical layer: Speech Coding and decoding, GMSK modulation, Data transmission in GSM: Data Services, SMS, HSCSD, GPRS, EDGE.
Unit VI : CDMA Based Mobile Systems 8L
Motivation for CDMA use, Spreading Sequences, Basic Transmitter and Receiver schemes, Rake Receiver, IS-95 system: Frequency Range, Downlink transmission, Uplink transmission, Power control, Introduction to 3G mobile systems: W-CDMA and cdma-2000.
Text Books
1. J. E. Flood , “Telecommunications Switching, Traffic and Networks”, Pearson Education 2. Krzysztof Wesolowski, “Mobile Communication Systems”, Wiley Student Edition.
Reference Books
1. Theodore S Rappaport, “Wireless Communications Principles and Practice” Second Edition, Pearson Education 2. John C. Bellamy, “Digital Telephony”, Third Edition; Wiley Publications 3. ThiagarajanVishwanathan, “Telecommunication Switching Systems and Networks”; PHI Publications 4. Wayne Tomasi, “Electronic Communications Systems”; 5th Edition; Pearson Education 5. Vijay K Garg, Joseph E Wilkes, “Principles and Applications of GSM” Pearson Education 6. Vijay K Garg, Joseph E Wilkes, “IS-95CDMA and CDMA 2000 Cellular/PCS Systems Implementation” Pearson Education 7. Mischa Schwartz, “Mobile Wireless Communications”, Cambridge University Press

Broadband Communication Systems(404190)

Teaching Scheme:		Examination Scheme:
Lectures 3 Hrs/ Week		In Semester Assessment: Phase I: 30 End Semester Examination: Phase II:70

Course Objectives:

- To understand the three primary components of a fiber-optic communication system.
- To understand the system design issues and the role of WDM components in advanced light wave systems.
- To understand the basics of orbital mechanics and the look angles from ground stations to the satellite.
- To apply their subject understanding in Link Design.

Course Outcomes:

After successfully completing the course students will be able to:

- Carry out Link power budget and Rise Time Budget by proper selection of components and check its viability.
- Carry out Satellite Link design for Up Link and Down Link.

UNIT I: Light wave System Components 6L

Key Elements of Optical Fiber Systems, Optical Fibers as a Communication Channel: Optical Fiber Modes and Configurations , Mode Theory for Circular Waveguides , Single-mode Fibers, Graded-index Fiber Structure, Signal Degradation in Optical Fibers.Optical Sources: Basic Concepts and characteristics of LEDs and LASERs. Photodetectors: Basic Concepts, Common Photodetectors.

UNIT II: Lightwave Systems6L

System Architectures, Point-to-Point Links: System Considerations, Design Guidelines: Optical Power Budget, Rise Time Budget, Long-Haul Systems.

UNIT III: Multichannel Systems6L

Overview of WDM, WDM Components: 2 x 2 Fiber Coupler, Optical Isolators and Circulators, Multiplexers and De-multiplexers, Fiber Bragg Grating, FBG applications for multiplexing and De-multiplexing function, Diffraction Gratings, Overview of Optical Amplifiers: SOA, EDFA and RFA in brief.

UNIT IV: Orbital Mechanics and Launchers6L
History of Satellite Communication, Orbital Mechanics, Look angle determination, Orbital perturbations, Orbital determination, Launchers and Launch Vehicles, Orbital effects in communication system performance.
UNIT V: Satellites 6L
Satellite Subsystems, Attitude and control systems (AOCS), Telemetry, Tracking, Commandand Monitoring, Power systems, Communication subsystems, Satellite antennas, EquipmentReliability and space qualification.
UNIY VI: Satellite Communication Link Design6L
Introduction, Basic transmission Theory, System Noise Temperature and G/T Ratio, Designof Downlinks, Satellite Systems using Small Earth Stations, Uplink Design, Design ofSpecified C/N : Combining C/N and C/I values in Satellite Links, System Design Examples
Text Books 1. Gerd Keiser, "Optical fiber Communications", Tata McGraw Hill, 4th edition. 2. Timothy Pratt, Charles Bostian, Jeremy Allnutt "Satellite Communications", John Wiley & Sons.
Reference Books 1.Govind P. Agrawal, Fiber-Optic Communication Systems, Wiley, 3rd edition. 2. Dennis Roody, "Satellite Communications", McGraw Hill

Speech and Audio Signal Processing(404191)

Teaching Scheme: Lectures: 3 Hrs/ Week		**Examination Scheme:** In Semester Assessment: Phase I : 30 End Semester Examination: Phase II: 70

Course Objectives:

- To understand basic concepts and methodologies for the analysis and modeling of speech signal.
- To characterize the speech signal as generated by a speech production model
- To understand the mechanism of speech and audio perception
- To understand the motivation of short-term analysis of speech and audio
- To perform the analysis of speech signal using LPC
- To extract the information of the speech or audio signals in terms of cepstral features
- To provide a foundation for developing applications in this field.

Course Outcomes:

After successfully completing the course students will be able to

- Design and implement algorithms for processing speech and audio signals considering the properties of acoustic signals and human hearing.
- Analyze speech signal to extract the characteristic of vocal tract (formants) and vocal cords (pitch).
- Write a program for extracting LPC Parameters using Levinson Durbin algorithm
- Formulate and design a system for speech recognition and speaker recognition

Unit I: Fundamentals of speech production6L

Anatomy and physiology of speech production, Human speech production mechanism, LTI model for speech production, Nature of speech signal, linear time varying model, articulatory phonetics, acoustic phonetics, Voiced and Unvoiced speech.

Unit II: Human auditory system 6L

Human auditory system, simplified model of cochlea. Sound pressure level and loudness. Sound intensity and Decibel sound levels. Concept of critical band and introduction to auditory system as a filter bank,Uniform, non uniform filter bank, mel scale and bark scale.Speech perception: vowel perception.

Unit III: Time and frequency domain methods for audio processing 6L

Time-dependent speech processing. Short-time energy, short time average magnitude, Short-time average zero crossing rate. Speech Vs. silence discrimination using energy and zero crossing rate. Short-time autocorrelation function, short-time average magnitude difference function. Pitch period estimation using autocorrelation method. Audio feature extraction, Spectral centroid, spectral spread, spectral entropy, spectral flux, spectral roll-off. Spectrogram: narrow band and wide band spectrogram.

Unit IV: Linear prediction analysis 6L

Basic principles of linear predictive analysis. Autocorrelation method, covariance method. Solution of LPC equations: Cholesky decomposition, Durbin's recursive solution, lattice formulations and solutions. Frequency domain interpretation of LP analysis. Applications of LPC parameters as pitch detection and formant analysis.

Unit V: Cepstral Analysis 6L

Homomorphic speech processing, Real Cestrum: Long-term real cepstrum, short-term real cepstrum, pitch estimation, format estimation, Mel cepstrum. Complex cepstrum: Long-term complex cepstrum, short-term complex cepstrum.

Unit VI : Speech and Audio processing applications 6L

Speech recognition: complete system for an isolated word recognition with vector quantization /DTW. Speaker recognition: Complete system for speaker identification, verification. Introduction to speech enhancement, Speech enhancement using spectral subtraction method, Introduction to Text to speech conversion, Introduction to Musical instrument classification, Musical Information retrieval.

Text Books :

1. Deller J. R. Proakis J. G. and Hanson J. H., "Discrete Time Processing of Speech Signals", Wiley Interscience
2. Ben Gold and Nelson Morgan, "Speech and audio signal processing" Wiley

Reference Books :

1. L. R. Rabiner and S.W. Schafer, "Digital processing of speech signals" Pearson Education.
2. Thomas F. Quateri , "Discrete-Time Speech Signal Processing: Principles and Practice" Pearson
3. Dr. ShailaApte, "Speech and audio processing", Wiley India Publication
4. L. R. Rabiner and B. H. Juang, "Fundamentals of speech recognition"
5. Theodoros Giannakopoulos and Aggelospikrakis, " Introduction to audio analysis : A MATLAB Approach : Eleseiver Publication.

List of Experiments(Minimum 8 experiments are to be performed):
NOTE: To perform the experiments software like MATLAB, SCILAB or any appropriate open source software can be used. For analysis of speech signals tools like PRAAT, Audacity can be used. Open source software is encouraged.

1. Record speech signal and find Energy and ZCR for different frame rates and comment on the result.
2. Record different vowels as /a/, /e/, /i/, /o/ etc. and extract the pitch as well as first three formant frequencies. Perform similar analysis for different types of unvoiced sounds and comment on the result.
3. Write a program to identify voiced, unvoiced and silence regions of the speech signal.
4. Record a speech signal and perform the spectrographic analysis of the signal using wideband and narrowband spectrogram. Comment on narrowband and wide band spectrogram.
5. Write a program for extracting pitch period for a voiced part of the speech signal using autocorrelation .
6. Write a program to design a Mel filter bank and using this filter bank write a program to extract MFCC features.
7. Write a program to perform the cepstral analysis of speech signal and detect the pitch from the voiced part using cepstrum analysis.
8. Write a program to find LPC coefficients using Levinson Durbin algorithm.
9. Write a program to enhance the noisy speech signal using spectral subtraction method.
10. Write a program to extract frequency domain audio features like SC, SF and Spectral roll off.

RF Circuit Design(404191)

Teaching Scheme: Lectures: 3 Hrs/ Week		**Examination Scheme:** In Semester Assessment: Phase I : 30 End Semester Examination: Phase II: 70

Course Objectives:

- To study RF issues related to active and passive components.
- To study circuit design aspects at RF.
- To learn design and modeling of circuits at RF.

Course Outcomes:

After successfully completion of the course students will be able to -

- Understand behavior of passive components at high frequency and modeling of HF circuit.
- Design HF amplifiers with gain bandwidth parameters.
- Understand Mixer types and characteristics.
- Gain the knowledge about PLLs and Oscillators with respect to their circuit topologies.

Unit I : RF Behavior of Passive Components — 6L

HF Resistors, HF Capacitors, HF Inductors, Chip Components. Circuit Board Considerations: Chip Resistors, Chip Capacitors, Surface Mounted Inductors.

Unit II : Bandwidth Estimation — 6L

Open Circuit Time Constant Method: Observations & Interpretations, Accuracy of OCτs, Considerations, Design examples. Short Circuit Time Constant Method:Background,Observations & Interpretations, Accuracy of SCτs, Considerations. Delay of a system in cascade, Rise time of systems in cascade, Relation Between Rise Time and Bandwidth.

Unit III : High Frequency Amplifier Design — 6L

Shunt Peaked Amplifier, Shunt Series peak Amplifier, Two port bandwidth enhancement, Design example. Bandwidth enhancement techniques. Tuned Amplifier: Common Source Amplifier with Single Tuned Load, Analysis of Tuned Amplifier. Neutralization and unilateralization. Characteristics of RF amplifier. Amplifier power relations. Stability considerations. Stabilization methods.

Unit IV: Low Noise Amplifier Design 6L

MOSFET two port noise parameters, LNA topologies, Power-constrained noise optimization. Design examples: Single ended LNA, Differential LNA. Linearity and large signal performance. Spurious free dynamic range.

Unit V : Oscillators 6L

Problem with Purely Linear Oscillators, Describing Functions, Describing Function for MOS. Colpitts Oscillator: Describing Function Model and Start-up Model of Colpitts Oscillator. Resonators: Quarter-Wave Resonators, Quartz Crystals. Tuned Oscillators: Basic LC Feedback Oscillators, Crystal Oscillator. Negative Resistance Oscillator.

Unit VI : Mixers 6L

Mixer Fundamentals. Significant Characteristics of Mixer: Conversion Gain, Noise Figure, Linearity and Isolation, Spurs. Non Linear Systems as Linear Mixers. Multiplier Based Mixers: Single Balanced Mixer, Linearization techniques of Mixer, Active Double Balanced Mixer. Passive Double Balanced Mixer, Diode Ring Mixers.

Text Books

1. Reinhold Ludwig, PavelBretchko, “RF Circuit Design Theory and Applications”, Pearson Education.
2. Thomas H. Lee, “The Design of CMOS Radio-Frequency Integrated Circuits”, Second Edition, Cambridge Publications.

Reference Books

1. T. Yettrdal, Yunhg Cheng, “Devices modeling for analog and RF COMS circuits design”, John Wiley publication.
2. Calvin Plett, “Radio frequency Integrated Circuits Design”, Artech house.

List of Experiments:

1. To plot frequency response of the impedance magnitude of series and parallel LC circuits.
2. To plot the resonant frequency behavior of parallel LC circuit, as a function of resistance R.
3. To determine stability regions of the device and sketch them in the Smith Chart. Assume suitable parameters.
4. To design, prepare layout and simulate CMOS amplifier for given voltage gain and bandwidth.

5. To design, prepare layout and simulate CMOS Collpitt oscillator.
6. To design, prepare layout and simulate CMOS mixer.
7. To design, prepare layout and simulate CMOS LNA.
8. To design, prepare layout and simulate double balance mixer.
9. To design, prepare layout and simulate diode Ring mixer.
10. To design, prepare layout and simulate local oscillator.

Audio Video Engineering(404191)

Teaching Scheme:		Examination Scheme:
Lectures: 3Hrs/ Week		In Semester Assessment: Phase I : 30 End Semester Examination: Phase II: 70

Course Objectives:

- After learning AVE course, students will get benefit to learn and understand the working of real life video system and the different elements of video system plus the encoding/decoding techniques.
- The learners will be groomed up to understand different channel allocations, difference between various systems present in this world, their transmission and reception techniques.
- Students will get insight on functioning of individual blocks, different standards of compression and they will be acquainted with different types of analog, digital TV and HDTV systems.
- The students will gate overview of fundamentals of Audio systems and basics Acoustics

Course Outcomes:

- To study the analysis and synthesis of TV Pictures, Composite Video Signal, Receiver, Picture Tubes and Television Camera Tubes.
- To study the various Colour Television systems with a greater emphasis on television standards.
- To study the advanced topics in Digital Television and High Definition Television.
- To study audio recording systems such CD/DVD recording, Audio Standards, and Acoustics principles.

Unit I :Fundamentals of Colour Television 8L

Color TV systems, fundamentals, mixing of colours, colour perception, chromaticity diagram. NTSC, PAL, SECAM systems, colour TV transmitter, (high level, low level), colour TV receivers, remote control. Fault finding and servicing equipments like Wobbuloscope, TV Pattern Generator, and Field Strength meter.

Unit II: Digital TV and Display Devices 6L

Introduction to Digital TV, Digital TV signals and parameters, Digital TV Transmitters, MAC signals, advanced MAC signal transmission, Digital TV receivers, Basic principles of Digital Video compression techniques, MPEG Standards. Digital TV recording techniques, Display devices: LED, LCD, TFT, Plasma,

Unit III: HDTV 6L

HDTV standards and systems, HDTV transmitter and receiver/encoder, Digital TV satellite Systems, video on demand, CCTV, CATV, direct to home TV, set top box with recording facility, conditional access system (CAS), 3D TV systems, Digital broadcasting, case study (Cricket match, Marathon, Football match).

Unit IV: Advanced TV Systems8L

IP Audio and Video, IPTV systems, Mobile TV, Video transmission in 3G mobile System, IPod(MPEG4 Video player), Digital Video Recorders, Personal Video Recorders, Wi-Fi Audio / Video Transmitter and Receivers. Video Projectors, HD Video projectors, Video Intercom systems/ Video door phones.

Unit V : .Fundamentals of Audio-Video Recording6L

Methods of sound recording & reproduction, optical recording, CD recording, , audio standards. Digital Sound Recording, CD/ DVD player, MP3 player, Blue Ray DVD Players, MPEG, MP3 Player.

Unit VI : Fundamentals of Acoustics 6L

Studio acoustics & reverberation, P.A. system for auditorium, , acoustic chambers ,Cordless microphone system, special types of speakers & microphones, Digital Radio Receiver Satellite radio reception.

Text Books

1. Television and video Engineering, A. M. Dhake, TMH Publication.
2. Video Demisified, Kelth jack, Penram International Publication.
3. Audio Video Systems, R.G. Gupta, TMH Publication

Reference Books

1. S. P. Bali, “Color TV Theory and Practice”.
2. Bernard Grobb, Charles E, “Basic TV and Video Systems”.

List of Experiments (Minimum 8 experiments are to be performed).

1. Voltage and waveform analysis for color TV.
2. Study of direct to home TV and set top box.
3. Study Wi-Fi TV / IPTV system

4. Study of Digital TV pattern generator.
5. Study of HDTV
6. Study of Digital TV.
7. Simulation of video, Audio and Image compressing techniques (Software Assignments)
8. Study of Audio system: CD players and MP3 player.
9. Study of PA system with chord less microphone
10. Directivity pattern of Microphones / Loud speakers
11. Visit to TV transmitter/ Digital TV Studio/ All India Radio / TV Manufacturing factory

SOFT COMPUTING TECHNIQUES(404191)

Teaching Scheme:		Examination Scheme:
Lectures: 3Hrs/ Week		In Semester Assessment: Phase I : 30 End Semester Examination: Phase II: 70

Course Objectives:

- Introduce a relatively new computing paradigm for creating intelligent machines useful for solving complex real world problems.
- Insight into the tools that make up the soft computing technique: fuzzy logic, artificial neural networks and hybrid systemsTechniques.
- To create awareness of the application areas of soft computing technique
- Provide alternative solutions to the conventional problem solving techniques in image/signal processing, pattern recognition/classification, control system

Course Outcomes:

Having successfully completing the course students will be able to

- use a new tool /tools to solve a wide variety of real world problems
- find an alternate solution , which may offer more adaptability, resilience and optimization
- Identify the suitable antenna for a given communication system
- Gain knowledge of soft computing domain which opens up a whole new career option
- Tackle real world research problems

Unit I : Artificial Neural Network -I — 8L

Biological neuron, Artificial neuron model, concept of bias and threshold , McCulloch- Pits Neuron Model , implementation of logical AND, OR, XOR functions Soft Topologies of neural networks, learning paradigms: supervised, unsupervised, reinforcement, Linear neuron model : concept of error energy , gradient descent algorithm and application of linear neuron for linear regression, Activation functions : binary , bipolar (linear, signup, log sigmoid, tan sigmoid) Learning mechanisms: Hebbian, Delta Rule o Perceptron and its limitations Draft

Unit II : Artificial Neural Network-II — 8L

Multilayer perceptron (MLP) and back propagation algorithm o Application of MLP for classification and regression o Self- organizing Feature Maps, k- means clustering o Learning vector quantization Radial Basis Function networks: Cover’s theorem, mapping functions

(Gaussian, Multi-quadrics, Inverse multiquadrics, Application of RBFN for classification and regression o Hopfield network, associative memories.
Unit III : Fuzzy Logic -I 6L
Concept of Fuzzy number, fuzzy set theory(continuous, discrete) o Operations on fuzzy sets, Fuzzy membership functions (core ,boundary ,support) , primary and composite linguistic terms , Concept of fuzzy relation, composition operation (T-norm,T-conorm) o Fuzzy if-then rules.
Unit IV : Fuzzy Logic -II 6L
Fuzzification , Membership Value Assignment techniques, De-fuzzification (Maxmembership principle, Centroid method, Weighted average method), Concept of fuzzy inference, Implication rules- Dienes-Rescher Implication, Mamdani Implication, Zadeh Implication, Fuzzy Inference systems -Mamdani fuzzy model , Sugeno fuzzy model , Tsukamoto fuzzy model, Implementation of a simple two-input single output FIS employing Mamdani model Computing.
Unit V : Fuzzy Control Systems 6L
CONTROL SYSTEM DESIGN PROBLEM 1.5, Control (Decision) Surface, Assumptions in a Fuzzy Control System Design V, Fuzzy Logic Controllers Soft o Comparison with traditional PID control, advantages of FLC, Architecture of a FLC: Mamdani Type , Example Aircraft landing control problem.
Unit VI : Adaptive Neuro-Fuzzy Inference Systems(ANFIS) 6L
ANFIS architecture, Hybrid Learning Algorithm, Advantages and Limitations of ANFIS Application of ANFIS/CANFIS for regression
Text Books
1. Fundamentals of Neural Networks: Architectures, Algorithms And Applications, LaureneFausett, Pearson Education, Inc, 2008 . 2. Fuzzy Logic With Engineering Applications, Third Edition Thomas, Timothy Ross, John Wiley & Sons,2010 3. Neuro- Fuzzy and Soft Computing, J.S. Jang, C.T. Sun, E. Mizutani, PHI Learning Private Limited. 4. Principles of Soft Computing , S. N. Sivanandam, S. N. Deepa, John Wiley & Sons, 2007
Reference Books
1. Introduction to the theory of neural computation, John Hertz, Anders Krogh, Richard Palmer, Addison –Wesley Publishing Company, 1991

2. Neural NetworksA comprehensive foundation,, Simon Haykin,Prentice Hall International Inc-1999
3. Neural and Adaptive Systems: Fundamentals through Simulations, José C. Principe Neil R. Euliano , W. Curt Lefebvre, John-Wiley & Sons, 2000
4. Pattern Classification, Peter E. Hart, David G. Stork Richard O.Duda,Second Edition,2000
5. Pattern Recognition, SergiosTheodoridis , KonstantinosKoutroumbas, Fourth Edition, Academic Press, 2008
6. A First Course in Fuzzy Logic, Third Edition, Hung T. Nguyen, Elbert A. Walker, Taylor & Francis Group, LLC, 2008
7. Introduction to Fuzzy Logic using MATLAB, S. N. Sivanandam , S.Sumathi, S. N. Deepa, Springer Verlag, 2007

Practical Sessions: (Use MATLAB / OCTAVE/ SCILAB /any appropriate open source software.)(any 8 experiments)

1. Implement simple logic network using MP neuron model
2. Implement a simple linear regressor with a single neuron model
3. Implement and test MLP trained with back-propagation algorithm
4. Implement and test RBF network
5. Implement SOFM for character recognition
6. Implement fuzzy membership functions (triangular, trapezoidal, gbell, PI, Gamma, Gaussian)
7. Implement defuzzyfication (Max-membership principle, Centroid method, Weighted average method)
8. Implement FIS with Mamdani inferencing mechanism
9. A small project: may include classification or regression problem, using any soft computing technique studied earlier

Biomedical Signal Processing(404192)		
Teaching Scheme: Lectures:3Hrs/ Week		**Examination Scheme:** In Semester Assessment: Phase I : 30 End Semester Examination: Phase II: 70

Course Objectives:

1. To understand the basic signals in the field of biomedical.
2. To study origins and characteristics of some of the most commonly used biomedical signals, including ECG, EEG, evoked potentials, and EMG.
3. To understand Sources and characteristics of noise and artifacts in bio signals.
4. To understand use of bio signals in diagnosis, patient monitoring and physiological investigation
5. To explore research domain in biomedical signal processing.
6. To explore application of established engineering methods to complex biomedical signals problems.

Course Outcomes:

Aftersuccessfully completing the course students will be able to:

- The student will be able to model a biomedical system.
- The student will be able to understand various methods of acquiring bio signals.
- The student will be able to understand various sources of bio signal distortions and its remedial techniques.
- The students will be able to analyze ECG and EEG signal with characteristic feature points.
- The student will have a basic understanding of diagnosing bio-signals and classifying them.

Unit I : Biomedical Signals 6L

Bioelectric Signals and Electrodes: Bio-potentials and their origin: ECG, EEG, EMG, ENG, ERG, EOG, MEG. Biomedical Instrumentation System, biomedical transducers, electrodes and their characteristics. Origin of bio potentials. Sources and contamination of Noise in bio signals.Motion artifacts and skin Impedance. Classification of biomedical signals.

Unit II: Cardio Vascular and Nervous System 6L

Cardio Vascular System: Cardiovascular system, Coronary and Peripheral Circulation, Electrical

Activity of the heart, Lead configurations , ECG data acquisition, ECG recorder, Concept of Blood Pressure Measurement, Cardiac output, Heart Sounds.

Nervous System: Nervous System, Structure and functions of Neurons, Electrical activity of nerve cell, Synapse, Reflex action and Receptors.

Unit III:Analysis of Electrical Activity of Heart 6L

ECG signal parameters & their estimation - Use of multiscale analysis for ECG parameters estimation, Noise & Artifacts, ECG Signal Processing: Baseline Wandering, Power line interference, Muscle noise filtering – QRS detection, Highlight the Feature points of ECG and its classification for Normal and Abnormal state using Multilayer Perceptron.

Unit IV: Analysis of Electrical Activity of Brain 6L

Electroencephalogram – Structure of brain, EEG signal acquisition,10-20 electrode placement, EEG rhythms & waveform - categorization of EEG activity - recording techniques - EEG applications- Epilepsy, sleep disorders, brain computer interface. Use of Fourier Transform in EEG Signal Analysis.

Unit V: Analog Signal Processing 6L

Basics of Instrumentation Amplifier, Isolation amplifier, Grounding and shielding techniques.

Integer Filters: Basic design Concept, Low Pass and High Pass Filters, Band Pass, Band Stop and Band Reject Filters. Its application in Biomedical field.

Adaptive Filters: Basic Concept, Principle noise cancellation model, removal of periodic events using adaptive cancellation, adaptive cancellation of maternal ECG from fetal ECG of Interest.

Unit VI: Digital signal Processing 6L

Characteristics, frequency domain representation; Stationary and non-stationary bio-signals, waveform detection, Sampling Theory, Finite data considerations (Edge effects), Z Transform, FIR and IIR filters specific to event detection of ECG.Computation of diagnostic signal parameters of ECG like Heart rate and QRS detection using Multivariate analysis like PCA and ICA.

Text Books

1. Joseph J. Carr and John M. Brown, “Introduction to Biomedical Equipment Technology”, 4th Edition, Prentice Hall, 2000.
2. R. Rangayan, “Biomedical Signal Analysis”, Wiley 2002.
3. John L Semmlow, “Bio-signal and Biomedical Image Processing”, Marcel Dekker.

References Books

1. R.S.Khandpur, “Handbook of Biomedical Instrumentation”, Tata McGraw Hill, New Delhi, 2003, Edition-II.
2. Joseph J. Carr and John M. Brown, “Introduction to Biomedical Equipment Technology”, 4th Edition, Prentice Hall, 2000.
3. Bruce, “Biomedical Signal Processing & Signal Modeling,” Wiley, 2001
4. Sörnmo, “Bioelectrical Signal Processing in Cardiac & Neurological Applications”, Elsevier.
5. C.Reddy “Biomedical Signal Processing: Principles and techniques”, Tata McGraw Hill, New Delhi, 2005.
6. Willis J Tompkins, “Biomedical Signal Processing”, ED, Prentice – Hall, 1993.

Nano Electronics and MEMS(404192)

Teaching Scheme: Lectures:3Hrs/ Week		**Examination Scheme:** In Semester Assessment: Phase I : 30 End Semester Examination: Phase II: 70

Course Objectives:

- To understand the processes in Nano electronic manufacturing.
- To understand the construction, characteristics and operation of Nano electronic devices.
- To get acquaint with MEMS technology.
- To gain the concepts of MEMS sensors and measurement methods.

Course Outcomes:

After successfully completing the course students will,

- Gain knowledge of Nano electronics material, and manufacturing of Nano devices.
- Be introduced to MEMS and its sensors and actuators.
- Understand various measuring methods and tools.

Unit I: Introduction to materials in Nano Electronics 6L

Band structures in Silicon, Historical development and basic concepts of crystal structure, defects, crystal growth and wafer fabrication, crystal planes and orientation. Modern CMOS technology, construction of MOS Field Effect Transistor, Electrical characterization: IV/CV characterization, temperature dependent characterization.

Unit II: Semiconductor Nano Electronic manufacturing 6L

Basic understanding of contaminations, Levels of contaminations, Wafer cleaning methods, Lithography: basic concepts of optics, photoresists, wager exposure systems, methods and equipment. Thermal Oxidation: formations of Si and SiO_2 interface, types of thermal oxidations and their comparisons. Dopant Diffusion and Ion implantation fundamentals, Thin film deposition, sputtering methods and types, etching process and types.

Unit III: Nano Electronic Devices 6L

Single Electron devices and Transistors, Quantum particle, Quantum Dot, Logic circuits using quantum dots, nanowires construction and applications, FinFETs, construction of FinFET, properties of FinFETs.

Unit IV: Introduction to MEMS 6L

Intrinsic characteristics of MEMS, miniaturization, Sensors and actuators, sensor noise and design complexity, packaging and integration, stress and strain, intrinsic stress, torsion deflections, types of beams and deflection of beams.

Unit V: MEMS based sensors and actuators 6L

Electrostatic sensors and Actuators, Thermal sensing and actuation, piezoresistive sensing and actuation, Magnetic actuation. Comparison of major sensing and actuation methods. Case studies of selected MEMS: Acceleration sensors, gyros etc.

Unit VI: Measurements methods and tools 6L

Electrical methods: Hot probe method, Sheet resistance, Hall effect measurements. Physical measurements: Fourier Transform Infrared Spectroscopy, Electron microscopy, Atomic Force Microscope, X-Ray photoelectron Spectroscopy, Profilometers, Reflectrometers.

Text Books

1. James D Plummer, Michael d Deal and Peter B Griffin, Silicon VLSI Technology, Fundamentals, Practice and Modeling, Pearson Education.
2. George W Hanson, Fundamentals of Nanoelectronics, Pearson education
3. Chang Liu, Foundations of MEMS, Pearson Education.

Reference Books

1. MinhangBao, Analysis and Design Principles of MEMS Devices, Elsevier
2. Byung-Gook Park, Sung Woo Hwang, Young June Park, Nanoelectronic Devices, Pan Stanford Publishing Pte. Ltd.
3. Niraj K. Jha, Deming Chen , “ Nano Circuit Design”, Springer.

Detection and Estimation Theory(404192)

Teaching Scheme: Lectures:3Hrs/ Week		**Examination Scheme:** In Semester Assessment: Phase I : 30 End Semester Examination: Phase III: 70

Course Objectives:

- To understand concepts of statistical decision theory and parameter estimation.
- To study application of detection and estimation theory in filtering, communication and radar.

Course Outcomes:

After successfully completing the course students will be able to

- Apply suitable hypothesis testing criteria for signal detection problems.
- Use parameter estimation in signal processing and communication problems.
- Design a estimator and detector.

Unit I : Statistical Decision Theory	6L
Introduction, Bayes' Criterion-Binary Hypothesis Testing, *M*-ary Hypothesis Testing, Minimax Criterion, Neyman-Pearson Criterion, Composite Hypothesis Testing, Sequential Detection.	
Unit II : Parameter Estimation-I	6L
Introduction, Some Criteria for Good Estimators, Maximum Likelihood Estimation, Generalized Likelihood Ratio Test, Bayes' Estimation	
Unit III : Parameter Estimation-II	6L
Cramer-Rao Inequality, Multiple Parameter Estimation, Best Linear Unbiased Estimator, Least-Square Estimation, Recursive Least-Square Estimator.	
Unit IV : Filtering	6L
Introduction, Linear Transformation and Orthogonality Principle, Wiener Filters, Discrete Wiener Filters, Kalman Filter.	

Unit V : Detection and Parameter Estimation 6L
Introduction, Signal Representation, Binary Detection, M-ary Detection, Linear Estimation.
Unit VI : Detection Theory in Radar 6L
Introduction, Radar Elementary concepts- Range, Range Resolution, and Unambiguous Range, Doppler Shift, Principles of Adaptive CFAR Detection- Target Models, Review of Some CFAR Detectors.
Text Books
3. MouradBarkat, "Signal detection and Esimation", Artec House, second edition 4. S M Kay, "Fundamentals of ststistical Signal Processing, Estimation Theory" PHI Signal Processing Series. 5. S M Kay, "Fundamentals of ststistical Signal Processing, Detection Theory" PHI Signal Processing Series.
Reference Books
8. H.Vincent Poor, "An Introduction to Signal Detection and Estimation", Springer, Second Edition. 9. Harry L.,Van Trees, "Detection, Estimation and Modulation Theory", John Wiley & Sons.

Wireless Networks(404192)

Teaching Scheme: Lectures: 3Hrs/ Week		**Examination Scheme:** In Semester Assessment: Phase I : 30 End Semester Examination: Phase II: 70

Course Objectives:

- To study the evolving wireless technologies and standards
- To understand the architectures of various access technologies such as 3G, 4G, WiFi etc.
- To understand various protocols and services provided by next generation netwoks.

Course Outcomes:

After successfully completing the course student will be able to

- Keep himself updated on latest wireless technologies and trends in the communication field
- Understand the transmission of voice and data through various networks.

Unit I : Introduction to Wireless Networks 7L

Introduction, Technology and service trends of Emerging Wireless technologies, The Amazing Growth of Mobile Communications, A Little History, Mobile Communications Fundamentals, Mobile Data, WiFi, Bluetooth, Cable Systems, Wireless Migration Options, Harmonization Process.

Unit II: WiFi and Next Generation WLAN 7L

WiFi (802.11), 802.11 Standards, WiFi Protocols, Frequency Allocation, Modulation and Coding Schemes, Network Architecture, Typical WiFi Configurations, Security, 802.11 Services, Hot Spots, Virtual Private Networks (VPNs), Mobile VPN, VPN Types, WiFi Integration with 3G/4G, Benefits of Convergence of WiFi and Wireless Mobile.

Unit III: Third Generation Mobile Services 6L

Introduction, Universal Mobile Telecommunications Service (UMTS), UMTS Services, The UMTS Air Interface, Overview of the 3GPP Release 1999 Network Architecture, Overview of the 3GPP Release 4 Network Architecture, Overview of the 3GPP Release 5, All-IP Network Architecture, Overview CDMA2000, TD-CDMA, TD-SCDMA, Commonality among WCDMA, CDMA2000, TD-CDMA, and TD-SCDMA

Unit IV : LTE	8L
LTE Ecosystem, Standards, Radio Spectrum, LTE Architecture, User Equipment (UE), Enhanced Node B (eNodeB), Core Network (EPC), Radio Channel Components, TD-LTE, Multiple Input Multiple Output, LTE Scheduler, Carrier Aggregation, Cell Search, Cell Reselection, Attach and Default Bearer Activation, Handover (X2, S1, Inter-MME), Self-Organizing Networks (SONs), Relay Cells, Heterogeneous Network (HetNET), Remote Radio Heads (RRH), VoLTE, LTE Advanced	
Unit V : WiMAX	6L
Introduction, Standards, Generic WiMAX Architecture, Core Network, Radio Network, WiMAX Spectrum, Modulation, Channel Structure, Mixed Mode, Interference Mitigation Techniques, Frequency Planning, Features and Applications, Security, QoS, Profiles, Origination, Handover, Femto and SON	
Unit VI : VOIP	7L
Why VoIP?, The Basics of IP Transport, VoIP Challenges, H.323, The Session Initiation Protocol (SIP), Distributed Architecture and Media Gateway Control, VoIP and SS7, VoIP Quality of Service.	
Text Books	
1. Clint Smith, P.E., Daniel Collins, “Wireless Networks: Design and Integration for LTE, EVDO, HSPA, and WiMAX”, McGrawHill Education, Third Edition 2. EldadPerahia, Robert Stacey, “Next Generation Wireless LANs”, Cambridge University Press, Second Edition.	
Reference Books	
1. Yi-Bang Lin, ImrichChlamtac, “Wireless and Mobile Network Architecture”, Wiley India Edition. 2. DipankarRaychaudhary, Maria Gerla, “Emerging Wireless Technologies and the Future Mobile Internet”, Cambridge University Press..	

Lab Practice - III (404193)

MC & BCS

Teaching Scheme:		Examination Scheme:
Practical: 4 Hrs/week		OR: 50Marks TW:50Marks

Mobile Communication

List of the Experiments(Minimum 8 experiments are to be performed).

1. Set up and carry out experiment on PSTN TST switch.
2. Set up and carry out experiment on analysis of telecommunication traffic.
3. Simulation of a wireless channel model.
4. Set up and carry out experiment on Mobile phone.
5. Set up and carry out experiment on GSM.
6. Set up and carry out experiment on AT commands.
7. Simulation of Speech coding and decoding.
8. Set up and carry out experiment on GMSK modulation.
9. Set up and carry out experiment on spreading Sequences.
10. Set up and carry out experiment on CDMA.
11. Set up and carry out experiment on3G Mobile.
12. Set up and carry out experiment on VOIP implementation
13. Visit to Mobile Telephone Switching Office (MTSO).

Broadband Communication Systems

List of the Experiments(Minimum 8 experiments are to be performed).

1. Estimation of Numerical aperture of fiber
2. Plot the characteristics of various sources and detectors
3. Measure attenuation of MMSI and SMSI fiber and comment on the result based on attenuation due to increase in length as well as loss due to bend
4. Set up a digital link and analyze.
5. Tutorial on Power budget and time budget analysis of optical fiber system.
6. Establishing a direct communication link between Uplink Transmitter and Downlink Receiver using tone signal.
7. To set up an Active Satellite link and demonstrate Link Fail Operation
8. To establish an AUDIO-VIDEO satellite link between Transmitter and Receiver
9. To communicate VOICE signal through satellite link
10. To transmit and receive three separate signals (Audio, Video, Tone) simultaneously through satellite Link
11. To transmit and receive PC data through satellite link
12. Tutorial on satellite link design
13. Students, as a part of their term work, should visit satellite earth station and submit areport of visit.(Optional)

Lab Practice - IV (404194)		
Teaching Scheme: Practical: 2Hrs/week		**Examination Scheme:** PR: 50Marks TW:50Marks
Elective III		
Experiments to be chosen based on Elective III. **(Minimum 8 experiments are to be performed).**		

Project Phase-II (404195)		
Teaching Scheme: Tutorial: 6Hrs/week		**Examination Scheme:** TW:100 Marks OR: 50 Marks

1. Group Size

The student will carry the project work individually or by a group of students. Optimum group size is in 3 students. However, if project complexity demands a maximum group size of 4 students, the committee should be convinced about such complexity and scope of the work.

2. Selection and approval of topic

Topic should be related to real life application in the field of Electronics and Telecommunication

OR

Investigation of the latest development in a specific field of Electronics or Communication or Signal Processing

OR

The investigation of practical problem in manufacture and / or testing of electronics or communication equipment

OR

The Microprocessor / Microcontroller based applications project is preferable.

OR

Software development project related to VHDL, Communication, Instrumentation, Signal Processing and Agriculture Engineering with the justification for techniques used / implemented is accepted.

OR

Interdisciplinary projects should be encouraged. The examination will be conducted independently in respective departments.

3. Note:

The group should maintain a logbook of activities. It should have entries related to the work done,problems faced, solution evolved etc., duly signed by internal and external guides.

Project report must be submitted in the prescribed format only. No variation in the format will be accepted. One guide will be assigned at the most 3 project groups.

RAISONI GROUP
a vision beyond

G. H. Raisoni College of Engineering & Management,Wagholi, Pune

(An Autonomous Institute affiliated to SPPU)

PUNE

Department of Electronics & Telecommunication

Post Graduate

Course Book

FOR

M.TECH (VLSI & EMBEDDED SYSTEMS)

Academic Year 2018-19

Engineering | Management | Law | Schools | Other Courses
• NAGPUR • AMRAVATI • AHMEDNAGAR • PUNE • JALGAON • RAIPUR •
RAISONI
GROUP OF INSTITUTIONS

INDEX

INSTITUTE VISION AND MISSION

VISION:-

To achieve excellent standards of quality education by keeping pace with rapidly changing technologies. To create technical manpower of global standards with capabilities of accepting new challenges.

MISSION:-

Our efforts will be dedicated to impart quality and value based education to raise satisfaction level of all stake-holders. Our strength will be directed to create competent engineers. Our endeavor will be to provide all support to promote research and development activities.

DEPARTMENT VISION AND MISSION

VISION:-

To create globally competent and acceptable technical manpower in the ever-changing domain of Electronics & Telecommunication with attributes of self and lifelong learning, thereby transforming challenges into contributions to rapidly changing technologies.

MISSION:-

M1: To impart quality and value based education to the learners by strengthening teaching learning process from innovative curriculum to its rigorous implementation.
M2: To create competent professionals with a feature of life long contributors to technology and mankind.
M3: To engage faculty and students into relevant and outcome oriented R&D activities.

Programme Educational Objectives (PEOs)

A graduate in E&TC will be able to demonstrate:

PEO1: Ability to grasp, comprehend and apply the knowledge acquired from basic sciences, mathematics, program specific core and elective courses to solve real life technical problems.

PEO2: As a self and lifelong learner, ability to deliver and contribute applications, products, services dealing with usage of modern software tools and hardware platforms.

PEO3: Ability to work as cohesive team members to exhibit professional ethics, human values and social awareness in their career.

PEO4: Competencies, excellence in higher education and employability in diversified areas of Electronics and Telecommunication Engineering.

PROGRAM SPECIFIC OBJECTIVES(PSOs)

PSO1: Design of complex VLSI/ES based electronic systems

PSO2: Development of software program for complex system

PSO3: Writing of technical Journal Paper, research publication

PSO4: Acquire effective verbal communication & interpersonal skills

PROGRAM OUTCOMES(POs)

Engineering Graduates will be able to:

1. Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

2. Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

3. Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

4. Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

5. Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

6. The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

7. Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

8. Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

9. Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

10. Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

11. Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

12. Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

G. H. Raisoni College of Engineering and Management, Pune

(Autonomous Institute Affiliated to Savitribai Phule Pune University)

<u>Board of Studies members of Electronics and Telecommunication Engineering</u>

SN	Name	Designation	Designation in BOS	E-mail ID	Mobile No
01	Dr. Vaibhav Hendre	Professor & Head (E&TC)	Chairman	vaibhav.hendre@ raisoni.net	9921580670
02	Dr. Preeti Bajaj	Director, GHRCE, Nagpur	Special Invitee	principal.ghrce@ raisoni.net	9822220369
03	Dr.Jaywant Sankpal	Director	Permanent Invitee	director_ghrcemp@r aisoni.net	9604787185
04	Dr.R.S. Bichkar	Professor (E &TC) and Dean (R&D)	Faculty Representative (Specialized faculty in Genetic Algorithm, Image Processing)	rajankumar.bichkar @raisoni.net	9657724108
05	Mr P.N. Matte	Assistant Professor E&TC & Dean Academics	Faculty Representative (Specialized Faculty in VLSI Design Embedded System Design)	pravin.matte @raisoni.net	9922944973
06	Ms. Meeta Bakuli	Assistant Professor UG-E&TC	Faculty Representative (Specialized Faculty in communication)	meeta.bakuli @raisoni.net	9960206474
07	Dr. M.S. Sutaone	Professor (E&TC) college of Engineering Pune	Subject Expert (Specialized Faculty in VLSI Design, Signal & Image Processing)	mssutaone @gmail.com	9923560608
08	Dr. V.M. Gadre	Professor IIT, Bombay	Subject Expert (Specialized Faculty in Digital Signal Processing)	vmgadre@ee.iitb.ac. in	9819007426

S N	Name	Designation	Designation in BOS	E-mail ID	Mobile No
09	Dr. A.N. Rajgopalan	Professor IIT, Madras	Subject Expert to be nominated by Vice- Chancellor	raju@ee.iitm.ac.in	044-22574433
10	Mr. Sanjay Mishra	Vice-President, Cotmac Electronics Pvt. Ltd, Pune	Industry Expert-1	sanjay.mishra @cotmac.com	9890180604
11	Mr. Prasanna Rode	Principal, Architect, Capgemini, Pune	Industry Expert-2	prasanna.rode @capgemini.com	9833289394
12	Mr. Anuj Sharma	Engineer (R&D),KPIT Cummins Info System Ltd.,Pune	Alumni Member	asharma614 @yahoo.com	8149002994
13	Mr. S K Waghmare	Assistant Professor , Dean-FY	Co-opted Member (Specialization Faculty in VLSI & RFM EMS)	surendra.waghmare @raisoni.net	9881240358
14	Dr.Milind Khanapurkar	Professor & Head E&TC GHRCE Nagpur	Co-opted Member	milind.khanapurkar @raisoni.net	9922411221
15	Ms. Rupali B. Patil	Assistant Professor UG-E&TC	Co-opted Member(Communication Engg.)	rupalib.patil @raisoni.net	9922411320
16	Mr. Pranav Chippallkatti	Assistant Professor PG-E&TC	Co-opted Member	pranav.chippalkatti @raisoni.net	9730468538
17	Mr. Ashutosh Satpute	UG-Student	Student member-UG	ashutoshsatpute30 @gmail.com	9552049697
18	Mr.Anish Polke	PG-Student	Student member-PG	anishpolke@gmail.com	8446292080

Proposed

Post Graduate

Course Structure

FOR

F.Y M.TECH (VLSI & EMBEDDED SYSTEMS)

Academic Year 2018-19

Electronics and Telecommunication Engineering

M Tech. VLSI & Embedded System
Course Code Details

S. N.	Code	Course Name	Sem	Scheme	Sub	Elective	Offer
1	MVEL501	Digital CMOS Design	I	VLSI & Embedded System 2016-17 (AUTONOMOUS)	Theory	NO	YES
2	MVEL502	Embedded System Design	I	VLSI & Embedded System 2016-17 (AUTONOMOUS)	Theory	NO	YES
3	MVEL503	Reconfigurable Computing	I	VLSI & Embedded System 2016-17 (AUTONOMOUS)	Theory	NO	YES
4	MVEL504	Research Methodology	I	VLSI & Embedded System 2016-17 (AUTONOMOUS)	Theory	NO	YES
5	MVEL505	Elective I	I	VLSI & Embedded System 2016-17 (AUTONOMOUS)	Theory	YES	YES
6	MVEP506	Lab I	I	VLSI & Embedded System 2016-17 (AUTONOMOUS)	Practical	NO	YES
7	MVESD501	Advanced Skill Development	I	VLSI & Embedded System 2016-17 (AUTONOMOUS)	Practical	NO	YES
8	MVEL507	Analog CMOS Design	II	VLSI & Embedded System 2016-17 (AUTONOMOUS)	Theory	NO	YES
9	MVEL508	System on Chip	II	VLSI & Embedded System 2016-17 (AUTONOMOUS)	Theory	NO	YES
10	MVEL509	Processor Design	II	VLSI & Embedded System 2016-17 (AUTONOMOUS)	Theory	NO	YES
11	MVEL510	Elective II	II	VLSI & Embedded System 2016-17 (AUTONOMOUS)	Theory	YES	YES
12	MVEL511	Elective III	II	VLSI & Embedded System 2016-17 (AUTONOMOUS)	Theory	YES	YES
13	MVEP512	Lab Practice II	II	VLSI & Embedded System 2016-17 (AUTONOMOUS)	Practical	NO	YES
14	MVEP513	Seminar I	II	VLSI & Embedded System 2016-17 (AUTONOMOUS)	Seminar	NO	YES

Course Structure and Scheme of Examination for M.Tech E&TC (VLSI & Embedded System)

Branch- E&TC

Semester- I

Subject code	Subject Name	Teaching scheme (Weekly Load in Hrs)				Credits	Evaluation Scheme						ESE Duration (Hrs)
							Theory			Practical		Total	
		Lecture	Tutorial	Practical	Total		TAE 20%	CAE 20%	ESE 60%	(Cont. Ass.)	Ext		
MVEL501	Digital CMOS Design	3	1	_	4	4	20	20	60	_		100	3
MVEL502	Embedded System Design	3	1	_	4	4	20	20	60	_		100	3
MVEL503	Reconfigurable Computing	3	1	_	4	4	20	20	60	_		100	3
MVEL504	Research Methodology	3	--	_	3	3	20	20	60	_		100	3
MVEL505	Elective I	3	--	_	3	3	20	20	60	_		100	3
MVEP506	Lab I	_	_	4	4	2	_	_	_	50	50	100	_
MVESD501	Advanced Skill Development			2	2	AU				-			
	Total	15	3	6	24	20	100	100	300			600	

Elective-I MVEL505

MVEL505A. Real Time Operating System

MVEL505B. Mixed Signal Circuit Design

MVEL505C. CMOS RF Circuit Design

MVEL505D. Wireless sensor Network

Course Structure andScheme of Examination for M.Tech E&TC (VLSI & Embedded System)

Branch- E&TC

Semester- II

Subject code	Subject Name	Teaching scheme (Weekly Load in hrs)				Credits	Evaluation Scheme						ESE Duration (Hrs)
							Theory			Practical		Total	
		Lecture	Tutorial	Practical	Total		TAE 20%	CAE 20%	ESE 60%	Con Ass	Ext		
MVEL507	Analog CMOS Design	3	1	_	4	4	20	20	60	_ _		100	3
MVEL508	System on Chip	3	1	_	4	4	20	20	60	_ _		100	3
MVEL509	Processor Design	3		_	3	3	20	20	60	_ _		100	3
MVEL510	Elective II	3	_	_	3	3	20	20	60	_		100	3
MVEL511	Elective III	3			3	3	20	20	60			100	
MVEP512	Lab Practice II	_	_	4	4	2	_	_	_	50	50	100	_
MVEP513	Seminar I			2	2	2				50	50	100	
Total		15	2	6	23	21	100	100	300	100	100	700	_

Elective - II (MVEL510)	**Elective-III (MVEL511)**
MVEL510A. ASIC Design	**MVEL511A**. Embedded Product Design
MVEL510B. VLSI Interconnection	**MVEL511B**. Network on Chip
MVEL510C. Fault Tolerant System Design	**MVEL511C**. DSP Processor & Architectures
MVEL510D. Optimization Technique	**MVEL511D**. Software Defined Radio
MVEL510E. Industry Offered Elective	**MVEL511E**. Open Elective

Approved Structure and Syllabus of M.Tech A.Y 2017-18

<u>Electronics and Telecommunication Engineering</u>

M Tech. VLSI & Embedded System
Course Code Details

S. N.	Code	Course Name	Sem	Scheme	Sub	Elective	Offer
1	MVEL501	Digital CMOS Design	I	VLSI & Embedded System 2016-17 (AUTONOMOUS)	Theory	NO	YES
2	MVEL502	Embedded System Design	I	VLSI & Embedded System 2016-17 (AUTONOMOUS)	Theory	NO	YES
3	MVEL503	Reconfigurable Computing	I	VLSI & Embedded System 2016-17 (AUTONOMOUS)	Theory	NO	YES
4	MVEL504	Research Methodology	I	VLSI & Embedded System 2016-17 (AUTONOMOUS)	Theory	NO	YES
5	MVEL505	Elective I	I	VLSI & Embedded System 2016-17 (AUTONOMOUS)	Theory	YES	YES
6	MVEP506	Lab I	I	VLSI & Embedded System 2016-17 (AUTONOMOUS)	Practical	NO	YES
7	MVESD501	Advanced Skill Development	I	VLSI & Embedded System 2016-17 (AUTONOMOUS)	Practical	NO	YES
8	MVEL507	Analog CMOS Design	II	VLSI & Embedded System 2016-17 (AUTONOMOUS)	Theory	NO	YES
9	MVEL508	System on Chip	II	VLSI & Embedded System 2016-17 (AUTONOMOUS)	Theory	NO	YES
10	MVEL509	Processor Design	II	VLSI & Embedded System 2016-17 (AUTONOMOUS)	Theory	NO	YES
11	MVEL510	Elective II	II	VLSI & Embedded System 2016-17 (AUTONOMOUS)	Theory	YES	YES
12	MVEL511	Elective III	II	VLSI & Embedded System 2016-17 (AUTONOMOUS)	Theory	YES	YES
13	MVEP512	Lab Practice II	II	VLSI & Embedded System 2016-17 (AUTONOMOUS)	Practical	NO	YES
14	MVEP513	Seminar I	II	VLSI & Embedded System 2016-17 (AUTONOMOUS)	Seminar	NO	YES

15	MVESD601	Technical Writing (LATEX)	III	VLSI & Embedded System 2016-17 (AUTONOMOUS)	Practical	NO	YES
16	MVEP602	Seminar-II	III	VLSI & Embedded System 2016-17 (AUTONOMOUS)	Seminar	NO	YES
17	MVEP603	Dissertation Phase I	III	VLSI & Embedded System 2016-17 (AUTONOMOUS)	Dissertation	NO	YES
18	MVEP604	Seminar - III	IV	VLSI & Embedded System 2016-17 (AUTONOMOUS)	Seminar	NO	YES
19	MVEP605	Dissertation Phase II	IV	VLSI & Embedded System 2016-17 (AUTONOMOUS)	Dissertation	NO	YES

Approved Syllabus in detail for Semester-I

Course Structure and Scheme of Examination for M.Tech E&TC (VLSI & Embedded System)

Branch- E&TC

Semester- I

Subject code	Subject Name	Teaching scheme (Weekly Load in Hrs)				Credits	Evaluation Scheme						ESE Duration (Hrs)
							Theory			Practical		Total	
		Lecture	Tutorial	Practical	Total		TAE 20%	CAE 20%	ESE 60%	(Cont. Ass.)	Ext		
MVEL501	Digital CMOS Design	3	1	_	4	4	20	20	60	_		100	3
MVEL502	Embedded System Design	3	1	_	4	4	20	20	60	_		100	3
MVEL503	Reconfigurable Computing	3	1	_	4	4	20	20	60	_		100	3
MVEL504	Research Methodology	3	--	_	3	3	20	20	60	_		100	3
MVEL505	Elective I	3	--	_	3	3	20	20	60	_		100	3
MVEP506	Lab I	_	_	4	4	2	_	_	_	50	50	100	_
MVESD501	Advanced Skill Development			2	2	AU				-			
	Total	15	3	6	24	20	100	100	300			600	

Elective-I MVEL505

MVEL505A. Real Time Operating System

MVEL505B. Mixed Signal Circuit Design

MVEL505C. CMOS RF Circuit Design
MVEL505D. Wireless sensor Network

MVEL501: DIGITAL CMOS DESIGN		
Teaching Scheme:	**Examination Scheme (Theory)**	**Examination Scheme(Laboratory)**
Lectures: 3 Hrs/Week **Tutorials:** 1 Hr/Week **Practical:** Nil	**TAE:** 20 Marks **CAE :** 20 Marks **ESE : 6**0 Marks	**Practical:** Nil
Credit	**4**	
Prerequisite(If any): Nil		
Course Objectives:		
1. To understand the fundamentals of CMOS Technology in Digital Domain.		
2.To gain the the skills of designing digital VLSI.		
3. To be able to demonstrate the ability for using backend tools in IC technology.		
Course Outcome:		
1. The student will understand the fundamentals of CMOS Technology in Digital Domain.		
2. The student will show the skills of designing digital VLSI.		
3. The student will demonstrate the ability for using backend tools in IC technology.		

Course Contents	**Hrs**
Unit – I :Module I	
MOSFET Models and Layout: MOS Capacitance models, MOS Gate Capacitance Model, MOS Diffusion Capacitance Model. Non ideal I-V Effects, MOSFET equivalent circuits and analysis, Parasitic; Technology scaling; Lambda parameter; wiring parasitic; SPICE Models, CMOS layout techniques; Transient response. CMOS Technologies: Layout Design Rules CMOS Process Enhancements: Transistors, Interconnect, Circuit Elements, Beyond Conventional CMOS. CMOS Fabrication and Layout: Inverter Cross-section, Fabrication Process, Stick Diagrams.	8
Unit – II : Module II	
Performance parameters Static, dynamic and short circuit power dissipations; Propagation delay; Power delay product; Fan in, fan out and dependencies. Delay Estimation: RC Delay Models, Linear Delay Model, Logical Effort, Parasitic Delay. Logical Effort and Transistor Sizing: Delay in a Logic Gate, Delay in Multistage Logic Networks, Interconnect: Resistance, Capacitance, Delay, Crosstalk. Design Margin:	8
Unit – III : Module III	
Logic design Static CMOS Logic : Inverter, NAND Gate, Combinational Logic, NOR Gate, Compound Gates, Pass Transistors and Transmission Gates, Tractates, Multiplexers, Latches and Flip-Flops, Design calculations for combinational logic and active area on chip; Hazards, sources and mitigation techniques, case study; HDL codes for FSM, Met stability and solutions; Transmission gate, utility and limitations	8
Unit – IV : Module IV	

Advanced trends	
Advanced trends Circuit Families: Static CMOS, Rationed Circuits, Cascade Voltage Switch Logic, Dynamic Circuits, Domino logic; NORA logic, Differential Circuits, Sense Amplifier Circuits, BiCMOS Circuits, Low Power Logic Design, Comparison of Circuit Families, Materials for performance improvement, Techniques for Low power, high speed designs	8

Text Books: (Book Title, Name of the author, name of the Publisher, edition, year of publication)
1. Neil Weste and Kamaran, "Principles of CMOS VLSI Design", Education Asia.
2. J. M. Rabaey, A. Chandrakasan and B. Nikolic, Digital Integrated Circuits : A Design Perspective, Pearson (Low Price Edition)
Reference Books:
1. Neil Weste and Kamaran, "Principles of CMOS VLSI Design", Education Asia.
2. J. M. Rabaey, A. Chandrakasan and B. Nikolic, Digital Integrated Circuits : A Design 3. Perspective, Pearson (Low Price Edition)
4. Charles Roth, "Digital System Design using VHDL", Tata McGraw Hill.
5. S-M. Kang and Y. Leblebici, CMOS Digital Integrated Circuits : Analysis and Design, Third Edition, McGraw-Hill

MVEL502: EMBEDDED SYSTEM DESIGN		
Teaching Scheme:	**Examination Scheme (Theory)**	**Examination Scheme (Laboratory)**
Lectures:3 Hrs/Week **Tutorials:** 1Hr/Week **Practical:**Nil	**TAE:**20 Marks **CAE :**20 Marks **ESE:**60 Marks	**Practical:**Nil
Credit	**4**	
Course Objective:		
1. Understanding use of microcontroller in embedded systems.		
2. Understanding & practicing design issue related to Microcontroller based Embedded System design.		
3. Understanding & practicing of programming by use of advanced tools.		
Course Outcome:		
1. The student will study ARM Processor based Embedded System design		
2. The student will be able to do programming in Embedded programming in C, C++		
3. The student will understand Linux operating system and device driver		
4. The student will demonstrate the knowledge of android operating system		

Course Contents	**Hrs**
Unit – I : Module I	8
Introduction to Embedded Systems Introduction to Embedded Systems, Architecture of Embedded System, Design Methodology, Design Metrics, General Purpose Processor, System On chip. **Embedded system design and development:** Embedded system design**,** Life-Cycle Models, Problem solving, The design process, Requirement identification, Formulation of requirements specification. Development tools **System design specifications:** System specifications versus system requirements, Partitioning and decomposing a	

system, Functional design, Architectural design, Functional model versus architectural model, Prototyping, Other considerations, Archiving the project.	
Unit – II : Module II	8
ARM-9 Architecture: ARM-9-TDMI Processor core, ARM architectural support for high level language, ARM architectural support for system development, ARM architectural support for operating System, Memory subsystem architecture, Designing a cache system, Memory allocation, Communication protocols.	
Unit – III : Module III	8
Embedded Linux: System architecture, BIOS versus boot-loader, Booting the kernel, Kernel initialization, Space initialization, Boot loaders, Storage considerations **Linux kernel construction**: Kernel build system, Obtaining a custom Linux kernel, File systems, Device drivers,Kernel configuration.	
Unit – IV : Module IV	8
Android Operating System Introduction to Android technology, Structure of Android applications, Understanding Manifest, Working with Activities, Data stores, Network services and APIs, Intents, Content Providers and services, Advance Operations with Android, Telephony and SMS, Audio Video using the Camera, Project Discussion on Android.	

Text Books: (Book Title, Name of the author, name of the Publisher, edition, year of publication)
1. Steve Ferber, "ARM System-on-Chip Architecture", Second Edition, Pearson Education Publication
2. James K. Peckol, "Embedded Systems: A Contemporary Design Tool", WILEY Student Edition Publication
Reference Books:
1. Steve Furber, "ARM System-on-Chip Architecture", Second Edition, Pearson Education Publication
2. James K. Peckol, "Embedded Systems: A Contemporary Design Tool", WILEY Student Edition Publication
3. TmmyNoergaard, "Embedded Systems Architecture", Elsevier Publication
4. CristopherHallinan, "Embedded Linux Primer: A Practical Real-World Approach", Second Edition, Pearson Education Publication
5. CaigHollabaugh, "Embedded Linux, Hardware, Software and Interfacing", Pearson Education Publication

MVEL503: RECONFIGURABLE COMPUTING

Teaching Scheme:	Examination Scheme (Theory)	Examination Scheme (Laboratory)
Lectures:3 Hrs/Week **Tutorials:** 1Hr/Week **Practical:**Nil	**TAE:**20 Marks **CAE :**20 Marks **ESE: 6**0 Marks	**Practical:**Nil
Credit	**4**	

Course Objective:

1. To understand the concepts of architecture reconfigurability, programmable logic devices and optimization of the Reconfigurable computer architecture to the task algorithm and data structure.

2. To understand the basics of the Complex Programmable Logic Devices (CPLD) and Field Programmable Gate Array (FPGA) organization and Reconfigurable computer architectures based on these devices.	
3. To understand and identify Reconfigurable Computing Systems (RCS) application in DSP, Video/Image Processing and Supercomputing applications	
Course Outcome:	
1. The student will understand concept of static and dynamic reconfiguration.	
2. The student will use the basics of the PLDs for designing reconfigurable circuits.	
3. The student will understand the reconfigurable system design using HDL	
Course Contents	**Hrs**
Unit – I : Module I	8
Types of computing and introduction to RC: General Purpose Computing, Domain-Specific Processors, Application Specific Processors; Reconfigurable Computing, Fields of Application; Reconfigurable Device Characteristics, Configurable, Programmable, and Fixed-Function Devices; General-Purpose Computing, General-Purpose Computing Issues;	
Unit – II : Module II	8
Metrics: Density, Diversity, and Capacity; Interconnects, Requirements, Delays in VLSI Structures; Partitioning and Placement, Routing; Computing Elements, LUTs, LUT Mapping,ALU and CLBs; Retiming, Fine-grained & Coarse-grained structures; Multi-context**;**	
Unit – III : Module III	8
Different architectures for fast computing viz. PDSPs, RALU, VLIW, Vector Processors, Memories, CPLDs, FPGAs, Multi-context FPGA, Partial Reconfigurable Devices; Structure and Composition of Reconfigurable Computing Devices: Interconnect, Instructions, Contexts, Context switching, RP space model;	
Unit – IV : Module IV	8
Reconfigurable devices for Rapid prototyping, Non-frequently reconfigurable systems, Frequently reconfigurable systems; Compile-time reconfiguration, Run-time reconfiguration; Architectures for Reconfigurable computing: TSFPGA, DPGA, Matrix; Applications of reconfigurable computing: Various hardware implementations of Pattern Matching such as the Sliding Windows Approach, Automaton-Based Text Searching. Video Streaming;	

Text Books: (Book Title, Name of the author, name of the Publisher, edition, year of publication)
1. Andre Dehon, "Reconfigurable Architectures for General Purpose Computing".
2. IEEE Journal papers on Reconfigurable Architectures.
Reference Books:
1. Andre Dehon, "Reconfigurable Architectures for General Purpose Computing".
2. IEEE Journal papers on Reconfigurable Architectures.
3. "High Performance Computing Architectures" (HPCA) Society papers.

4.	Christophe Bobda, “Introduction to Reconfigurable Computing”, Springer Publication.
5.	MayaGokhale, Paul Graham, “Reconfigurable Computing”, Springer Publication.

MVEL504 : RESEARCH METHODOLOGY		
Teaching Scheme:	**Examination Scheme (Theory)**	**Examination Scheme(Laboratory)**
Lectures:3 Hrs/Week **Tutorials:** Nil **Practical:**Nil	**TAE:**20 Marks **CAE :**20 Marks **ESE: 6**0 Marks	**Practical:**Nil
Credit	**3**	
Prerequisite (If any): Nil		
Course Objective:		
1. To gain insights into how scientific research is conducted. 2. To help in critical review of literature and assessing the research trends, quality and extension potential of research and equip students to undertake research. 3. To learn and understand the basic statistics involved in data presentation. 4. To identify the influencing factor or determinants of research parameters. 5. To test the significance, validity and reliability of the research results. 6. 6. To help in documentation of research results.		
Course Outcome:		
1. The student will learn research problem & its scope, objectives, and errors.		
2. The student will learn the basic instrumentation schemes & data collection methods.		
3. The student will study the various statistical techniques.		
4. The students will study modeling and predict the performance of experimental system.		
5. The student will learn to develop the research proposals.		

Course Contents	**Hrs**
Unit – I :Module I	8
Research Problem: Meaning of research problem, Sources of research problem, Criteria/Characteristics of a good research problem, Errors in selecting a research problem, Scope and objectives of research problem. **Basic instrumentation:**Instrumentation schemes, Static and dynamic characteristics of instruments used in experimental set up, Performance under flow or motion conditions, Data collection using a digital computer system, Linear scaling for receiver and fidelity of instrument, Role of DSP is collected data contains noise.	
Unit – II : Module II	8
Applied statistics Regression analysis, Parameter estimation, Multivariate statistics, Principal component analysis Moments and response curve methods, State vector machines and uncertainty analysis.	

Unit – III : **Module III**	8
Modeling and prediction of performance Setting up a computing model to predict performance of experimental system, Multiscalemodeling and verifying performance of process system, Nonlinear analysis of system and asymptotic analysis, Verifying if assumptions hold true for a given apparatus setup, Plotting family of performance curves to study trends and tendencies, Sensitivity theory and applications	
Unit – IV : Module IV	8
Developing a Research Proposal Format of research proposal, Individual research proposal, Institutional proposal. Proposal of a student– a presentation and assessment by a review committee consisting of Guide and external expert only. Other faculty members may attend and give suggestions relevant to topic of research.	

Text Books: (Book Title, Name of the author, name of the Publisher, edition, year of publication)
1. Research methodology: an introduction for science & engineering students‟, by Stuart Melville and Wayne Goddard
2. Research Methodology: An Introduction‟ by Wayne Goddard and Stuart Melville
Reference Books:
1. Research Methodology: A Step by Step Guide for Beginners‟, by Ranjit Kumar, 2nd Edition
2. „Research Methodology: Methods and Trends‟, by Dr. C. R. Kothari
3. Operational Research‟ by Dr. S.D. Sharma, KedarNath Ram Nath& co.

Elective-I

MVEL505A: REAL-TIME OPERATING SYSTEMS		
Teaching Scheme:	**Examination Scheme (Theory)**	**Examination Scheme (Laboratory)**
Lectures:3 Hrs/Week **Tutorials:** 1Hr/Week **Practical:**Nil	**TAE:**20 Marks **CAE :**20 Marks **ESE:**60 Marks	**Practical:**Nil
Credit :	**3**	
Course Objective:		
1. Ability to apply knowledge of RTOS based design.		
2. To solve problems and introduce device and buses for embedded networking.		
3. Explain Real time operating system for inter & intra task communication models		
Course Outcome:		
1. Describe the general architecture of computers.		
2. Describe, contrast and compare differing structures for operating systems		
3. Understand and analyses theory and implementation of: processes, resource control (concurrency etc.),physical and virtual memory, scheduling, I/O and files		

Course Contents	**Hrs**
Unit – I : Basic Principles - Operating System structures – System Calls – Files – Processes – Design and Implementation of processes – Communication between processes –Introduction to Distributed operating	8

system – Distributed scheduling	
Unit – II : RTOS Task and Task state - Process Synchronization- Message queues – Mail boxes – pipes Critical section – Semaphores – Classical synchronization problem – Deadlocks	8
Unit – III : Event Based – Process Based and Graph based Models – Real Time Languages – RTOS Tasks – RT scheduling - Interrupt processing – Synchronization – Control Blocks –Memory Requirements.	8
Unit – IV : Principles – Design issues – Polled Loop Systems – RTOS Porting to a Target –Comparison and study of various RTOS like QNX – VX works – PSOS – C Executive –Case studies.	8
Unit – V : RTOS for Image Processing – Embedded RTOS for voice over IP – RTOS for fault Tolerant Applications – RTOS for Control Systems.	8

Text Books: (Book Title, Name of the author, name of the Publisher, edition, year of publication)
1. Real-Time Systems Jane W.S. Liu Prentice Hall. 2002 1st
2. Operating Systems Principle Peter Galvin and Abraham SilberschatzPenramInternational& Thomson Asia 2004 2nd
Reference Books:
1. Embedded Systems Architecture programming and Design Raj kamalMcGraw-Hill Publishing Company 2002 1st
2. Real – Time Systems and software Alan C. Shaw John Wiley & Sons Inc 2001 1st

MVEL505B : MIXED SIGNAL CIRCUIT DESIGN		
Teaching Scheme:	**Examination Scheme (Theory)**	**Examination Scheme (Laboratory)**
Lectures:3 Hrs/Week **Tutorials:** 1Hr/Week **Practical:**Nil	**TAE:**20 Marks **CAE :**20 Marks **ESE:**60 Marks	**Practical:**Nil
Credit :	**3**	
Prerequisite (If any):		
1. Analog VLSI		
Course Objective:		
1. This Mixed Signal processing course provides comprehensive techniques on the essential concepts of Mixed Signal Testing. This information is designed to elevate the baseline understanding and capabilities of product/test engineers.		
2. This subject introduces digital test and linear test engineers to the mixed signal world by teaching the basics of analog and mixed signal test methods. Sampling Theory, Frequency Domain Testing, and Digital Signal Processing.		
3. The course applies these fundamental concepts to different test methods and data validation for mixed signal parameters together with debugging, noise reduction and device interface techniques.		
Course Outcome:		
1. Students will be able to Design and verification of digital circuit using high level circuit description language		
2. Students will be able to Integrate the analog and digital circuits blocks and verify the complete mixed-signal structure over process, voltage and temperature variations.		
3. Students will be able to use advanced tools available for design and verification digital circuit		

Course Contents	**Hrs**
Unit – I : CMOS comparators, switched capacitor circuits and filters.	8
Unit – II : Dynamics of PLL, phase detector, loop filters, charge pump PLLs.	8
Unit – III : Data converter fundamentals, specifications,	8
Unit – IV : Nyquist rate D/A and A/D converters-Over sampling converters, noise shaping modulators,	8
Unit – V :multibite delta sigma converters	8

Text Books: (Book Title, Name of the author, name of the Publisher, edition, year of publication)
1. CMOS: Mixed-Signal Circuit Design R. Jacob Baker Wiley-Inter Sciences.1999 Second
2. CMOS Analog Circuit Design Allen and HolmbergDramatic Press 2001 1st
Reference Books:
1. Design of Analog CMOS Integrated Circuits Razavi.by BPB Publication 2003 2nd

MVEL505C: CMOS RF CIRCUIT DESIGN		
Teaching Scheme:	**Examination Scheme (Theory)**	**Examination Scheme (Laboratory)**
Lectures:3 Hrs/Week **Tutorials:** 1Hr/Week **Practical:**Nil	**TAE:**20 Marks **CAE :**20 Marks **ESE:**60 Marks	**Practical:**Nil
Credit :	**3**	
Prerequisite (If any):		
1. VLSI Subsystem Design		
Course Objective:		
1. Introduce the theory and concept of radio frequency integrated system.		
2. To analyze the performance parameters of radio frequency circuits and identify design trade-off of radiofrequency communication systems.		
3. Students will perform practical design and simulation exercises using the electronic design automation tools 4. To enhance their understanding of the design problems encountered in comesrf integrated circuits.		
Course Outcome:		
1. Understanding of the design and analysis of radio frequency integrated circuits and systems (RFICs) for communications		
2. Understanding the enabling integrated circuit technology and devices		

Course Contents	**Hrs**
Unit – I : Characteristics of passive IC components at RF frequencies.	8
Unit – II : Two port noise theory, passive impedance transformation.	8
Unit – III : High frequency amplifier design, Low noise amplifiers.	8
Unit – IV : Mixers, RF power amplifiers.	8
Unit– V : Oscillators and synthesizers, phase noise considerations.	8

Text Books: (Book Title, Name of the author, name of the Publisher, edition, year of publication)

1. The Design of CMOS Radio-Frequency Integrated Circuits Thomas H. Lee Pearson 2002 2nd	
2. Design of CMOS RF Integrated Circuits and Systems ManhAnh Do, ChirnChye Boon, KiatSengYeo TMH 2001 1st	
Reference Books:	
1. The Design of CMOS Radio- Frequency Integrated Circuits Thomas H. LeeCambridge University Press CMOS RFIC design Principles 1999 2nd	

MVEL505D : WIRELESS SENSOR NETWORK		
Teaching Scheme:	**Examination Scheme (Theory)**	**Examination Scheme (Laboratory)**
Lectures:3 Hrs/Week **Tutorials:** 1Hr/Week **Practical:**Nil	**TAE:**20 Marks **CAE :**20 Marks **ESE:**60 Marks	**Practical:**Nil
Credit	**3**	
Prerequisite (If any):		
Course Objective:		
1. To understand the architecture of WSN network.		
2. To understand the physical layer related aspects of WSN network.		
3. To exhibit the knowledge of power management in wireless communication systems.		
4. To exhibit the knowledge of security aspects of WSN systems.		
Course Outcome:		
1. The student will understand the architecture of WSN network.		
2. The student will understand the physical layer related aspects of WSN network.		
3. The student will exhibit the knowledge of power management in wireless communication systems.		
4. The student will exhibit the knowledge of security aspects of WSN systems.		

Course Contents	**Hrs**
Unit – I :Module I	8
Introduction : Motivation for a Network of Wireless Sensor Nodes , Sensing and Sensors Wireless Networks, Challenges and Constraints **Applications :** Health care, Agriculture, Traffic and others	
Unit – II : Module II	8
Architectures : Node Architecture; the sensing subsystem, processor subsystem, communication interface, LMote, XYZ, Hogthrob node architectures **Power Management** - Through local power, processor, communication subsystems and other means, time Synchronization need, challenges and solutions overview for ranging techniques. **Security** Fundamentals, challenges and attacks of Network Security, protocol mechanisms for security.	
Unit – III : Module III	8
Operating Systems -Functional and non-functional Aspects, short overview of prototypes Tiny OS, SOS, Contiki, LiteOS, sensor grid.	
Unit – IV : **Module IV**	8
Physical Layer- Basic Components, Source Encoding, Channel Encoding, Modulation, Signal Propagation	

Medium Access Control – types, protocols, standards and characteristics, challenges **Network Layer** - Routing Metrics, different routing techniques	

Text Books: (Book Title, Name of the author, name of the Publisher, edition, year of publication)

1. Dargie, W. and Poellabauer, C., "Fundamentals of wireless sensor networks: theory and practice", John Wiley and Sons, 2010
2. Sohraby, K., Minoli, D., Znati, T. "Wireless sensor networks: technology, protocols, and applications, John Wiley and Sons", 2007

Reference Books:

1. Hart, J. K. and Martinez, K. (2006) Environmental Sensor Networks: A revolution in the earth system science? Earth-Science Reviews, 78.
2. Protocols and Architectures for Wireless Sensor Networks Holger Karl, Andreas Willig -08-Oct-2007

MVEP506: LAB I

Teaching Scheme:	Examination Scheme(Theory)	Examination Scheme (Laboratory)
Lectures: Nil **Tutorials:** Nil **Practical:** 4Hrs/Week	**TAE:**Nil **CAE :**Nil**ESE:**Nil	**Practical: 100 Marks**
Credit		**2**

Prerequisite (If any):

Course Objective:

1. To understand software development for embedded systems.
2. To use IDEs for Embedded software development
3. To understand and implement hardware interfacing with microcontrollers.

Course Outcome: After successfully completing the course students will be able to

1. Use software development tools
2. Interface hardware with electronic circuit build with microcontrollers
3. Develop embedded system
4. Development of firmware program for complex system

List of Assignments :The laboratory work will be based on completion of minimum four assignments/experiments confined to the courses of that semester.

1. Modelsim, Xilinx ISE , FPGA/CPLD Board
2. To design, prepare layout and simulate CMOS Inverter for the given specifications of load capacitance, propagation delay, power dissipation, foundry etc.
3. To design CMOS logic for F = A + B (C + D) + EFG and prepare layout. Assume suitable capacitive load & foundry. Measure TF,Tf,Tpd
4. Application of Software Development & IDE
   - AVR studio
   - Code Compressor Studio
   - MPLAB
   - UVISION
   - MICROC
5. Develop character device driver for GPIO based on Linux Operating system

6. Write a program for External Interrupt based on Linux Operating system

Approved Syllabus in detail for Semester-II

Course Structure and Scheme of Examination for M.Tech E&TC (VLSI & Embedded System)

Branch- E&TC

Semester- II

Subject code	Subject Name	Teaching scheme (Weekly Load in hrs)				Credits	Evaluation Scheme						ESE Duration (Hrs)
							Theory			Practical		Total	
		Lecture	Tutorial	Practical	Total		TAE 20%	CAE 20%	ESE 60%	Con Ass	Ext		
MVEL507	Analog CMOS Design	3	1	_	4	4	20	20	60	_ _		100	3
MVEL508	System on Chip	3	1	_	4	4	20	20	60	_ _		100	3
MVEL509	Processor Design	3		_	3	3	20	20	60	_ _		100	3
MVEL510	Elective II	3	_	_	3	3	20	20	60	_		100	3
MVEL511	Elective III	3			3	3	20	20	60			100	
MVEP512	Lab Practice II	_	_	4	4	2	_	_	_	50	50	100	_
MVEP513	Seminar I			2	2	2				50	50	100	
Total		15	2	6	23	21	100	100	300	100	100	700	_

Elective - II (MVEL510)	**Elective-III (MVEL511)**
MVEL510A.Micro-Electro-Mechanical Microwave systems(MEMS)	**MVEL511A**. ASIC Design
MVEL510B. VLSI Interconnection	**MVEL511B**. Network on Chip
MVEL510C. Embedded Product Design	**MVEL511C**.DSP Processor & Architectures
MVEL510D. Optimization Technique	**MVEL511D**. Software Defined Radio
MVEL510E. Design and Analysis of Algorithm	**MVEL511E**. Energy Studies

MVEL510F. Industry Offered Elective	**MVEL511F.** Environmental Studies
MVEL511G. Open Elective	

MVEL507:ANALOG CMOS DESIGN		
Teaching Scheme:	**Examination Scheme (Theory)**	**Examination Scheme(Laboratory)**
Lectures:3 Hrs/Week **Tutorials:** 1Hr/Week **Practical:**Nil	**TAE:**20 Marks **CAE :**20 Marks **ESE:**60 Marks	**Practical:**Nil
Credit	**4**	
Prerequisite (If any):		
Course Objective:		
1. Knowledge of various MOS based analog circuits.		
2. Understand design issues related to analog VLSI system.		
3. Understand the working of MOS based data converter circuits		
Course Outcome:		
1. The student will understand the fundamentals of CMOS Technology in Analog Domain.		
2. The student will show the skills of designing CMOS analog circuits.		
3. The student will demonstrate the ability for using backend tools in analog IC technology.		

Course Contents	**Hrs**
Unit – I :Module I	8
Current sources and References MOSFET as switch, diode and active resistor; MOS Small-signal Models, Common Source Amplifier, The CMOS Inverter as an Amplifier, Weak inversion; Short channel regime; Current sinks and sources; Current mirrors; Current and voltage references, band gap reference.	
Unit – II : Module II	8
CMOS Opamp Inverters, cascade and differential amplifiers; Output amplifier; Opamp, high speed opamp, micro power opamp, low noise opamp.	
Unit – III : Module III	8
Low and High Bandwidth Design Digital to Analog Converters, switched capacitors, Analog to Digital Converters, Bandwidth estimation open and short circuit techniques; Zeros as bandwidth enhancers; Tuned amplifiers.	
Unit – IV : Module IV	8
Low Noise Amplifier Low Noise Amplifier (LNA) design, noise and power trade off, optimizations; Design of mixer; Advanced trends in Radio Frequency (RF) chip design.	

Text Books: (Book Title, Name of the author, name of the Publisher, edition, year of publication)
1. Thomas Lee, “The Design of CMOS Radio – Frequency Integrated Circuits”, Second edition, Cambridge.
2. B. Razavi, Design of Analog CMOS Integrated Circuits, McGraw-Hill
Reference Books:

1. P. E. Allen and D. R. Holberg, *CMOS Analog Circuit Design*, Second Edition, Oxford University Press
2. P. Gray, P. J. Hurst, S. H. Lewis and R. Meyer, *Analysis and Design of Analog Integrated Circuits*, Fourth Edition, Wiley, 2001. (Low Price Edition)

MVEL508: SYSTEM ON CHIP

Teaching Scheme:	Examination Scheme(Theory)	Examination Scheme (Laboratory)
Lectures:3 Hrs/Week **Tutorials:** 1Hr/Week **Practical:**Nil	**TAE:**20 Marks **CAE :**20 Marks **ESE:**60 Marks	**Practical:**Nil
Credit	**4**	

Prerequisite (If any):

Course Objective:

1. This course aims to Model and specify embedded systems at high levels of abstraction.
2. Analyze hardware/software tradeoffs, algorithms, and architectures to optimize the system based on requirements and implementation constraints.
3. Understand hardware, software, and interface synthesis

Course Outcome:

1. The student will learn to design flow graphs and flow modeling.
2. The student will study SOC modeling and interfacing.
3. The student will learn SOC memory system design, embedded software and energy, Management techniques for SOC design, SOC prototyping, verification, testing and physical design.
4. The student will able to design , implement and test SOC.

Course Contents	Hrs
Unit – I :Module I	
Basic Concepts: The nature of hardware and software, data flow modeling and implementation,the need for concurrent models, analyzing synchronous data flow graphs, control flow modeling and the limitations of data flow models, software and hardware implementation of data flow, analysis of control flow and data flow, Finite State Machine with data-path, cycle based bit parallel hardware, hardware model , FSMD data-path , simulation and RTL synthesis, language mapping for FSMD.	8
Unit – II : Module II	
Micro-programmed Architectures : limitations of FSM , Micro-programmed : control, encoding , data-path, Micro-programmed machine implementation , handling Micro-program interrupt and pipelining , General purpose embedded cores , processors, The RISC pipeline, program organization, analyzing the quality of compiled code, System on Chip, concept, design principles , portable multimedia system, SOC modeling, hardware/software interfaces , synchronization schemes, memory mapped Interfaces, coprocessor interfaces, coprocessor control shell design, data and control design, Programmer’s model .	8
Unit – III : Module III	
RTL intent: Simulation race, simulation-synthesis mismatch, timing analysis, timing parameters for digital logic, factors affecting delay and slew, sequential arcs, clock domain crossing ,bus synchronization , preventing data loss through FIFO, Importance of low power, causes and factors affecting	8

power, switching activity, simulation limitation, implication on synthesis and on backend.	
Unit – IV : Module IV	8
Research topics in SOC design: A SOC controller for digital still camera, multimedia I P development image and video CODECS, soc memory system design, embedded software, and energy management techniques for SOC design, SOC prototyping, verification, testing and physical design.	

Text Books: (Book Title, Name of the author, name of the Publisher, edition, year of publication)
1. Patrick R. Schaumont, "A Practical Introduction to Hardware/Software Co design", Springer
2. Sanjay Churiwala, SapanGarg , "Principles of VLSI RTL Design A Practical Guide", Springer
Reference Books:
1. Youn-Long Steve Lin, "Essential Issues in SOC Design, Designing Complex Systems-on-Chip", Springer
2. Wayne Wolf, "Modern VLSI Design Systems on Chip", Pearson Education
3. Rajanish K. Kamat, Santhosh A. Shinde, Vinod G. Shelake, "Unleash the System On Chip using FPGAs and Handel C", Springer

MVEL509: PROCESSOR DESIGN

Teaching Scheme:	Examination Scheme (Theory)	Examination Scheme (Laboratory)
Lectures:3 Hrs/Week **Tutorials:** Nil **Practical:**Nil	**TAE:**20 Marks **CAE :**20 Marks **ESE:**60 Marks	**Practical:**Nil
Credit	**3**	

Course Outcome:
1. The student will learn Problems, Fallacies and Pitfalls in Processor Design.
2. The student will study Extreme CISC and extreme RISC, Very Long Instruction Word 3. (VLIW), overly aggressive pipelining, unbalanced processor.
4. The student will show skills to implement Processor functional components like MAC.

Course Contents	Hrs
Unit – I : Module I	8
Embedded Computer Architecture Fundamentals: Components of an embedded computer, Architecture organization, ways of parallelism, I/O operations and peripherals.Problems, Fallacies, and Pitfalls in Processor Design for a high level computer instruction set architecture to support a specific language or language domain, use of intermediate ISAs to allow a simple machine to emulate it"s betters, stack machines ,overly aggressive pipelining ,unbalanced processor design, Omitting pipeline interlocks, Nonpower-of-2 data-word widths for general-purpose computing	
Unit – II : Module II	8
Memory: Organization, Memory segmentation, Multithreading, Symmetric multiprocessing. **Processor Design flow:** Capturing requirements, Instruction coding, Exploration of architecture	

organizations, hardware and software development. Extreme CISC and extreme RISC ,Very long instruction word (VLIW),	
Unit – III : Module III	8
Digital signal processor: Digital signal processor and its design issues, evolving architecture of DSP, next generation DSP. **Customizable processors**: Customizable processors and processor customization, A benefit analysis of processor customization, use of microprocessor cores in SOC design, benefits of microprocessor extensibility.	
Unit – IV : Module IV	8
Run time Re-configurable Processors: Run time Re-configurable Processors ,Embedded microprocessor trends, instruction set metamorphosis, reconfigurable computing, run-time reconfigurable instruction set processors ,coarse grain reconfigurable processor. **Processor Clock Generation and Distribution**: Clock parameters and trends, Clock distribution networks, de-skew circuits, jitter reduction techniques, low power clock distribution. **Asynchronous Processor Design**: Asynchronous and self timed processor design, need of asynchronous design, development of asynchronous processors, asynchronous design styles, features of asynchronous design.	

Text Books: (Book Title, Name of the author, name of the Publisher, edition, year of publication)
1. JariNurmi, Processor Design-System on Chip Computing for ASIC"s and FPGA, Springer Publications.
2. G. Frantz, The DSP and It"s Impact on the Technology.
Reference Books:
1. S. Leibson,Tensilica, Customizable Processors and Processor Customization ,
2. F. Campi , Run-Time Reconfigurable Processors

MVEL510A: Micro-Electro-Mechanical Microwave Systems(MEMS)		
Teaching Scheme:	**Examination Scheme (Theory)**	**Examination Scheme (Laboratory)**
Lectures:3 Hrs/Week **Tutorials:** Nil **Practical:**Nil	**TAE:**20 Marks **CAE :**20 Marks **ESE:**60 Marks	**Practical:**Nil
Credit :	**3**	
Prerequisite (If any):		
Course Objective:		
1. To understand the concept of MEMS technology.		
2. To learn MEMS based Sensors and Actuators.		
3. To learn MEMS Switches and its electromagnetic modelling		
4. To learn various MEMS based Microwave circuits and systems		
Course Outcome:		

After successfully completing the course students will be
1. Familiarised to MEMS Technology and MEMS based sensors and actuators
2. Familiarised with Electromagnetic Modelling of .RF MEMS Switches
3. Able to apply MEMS technology for various Microwave Circuits & Systems

Course Contents	**Hrs**
Unit – I:Introduction to MEMS Intrinsic characteristics of MEMS, miniaturization, Sensors and actuators, sensor noise and design complexity, packaging and integration, stress and strain, intrinsic stress, torsion deflections, types of beams and deflection of beams.	8
Unit – II: MEMS based sensors and actuators Electrostatic sensors and Actuators, Thermal sensing and actuation, piezoresistive sensing and actuation, Magnetic actuation. Comparison of major sensing and actuation methods. Case studies of selected MEMS: Acceleration sensors, gyros etc.	8
Unit – IIIRF MEMS Switches MEMS Capacitive Shunt Switch and Its Circuit Model, Electromagnetic modelling of MEMS Shunt Switches, MEMS Series Switches and Its electromagnetic Modelling, Comparison of MEMS switches with semiconductor Switches	8
Unit – IV:MEMS based Microwave Circuits and Systems Wireless Communication Systems, MEMS based RF and Microwave Circuits-Phase Shifters, Resonators, Filters, Oscillators, Mixers	8

Text Books: (Book Title, Name of the author, name of the Publisher, edition, year of publication)
1. Chang Liu: Foundations of MEMS, Pearson Education
2. G.M.Rebeiz: RF MEMS Theory, Design, and Technology, Wiley-India Edition
3. Hector J.De Los Santos: Introduction to Micro-Electro-Mechanical (MEM) Microwave Systems
Reference Books:
1. MinhangBao: Analysis and Design Principles of MEMS Devices, Elsevier
2.Vijay K.Varadan , K.J.Vinoy and K.A.Jose: RF MEMS and Their Applications, Wiley Edition

MVEL510B : VLSI INTERCONNECTIONS		
Teaching Scheme:	**Examination Scheme (Theory)**	**Examination Scheme (Laboratory)**
Lectures:3 Hrs/Week **Tutorials:** Nil **Practical:**Nil	**TAE:**20 Marks **CAE :**20 Marks **ESE:**60 Marks	**Practical:**Nil
Credit	**3**	
Prerequisite (If any):		
Course Objective:		
1. To understand the interconnect models.		
2. To study delay aspects due to high speed operations.		
3. To study futuristic aspects of interconnection		
Course Outcome:		
1. The student will understand the interconnect models.		
2. The student will study delay aspects due to high speed operations.		
3. The student will study futuristic aspects of interconnection		

Course Contents	Hrs
Unit – I : Module I	8
Metal interconnects, Transmission line equations, Analysis of tree structure, Interconnect model based on scattering matrix.	
Unit – II : Module II	8
Propagation modes, slow wave mode; Parasitic inductances, capacitances, resistances, Ground planes.	
Unit – III : Module III	8
Propagation modes, slow wave mode; Parasitic inductances, capacitances, resistances, Ground planes, Green"s function method; Interconnect delays	
Unit – IV : Module IV	8
Micro strip line model, Analysis, RC models, RLC models; Electromagnetic analysis of multi conductor interconnects; Mesh interconnects, hierarchical interconnects. Switch box routing in PLDs, Optimizations; Future interconnects, Optical interconnects, super conducting interconnects, nano technology circuit interconnects.	

Text Books: (Book Title, Name of the author, name of the Publisher, edition, year of publication)
1. Ashok K. Goyal, "High Speed VLSI Interconnections", Second Edition, IEEE Press, John Wiley Publications
2. Michel S. Nakhla, O. J. Zhang, "Modeling and Simulation of High Speed VLSI Interconnects", Springer Publication

MVEL510C : EMBEDDED PRODUCT DESIGN		
Teaching Scheme:	**Examination Scheme (Theory)**	**Examination Scheme (Laboratory)**
Lectures:3 Hrs/Week **Tutorials:** Nil **Practical:**Nil	**TAE:**20 Marks **CAE :**20 Marks**ESE:**60 Marks	**Practical:**Nil
Credit	**3**	
Prerequisite (If any):		
Course Objective:		
1. To acquaint students with embedded product design process. 2. Identify various models and techniques used for development of hardware and software of embedded system. 3. Identification of Testing ,verification , Certification and documentation process of Embedded Product		
Course Outcome:		
1. The student will study Embedded System & Product specifications, challenges		
2. The student will be able to do cost estimation of Embedded product		
3. The student will understand the aspects of Mechanical Packaging, Testing, reliability and failure analysis, Certification (EMI / RFI) and Documentation		
4. The student will demonstrate the knowledge embedded product design related hardware and software design		

tools.	
Course Contents	**Hrs**
Unit – I : Module I	8
Overview of embedded products: Need, Design challenges, product survey, specifications of product need of hardware and software, Partitioning of the design into its software and hardware components,Iteration and refinement of the partitioning.	
Unit – II : Module II	8
Deign models and techniques: various models of development of hardware and software, their features, different Processor technology, IC technology, Design Technology.	
Unit – III : Module III	8
Modules of H/W.S/W: Tradeoffs,Custom Single-purpose processors, General-purpose processors, Software, Memory, Interfacing, Design technology-Hardware design, FPGA design, firmware design, driver development, RTOS porting, cost reduction, re-engineering, optimization, maintenance, validation and development, prototyping, turnkey product design.	
Unit – IV : Module IV	8
Testing and verification: Embedded products-areas of technology, Design and verification, Integration of the hardware and software components, testing- different tools, their selection criterion **Certification and documentation**: Mechanical Packaging, Testing, reliability and failure analysis, communication protocols, Certification (EMI / RFI) and Documentation. Study of any TWO real life embedded products in detail.	

Text Books: (Book Title, Name of the author, name of the Publisher, edition, year of publication)
1. Frank Vahid and Tony Givargis , "Embedded System Design: A Unified Hardware/Software Introduction", John Wiley publication
Reference Books:
1. P Marwedel, "Embedded System Design", Springer publication

MVEL510D: Optimization Technique		
Teaching Scheme:	**Examination Scheme (Theory)**	**Examination Scheme (Laboratory)**
Lectures:3 Hrs/Week **Tutorials:** Nil **Practical:**Nil	**TAE:**20 Marks **CAE :**20 Marks **ESE:**60 Marks	**Practical:**Nil
Credit :	**3**	
Prerequisite (If any):		
Course Objective:		
1. Student should understand various optimization techniques for Engineering Designs		
2. Should be able to apply optimization techniques for Designs.		
Course Outcome:		
1. Formulate optimization problems.		
2. Understand and apply the concept of optimality criteria for various type of optimization problems.		

3. Solve various constrained and unconstrained problems in single variable as well as multivariable .	
4. Apply the methods of optimization in real life situation.	
Course Contents	**Hrs**
Module I : First and second order conditions for local interior optima (concavity and uniqueness), Sufficient conditions for unique global optima.	8
Module 2: Constrained optimization with Lagrange multipliers; Sufficient conditions for optima with equality and inequality constraints.	8
Module 3: Recognizing and solving convex optimization problems. Convex sets, functions, and optimization problems. Least-squares, linear, and quadratic optimization. Geometric and semi definite programming.	8
Module 4: Vector optimization. Duality theory. Convex relaxations. Approximation, fitting, and statistical estimation. Geometric problems. Control and trajectory planning.	8

Books: (Book Title, Name of the author, name of the Publisher, edition, year of publication)
1. Stephen Boyd and LievenVandenberghe, *Convex Optimization*, Cambridge University Press
2. A. Ben-Tal, A. Nemirovski, *Lectures on Modern Convex Optimization: Analysis,Algorithms, and Engineering Applications*, SIAM
3. D. P. Bertsekas, A. Nedic, A. E. Ozdaglar, *Convex Analysis and Optimization,*Athena Scientific.
4. D. P. Bertsekas, *Nonlinear Programming*, Athena Scientific.
5. Y. Nesterov, *Introductory Lectures on Convex Optimization: A Basic Course*, Springer.
6. J. Borwein and A. S. Lewis, *Convex Analysis and Nonlinear Optimization:Theory and Examples,* Springer**.**

MVEL510E: Design and Analysis of Algorithm		
Teaching Scheme:	**Examination Scheme (Theory)**	**Examination Scheme (Laboratory)**
Lectures:3 Hrs/Week **Tutorials:** Nil **Practical:**Nil	**TAE:**20 Marks **CAE :**20 Marks **ESE:**60 Marks	**Practical:**Nil
Credit :	**3**	
Prerequisite (If any):		
Course Objective:		
1. Analyse the asymptotic performance of algorithms		
2.Apply important algorithmic design paradigms and methods of analysis		
3. Synthesize efficient algorithms in common engineering design situations.		
Course Outcome:		
1. Discuss the correctness of algorithms using inductive proofs and invariants.		
2. Analyse randomized algorithms. Employ indicator random variables and linearity of expectation to perform the analyses		
Course Contents	**Hrs**	

Module I : Introduction- Fundamental characteristics of an algorithm. Basic algorithm analysis –Asymptotic analysis of complexity bounds– best, average and worst-case behaviour, standard notations for expressing algorithmic complexity.	8
Module 2: Empirical measurements of performance, time and space trade-offs in algorithms.	8
Module 3: . Properties of big-Oh notation – Recurrence equations – Solving recurrence equations – Analysis of linear search. Divide and Conquer.	8
Module 4: General Method – Binary Search – Finding Maximum and Minimum – Merge Sort – Greedy Algorithms: General Method – Container Loading – Knapsack	8

Books: (Book Title, Name of the author, name of the Publisher, edition, year of publication)
1. Algorithm Design – Jon Kleinberg and Eva Tardos
2Introduction to Algorithms – T.H. Corman et. Al

MVEL511A: ASIC DESIGN		
Teaching Scheme:	**Examination Scheme (Theory)**	**Examination Scheme (Laboratory)**
Lectures:3 Hrs/Week **Tutorials:** Nil **Practical:**Nil	**TAE:**20 Marks **CAE :**20 Marks **ESE:**60 Marks	**Practical:**Nil
Credit	**3**	
Prerequisite (If any):		
Course Objective:		
1. To prepare the student to be an entry level industrial standard cell ASIC or FPGA designer. 2. To give the student an understanding of issues and tools related to ASIC/FPGA design. 3. Prepare the student for implementation, including timing, performance and power optimization, verification and manufacturing test.		
Course Outcome:		
1. The student will understand the skills of designing analog and digital ASICs.		
2. The student will use the basics of the PLDs for designing IP Cores.		
3. The student will understand the ASIC testing.		

Course Contents	**Hrs**
Unit – I : Module I	8
Introduction to ASIC : Introduction to ASIC, Types of ASIC, ASIC Design flow, Comparison between ASIC technologies, SIC cell libraries. Design entry by VHDL, Modeling of combinational and sequential circuits, Logic synthesis and logic simulations like static timing analysis, functional simulation and Test benches.	
Unit – II : Module II	8
Mixed Signal ASIC Design **:** Mixed Signal ASIC Design, practical aspects of mix analog digital design, gate level mixed mode simulation, synthesis and testing. A brief introduction to signal integrity effects in ASIC design.	
Unit – III : Module III	8
ASIC construction **:**	

ASIC construction with goals, objectives and various algorithms for system partitioning, floor-planning placement and routing, Parameter extraction with Post layout simulation and Pre layout simulation.	
Unit – IV : Module IV	8
Testing techniques used in ASIC **:** Testing techniques used in ASIC like Automatic test pattern generation, Scan test, Built in self-test and JTAG. Brief view of Stuck at fault models and fault simulation. ASIC Verification and its issues, Types and features of existing available EDA tool.	

Text Books: (Book Title, Name of the author, name of the Publisher, edition, year of publication)
1. Michael Smith, "Application Specific Integrated Circuits" Pearson Education Asia
2. R.S. Soin, F. Maloberti and J. Franca, "Analogue-digital ASICs: circuit techniques, design tools and applications", IEE Publications
Reference Books:
1. Raminderpal Singh, "Signal Integrity Effects in Custom IC and ASIC Designs", Wiley Publications

MVEL511B: NETWORK ON CHIP		
Teaching Scheme:	**Examination Scheme (Theory)**	**Examination Scheme (Laboratory)**
Lectures:3 Hrs/Week **Tutorials:** Nil **Practical:**Nil	**TAE:**20 Marks **CAE :**20 Marks **ESE:**60 Marks	**Practical:**Nil
Credit :	**3**	
Prerequisite (If any):		
1. Basics communication		
Course Objective:		
1. To learn the basic concepts of NOC design by studying the topologies, router design and MPSOC styles,		
2. To learn sample routing algorithms on a NOC with deadlock and live lock avoidance,		
3. To understand the role of system-level design and performance metrics in choosing a NOC design,		
4. To understand the relationship between semiconductor technology, computer architecture and computernetworking in the design of the communication network for a MPSOC or a many-core design.		
Course Outcome:		
1. To learn the basic concepts of NOC design by studying the topologies, router design and MPSOC styles,		
2. To learn sample routing algorithms on a NOC with deadlock and live lock avoidance,		
3. To understand the role of system-level design and performance metrics in choosing a NOC design		

Course Contents	**Hrs**
Unit – I: Communication infrastructure between the many cores of a multi-processor system one-chip (MPSOC)	8
Unit – II Quad-core, eight-core, eighty-core processors that target exa-scale computing or multicore systems that target high-performance mobile computing.	8
Unit – III Systematic understanding, design and analysis of NOCs will be covered.	8

Unit – IV: In particular, the focus will be on topics that include Topology design, Routingalgorithms, Router design Emerging NOC paradigms, System-level performance metrics	8

Text Books: (Book Title, Name of the author, name of the Publisher, edition, year of publication)
1. Architectures A Holistic Design Exploration Chrysostom'sNicopoulos,Vijaykrishnan Narayanan&ChitaR.Das Springer 2001 1st
2. "Networks-on- Chips theory and Practice Fayezgebali,Haythamelmiligi,HqhahedWatheq E1-Kharashi Dramatic Press 2003 2nd
Reference Books:
1. Designing Reliable and Efficient Networks on Chips SrinivasanMurali by BPB Publication 2001 1st

MVEL511C: DSP PROCESSORS & ARCHITECTURES		
Teaching Scheme:	**Examination Scheme (Theory)**	**Examination Scheme (Laboratory)**
Lectures:3 Hrs/Week **Tutorials:** Nil **Practical:**Nil	**TAE:**20 Marks **CAE :**20 Marks **ESE:**60 Marks	**Practical:**Nil
Credit :	**3**	
Prerequisite (If any):		
1. Advanced Digital Signal Processing		
Course Objective:		
1. To impart Digital Signal Processor basics		
2. Third generation DSP Architecture and programming skills		
3. Advanced DSP architectures and some applications.		
Course Outcome:		
1. Be able to identify the basic architectural elements of DSP hardware;		
2. Understand common real-time DSP algorithms for filtering and multimedia processing applications;		
3. Gain an appreciation for the trade-offs necessary in algorithm design for real-time DSP implementation;		

Course Contents	**Hrs**
Unit – I : An overview of DSP concepts-Linear system theory, DFT, FFT, realization of digital filters. Typical DSP algorithms, DSP applications.	8
Unit – II : Data flow graph representation of DSP algorithm. Loop bound and iteration bound Retiming and its applications	8
Unit – III : Algorithms for fast convolution. Algorithmic strength reduction in filters and transforms.DCT and inverse DCT. Parallel FIR filters.	8
Unit – IV : Pipelining of FIR filters. Parallel processing. Pipelining and parallel processing for low power. Pipeline interleaving in digital filters. Pipelining and parallel processing for IIR filters. Low power IIR filter design using pipelining and parallel processing, Pipelined adaptive digital filters. Round off noise and its computation.	8

Unit – V : State variable description of digital filters, Round off noise computation using state variable description. Scaling using slow-down, retiming and pipelining	8

Text Books: (Book Title, Name of the author, name of the Publisher, edition, year of publication)
Reference Books:
1. Discrete time signalprocessing Oppenheim and Schaffer Prentice Hall. 1999 1st
2. Digital Signal Processing principals J. G.Proakis, D.G.Manolakis Prentice Hall 2003 1st
3. Theory and Applications of Digital Signal ProcessingRabinar and Gold Prentice Hall 2001 2nd

MVEL511D: SOFTWARE DEFINED RADIO		
Teaching Scheme:	**Examination Scheme (Theory)**	**Examination Scheme (Laboratory)**
Lectures:3 Hrs/Week **Tutorials:** Nil **Practical:**Nil	**TAE:**20 Marks **CAE :**20 Marks **ESE:**60 Marks	**Practical:**Nil
Credit	**3**	
Prerequisite (If any):		
Course Objective:		
1. To enable the student to understand the evolving paradigm of Software Defined radio communication and the enabling technologies for its implementation. 2. To enable the student to understand the essential functionalities and requirements in designing software defined radios and their usage for cognitive communication. 3. To expose the student to the evolving next generation wireless networks and their associated challenges.		
Course Outcome:		
1. The student will study Needs, Characteristics, Benefits and Design Principles of a Software Radio.		
2. The student will be study design aspects of software radios.		
3. The student will understand concept of Smart Antennas.		
4. The student will study key hardware elements and related Trade-Offs.		

Course Contents	**Hrs**
Unit – I :Module I	8
Fundamentals of SDR: Software Radios, Needs, Characteristics, Benefits, Design Principles of a Software Radio, Radio frequency implementation issues, Principal Challenge of Receiver Design	
Unit – II : Module II	8
RF and SDR: RF Receiver Front-End Topologies, Enhanced Flexibility of the RF Chain with Software Radios, Transmitter Architectures and their issues, Noise and Distortion in the RFChain, Timing Recovery in Digital Receivers Using Multirate Digital Filters	
Unit – III : Module III	8
Signals in SDR: Approaches to Direct Digital Synthesis, Analysis of Spurious Signals, Spurious Components due to Periodic Jitter, Band-pass Signal Generation, Hybrid DDS-PLL Systems, Generation of Random Sequences, Parameters of data converters	
Unit – IV : Module IV	8

Smart Antennas: Concept of Smart Antennas, Structures for Beam-forming Systems, Smart Antenna Algorithms, Digital hardware choices, Key Hardware Elements, DSP Processors, Field Programmable Gate Arrays, Trade-Offs in Using DSPs, FPGAs and ASICs **Case studies in Radio System:** Power Management Issues, Object-oriented representation of radios and network resources, Mobile Application Environments, Joint Tactical Radio System, Case studies in software radio design.	

Text Books: (Book Title, Name of the author, name of the Publisher, edition, year of publication)
1. Jeffrey H. Reed, "Software Radio: A Modern Approach to Radio Engineering", Prentice Hall PTR; May 2002 ISBN: 0130811580
2. Dillinger, Madani, Alonistioti (Eds.), "Software Defined Radio, Architectures, Systems and Functions", Wiley 2003
Reference Books:
1. Bard, Kovarik, "Software Defined Radio, The Software Communications Architecture", Wiley 2007
2. Johnson, C.R. and W.A. Sethares, "Telecommunication Breakdown: Concepts of Communication Transmitted via Software-Defined Radio, Pearson Prentice Hall, 2004
3. Bard, John and Kovarik, Vincent, "Software Defined Radio: The Software Communications Architecture", Wiley Series in Software Radio, 2007

MVEL511E: Energy Studies		
Teaching Scheme:	**Examination Scheme (Theory)**	**Examination Scheme (Laboratory)**
Lectures:3 Hrs/Week **Tutorials:** Nil **Practical:**Nil	**TAE:**20 Marks **CAE :**20 Marks **ESE:**60 Marks	**Practical:**Nil
Credit	**3**	
Prerequisite (If any):		
Course Objective:		
1. To introduce the concepts of Interrelationship between energy, ecology and environment.		
2. Environmental issues related to harnessing and utilization of various sources of energy.		
3. Related environmental degradation.		
Course Outcome:		
1. Interrelationship between energy and environment		
2.Classification of energy sources, Environmental issues related to harnessing to fossil fuels (coal, oil, natural gas),		
3.Geothermal, tidal, nuclear energy, solar, wind, hydropower, biomass		

Course Contents	**Hrs**
Unit – I :Module I	8
Energy Sources : Fossil fuels, Nuclear fuels, hydel, solar, wind and bio fuels in India, Energy conservation, Nuclear energy through fission and fusion processes.	
Unit – II : Module II	8

Energy Conservation: Energy conversion from source to utility, Solar, Nuclear, Geothermal, Tide and Wind Energies. Global Energy Scenario: Role of energy in economic development and social transformation, Overall energy demand, availability and consumption .	
Unit – III : Module III	8
Depletion of energy resources and its impact on economy, Non-proliferation of nuclear energy. International energy policies of G-8, G-20, OPEC and European union countries.	
Unit – IV : Module IV	8
Indian Energy Scenario- Commercial and noncommercial forms of energy, Utilization pattern in the past, present and also future prediction, Sector wise energy consumption. Energy Policy: Energy policy issues at global level, national level and state level, Energy conservation act 2001, Electricity act 2003, Energy pricing and its impact on global variations	

Books: (Book Title, Name of the author, name of the Publisher, edition, year of publication)
1. Jose Goldenberg, Thomas Johanson, and Reddy, A.K.N., Energy for Sustainable World, WileyEastern ,2005.
2.Charles E. Brown, World Energy Resources, Springer Publication, New York, 2002.
3.Culp, A.W., Principles of Energy Conversion, McGraw Hill New York, 2004.
4.Bukhootsow, B., Energy Policy and Planning, Prentice Hall of India, New Delhi, 2003.

MVEP512: LAB II		
Teaching Scheme:	**Examination Scheme(Theory)**	**Examination Scheme (Laboratory)**
Lectures: Nil **Tutorials:** Nil **Practical:** 4Hrs/Week	**TAE:**Nil **CAE :**Nil **ESE:**Nil	**Practical: 100 Marks**
Credit		**2**

Prerequisite (If any):

Course Objective:

1. To understand design CMOS circuits .
2. To design, model and interface SoC
3. To design and implement DSP algorithms on DSP Processor Platform.
4. To use various EDA Tools for design and simulation

Course Outcome: After successfully completing the course students

Use software development tools& Should be able to

1. Design CMOS circuits
2. Design, model and interface SoC
3. Design and implement DSP algorithms on DSP Processor Platform
4. Use various EDA Tools for design and simulation
5. Design Sub system of Software Defined Radio.

List of Practical

The laboratory work will be based on completion of minimum four assignments/experiments confined to the courses of that semester.

1. Design, prepare, layout and simulate CMOS Differential Amplifier and Cascade amplifier
2. Design CMOS RF amplifier and suggest suitable technique to enhance BW
3. Design memory system for SoC and Embedded Software and energy management techniques

4. Design adaptive filters using DSP Processor
5. Design a Smart antenna
6. Implement processor functional components like MAC.
7. Writing a VHDL Code to simulate, synthesize, place and route RAM/FIFO on PLD.
8. Draw CMOS layout and simulate full adder/MUX by using DRC appropriate foundry using backend tools and verify outputs
9. Design and simulate OFDM system using Matlab.
10. Design and simulate parts of Radio Transmitter / Receiver

MVEP513: SEMINAR I		
Teaching Scheme:	**Examination Scheme (Theory)**	**Examination Scheme (Laboratory)**
Lectures: Nil **Tutorials:** Nil **Practical:** 2 Hr/Week	**TAE:** Nil **SAE:** Nil **ESE:** Nil	**Marks : 100**
Credit		**2**
Prerequisite (If any):		

Course Objective:

Shall be on state of the art topic of students own choice approved by an authority.

The student shall submit the duly certified seminar report in standard format, for satisfactory completion of the work by the concerned Guide and head of the department/institute.

The presentation and the report should cover motivation, mathematical modeling, data-table discussion and conclusion.

The reports to be prepared using LATEX derivative. To maintain the quality of the seminar work it is mandatory to the seminar guides to maintain a progressive record of the seminar.

Contact Hrs of 4Hrsper week per seminar which shall include the discussion agenda, weekly outcomes achieved during practical sessions, corrective actions and comments on the progress report as per the plan submitted by the students including dates and timing, along with the signature of the student as per the class and teacher time table (as additional teaching load).

Such record of progressive work shall be referred by the examiners during evaluation. Students should implement the idea of seminar topic using any technical open tools appropriately.

Approved Syllabus in detail for Semester- III

Course Structure andScheme of Examination for M.Tech E&TC (VLSI & Embedded System)

Subject code	Subject Name	Teaching scheme (Weekly Load in hrs.)				Credits	Evaluation Scheme						ESE Duration (Hrs.)
Branch- E&TC													
Semester- III													
							Theory			PR		Total	
		Lecture	Tutorial	Practical	Total		TAE 20 %	CAE 20 %	ESE 60%	Internal	External		
MVESD601	Technical Writing (LATEX)	-	-	2	2	2	-	-	-	50	50	100	_
MVEP602	Seminar-II	-	-	4	4	4	-	-	-	50	50	100	-
MVEP603	Dissertation Phase I	-	-	8	8	8	-	-	-	150	50	200	-
	Total	-	-	14	14	14	-	-	-	250	150	400	-

MVESD601: Technical Writing (LATEX)		
Teaching Scheme:	**Examination Scheme (Theory)**	**Examination Scheme (Laboratory)**
Lectures: Nil **Tutorials:** Nil **Practical:** 2Hr/Week	**TAE:** Nil **SAE:** Nil **ESE:** Nil	**Internal: 50** **External : 50** **Total Marks : 100**
Credit		**2**
Prerequisite (If any):		
Course Objective:		

Course Objective:

1. This course discusses the principles of composing decent pieces of technical writings. We will discuss strategies for different types of writing, including academic papers, presentation slides, resume/CV, statement of purpose, and popular science articles.
2. The course will lay more emphasis on *writing*.

Course Outcomes:

1. Apply many important techniques of technical writing .
2. Produce well-written reports, instructions, memos, chapters, and other common types of documents
3. Edit a piece of writing in an effective manner
4. Develop a set of slides for a presentation and deliver an effective presentation
5. Use the LATEX typesetting system
6. Develop indexes for books

Course Contents:

1. Issues of technical writing and effective presentation of material.
2. Types of documentation, papers, books, and computer programs.
3. Use of Latex for writing.
4. Writing IEEE paper in Format, dissertation format and writing articles.
5. Resume writing .

MVEP602: SEMINAR II

Teaching Scheme:	Examination Scheme (Theory)	Examination Scheme (Laboratory)
Lectures: Nil **Tutorials:** Nil **Practical:** 4 Hr/Week	**TAE:** Nil **SAE:** Nil **ESE:** Nil	**Internal: 50** **External : 50** **Total Marks : 100**
Credit		**4**

Prerequisite (If any):

Course Objective:

Shall be on state of the art topic of students own choice approved by anDepartmental Research Committee (DRC).

The student shall submit the duly certified seminar report in standard format, for satisfactory completion of the work by the concerned Guide and head of the department/institute.

Seminar-II shall be on the topic relevant to latest trends in the field.

Term work should consist of ---

I) Spiral bound report preferably, printed on both sides of paper on the topic of dissertation work and should be submitted in standard format having following contents.

   i)A report on training undergone on a construction project site/ organization /for a period of minimum 15 days , including the data collection necessary for the project work.

   ii) A report on the topic of dissertation , containing the following :

   a) Literature review and problem statement formulation.
   b) Research Methodology and proposed schedule of completion of project work.
   c) Students should prepare a power point presentation to be delivered in 15 minutes and should be able to answer questions asked in remaining five minutes.

II) Spiral bound report preferably, printed on both sides of paper on vocational training of 2 weeks.

MVEP603: Dissertation Phase I		
Teaching Scheme:	**Examination Scheme (Theory)**	**Examination Scheme (Laboratory)**
Lectures: Nil **Tutorials:** Nil **Practical:** 8 Hr/Week	**TAE:** Nil **SAE:** Nil **ESE:** Nil	**Internal: 150** **External : 50** **Total Marks : 200**
Credit		**8**
Prerequisite (If any):		

Course Objective:

The project work will start in semester- III and should preferably be a live problem in the industry or macro-issue of industry and should involve scientific research, design, collection and analysis of data, determining solutions and must preferably bring out the individuals contribution.

The Dissertation Stage-I report should be presented in a standard format , in a spiral bound hard copy, preferably printed on both sides of paper, containing the following contents.

i) Introduction including objectives, limitations of study
ii) Literature survey, background to the research.
iii) Problem statement and methodology of work.
iv) Theoretical contents associated with topic of research
v) Filed application, case studies
vi) Data collection from field/organization or details of experimental work/analytical work
vii) Part analysis/ inferences
viii) Details of remaining work to be completed during the project work stage-II
ix) References

Students should prepare power point presentation to be delivered in 25 minutes and should be able to answer questions asked in remaining five minutes.(It is preferred that at least one paper on the research area be preferred in a conference or published in a referred journal)

Approved Syllabus in detail for Semester- IV

Course Structure andScheme of Examination for M.Tech E&TC (VLSI & Embedded System)

Branch- E&TC

Semester-IV

Subject code	Subject Name	Teaching scheme (Weekly Load in hrs.)				Credits	Evaluation Scheme						ESE Duration (Hrs.)
							Theory			PR		Total	
		Lecture	Tutorial	Practical	Total		TAE 20 %	CA E 20 %	ESE 60%	Internal	External		
MVEP604	Seminar - III	-	-	4	4	4	-	-	-	50	50	100	-
MVEP605	Dissertation Phase II	-	-	16	16	16	-	-	-	150	50	200	-
	Total	-	-	20	20	20	-	-	-	200	100	300	-

MVEP604: SEMINAR III		
Teaching Scheme:	**Examination Scheme (Theory)**	**Examination Scheme (Laboratory)**
Lectures: Nil **Tutorials:** Nil **Practical:** 4 Hr/Week	**TAE:** Nil **SAE:** Nil **ESE:** Nil	**Internal: 50** **External : 50** **Total Marks : 100**
Credit		**4**
Prerequisite (If any):		
Seminar III: Shall preferably an extension of **seminar II.** The student shall submit the duly certified seminar report in standard format, for satisfactory completion of the work by the concerned guide and Head of the Department.		

MVEP605 : Dissertation Phase II		
Teaching Scheme:	**Examination Scheme (Theory)**	**Examination Scheme (Laboratory)**
Lectures: Nil **Tutorials:** Nil **Practical:** 16 Hr/Week	**TAE:** Nil **SAE:** Nil **ESE:** Nil	**Internal: 150** **External : 50** **Total Marks : 200**
Credit		**16**
Prerequisite (If any):		

Course Objective:

The students should be :

1. Able to design system for research problem
2. Able to apply latest technology.
3. Able to apply testing skills.
4. Able to implement other real time problems

Dissertation Stage – II

In Dissertation Stage – II, the student shall complete the remaining part of the dissertation which will consist of the fabrication of set up required for the project, work station, conducting experiments and taking results, analysis & validation of results and conclusions.

Student should publish one International Journal Paper (having ISSN Number and preferably with Citation Index II); or paper can be published in reputed International Journal recommended by the guide of the Dissertation and in addition to above the term work shall include the paper published.
To maintain the quality of the dissertation work it is mandatory on the dissertation guides to maintain a progressive record of the dissertation contact 8 Hrs of at least 4Hrs per week which shall include the dissertation discussion agenda.
Weekly outcomes achieved during practical sessions, corrective actions and comments on the progress report as per the plan submitted by the students including dates and Such record of progressive work shall be referred by the dissertation examiners during evaluation.

The student shall prepare the duly certified final report of project work in standard format for satisfactory completion of the work by the concerned guide and Head of the Department

Department of

First Year B.Tech.

F.Y.B.Tech Course Book

(2016 Pattern)

(With effect from June 2016)

Department of
First Year B.Tech.

Under Graduate (UG) Course Book

F.Y. B.Tech. (Common)

Semester I /II

INDEX

About First Year Department

- Department provides a common platform to all branches students by imparting fundamental knowledge
- Involvement of Experts from IITs, NITs, Govt. Colleges, Reputed Industries, Alumni and Students in development of curriculum
- Choice Based Credit System (CBCS)
- General Proficiency - Foreign Language (German, French, Japanese and Spanish)
- Remedial Teaching
- Sponsorship for Publications and IPR
- Research Mentorship
- Industry Internship
- Provision of Credit Transfer Scheme (CTS)
- Peer Teaching Scheme
- Teacher Guardian Scheme (TGS)
- Various Clubs and Hobby Modules
- Emphasis on English Communication
- Activity based learning

INSTITUTE VISION AND MISSION

VISION

To achieve excellent standards of quality education by keeping pace with rapidly changing technologies and to create technical manpower of global standards with capabilities of accepting new challenges.

MISSION

Our efforts are dedicated to impart quality and value based education to raise satisfaction level of all stake holders. Our strength is directed to create competent professionals. Our endeavor is to provide all possible support to promote research and development activities.

DEPARTMENT VISION AND MISSION

DEPARTMENT VISION

To achieve excellent standard of quality education through effective teaching and learning process and to create technical manpower with capabilities of global standards.

DEPARTMENT MISSION

To impart quality and value education by providing high standard technical knowledge to create competent professionals.

To inculcate research amongst students and faculties.

Program outcomes

Engineering Graduate will be able to:

PO1	**Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO2	**Identify**, formulate, review research literature, and analyse complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences
PO3	**Design/development of solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
PO4	**Conduct investigations of complex problems**: Use research-based knowledge and research methods including design of experiments, analysis, and interpretation of data, and synthesis of the information to provide valid conclusions.
PO5	**Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.
PO6	**The engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
PO7	**Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and a need for sustainable development.
PO8	**Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO9	**Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO10	**Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions
PO11	**Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
PO12	**Life-long learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

First Year B.Tech Structure & Evaluation Scheme

Semester - I														
S N	**Subject Code**	**Subject Name**	**Teaching**				**Credits**	**Evaluation Scheme (Marks)**						**ESE Duration (Hrs)**
								Theory			**Practical**		**Total**	
			Lect.	**Tut.**	**Pract.**	**Total**		**TAE**	**CAE**	**ESE**	**Cont. Assessment**	**Ext**		
1	BEML101	Engineering Mathematics-I	3	1	–	4	4	20	20	60	–	–	100	3
2	BPHL102 BPHP102 / BCHL103 BCHP103	Engineering Physics/Engineering Chemistry	4	1	2	7	6	20	20	60	25	25	150	3
3	BITL104 BITP104 / BECL105 BECP105	Programming in C / Basic Electronics Engineering	2	–	2	4	3	10	10	30	25	25	100	2
4	BEEL106 BEEP106 / BCEL107 BCEP107	Basic Electrical Engineering /Engineering Mechanics	3	1	2	6	5	20	20	60	25	25	150	3
5	BMEL108 BMEP108/ BHUL113, BMEP111, BFYP112	Basic Mechanical and Engineering Graphics/ Communication Skills, Workshop, Mini modeling	2	–	2	4	3	20	20	60	25	25	150	3
6	BHUP109 / BIDL101	Environmental Studies and Professional Ethics / Bio System in Engineering	2	–	–	2	Audit Course	–	–	–	–	–	–	–
Total			**16**	**3**	**8**	**27**	**21**	**90**	**90**	**270**	**100**	**100**	**650**	**14**

Engineering Management Law Schools Other Courses
NAGPUR PUNE JALGAON AMRAVATI AHMEDNAGAR CHHINDWARA
RAISONI GROUP OF INSTITUTIONS

First Year B.Tech Structure & Evaluation Scheme

Semester - II														
S N	**Subject Code**	**Subject Name**	**Teaching**				**Credits**	**Evaluation Scheme (Marks)**						**ESE Duration (Hrs)**
								Theory			**Practical**		**Total**	
			Lect.	**Tut.**	**Pract.**	**Total**		**TAE**	**CAE**	**ESE**	**Cont. Assessment**	**Ext**		
1	BEML110	Engineering Mathematics-II	3	1	–	4	4	20	20	60	–	–	100	3
2	BPHL102 BPHP102 /BCHL103 BCHP103	Engineering Physics/ Engineering Chemistry	4	1	2	7	6	20	20	60	25	25	150	3
3	BITL104 BITP104 /BECL105 BECP105	Programming in C / Basic Electronics Engineering	2	–	2	4	3	10	10	30	25	25	100	2
4	BEEL106 BEEP106 /BCEL107 BCEP107	Basic Electrical Engineering / Engineering Mechanics	3	1	2	6	5	20	20	60	25	25	150	3
5	BMEP111	Workshop	–	–	2	2	1	–	–	–	50	–	50	–
6	BFYP112	Mini Modeling	–	–	2	2	1	–	–	–	50	–	50	–
7	BMEL108 BMEP108 /BHUL113 & BMEP111	Basic Mechanical and Engineering Graphics/ Communication Skills	2	–	–	2	2	10	10	30	–	–	50	2
8	BHUP109 / BIDL101	Environmental Studies and Professional Ethics / Bio System in Engineering	2	–	–	2	Audit Course	–	–	–	–	–	–	–
Total			**16**	**3**	**10**	**29**	**22**	**80**	**80**	**240**	**175**	**75**	**650**	**13**

Department of First Year B.Tech.

Detailed Syllabus

F. Y. B. Tech
Semester I/II

BEML101: Engineering Mathematics - I

Teaching Scheme	**Examination Scheme (Theory)**	**Examination Scheme(Lab)**
Lectures: 3 Hrs/Week	**Teachers Assessment Exam:** 20 Marks	**Internal(TW):** ---
Tutorials: 1 Hr/Week	**Class Assessment Exam:** 20 Marks	**External(PR) :**Nil
	End Semester Exam: 60 Marks	**External(OR) :** Nil
Credit	**4**	**-----**

Prerequisite: 12th Science Basics

Course Objective : After completing this course student will able

1. To understand system of linear equations arising in all engineering fields using matrix methods where knowledge of Eigen values and Eigen vectors are essential.
2. To introduce Successive Differentiation and its application in the field of Engineering.
3. To understand concept of convergence of sequences and series with applications to modeling of realistic problems
4. To understand concept of sphere, Cone and Cylinder that arise in vector calculus, electro-magnetic field theory, CAD-CAM, computer graphics etc.

Course Outcome:

1. It will be possible to express the physical problems in to mathematical formulation and to find the proper solutions and apply concepts of matrices and its application for solving engineering problems.
2. Able to find solution of linear algebraic equations with consistency and inconsistency.
3. Able to find the limits and continuity of functions of multiple variables and finding nth derivative by various methods.
4. Able to find the convergence, divergence and range of convergence of various series.
5. Able to find Reduction formulae of various functions and its applications.
6. Able to calculate Cartesian, spherical, polar co-ordinate system as well as equation of sphere, cone, cylinder with guiding curve.

Course Contents **Hrs**

Unit – I : Matrices 6

Basics of Matrix, Rank of Matrix, Reduction methods Normal form, Row Echelon form and PAQ form, System of Linear algebraic equations , homogeneous and Non-homogeneous equations with consistency and inconsistency.

Unit – II : Linear Algebra 6

Linear dependence and independence of vectors, Linear and Orthogonal Transformation, Eigen values, Eigen vectors (Symmetric and Non Symmetric Matrices), Cayley-Hamilton theorem.

Unit –III: Differential Calculus and Expansion of Functions 8

Successive Differentiation, Finding Nth Derivative by standard function, trigonometrical transformation, Partial fraction method. Leibnitz's Theorem. Indeterminate Forms, L' Hospital's Rule, Taylor's Series and Maclaurine's series with standard expansion, differentiation and Integration, use of substitution.

Unit – IV : Infinite Series 6

Infinite Sequences, Infinite Series, Alternating Series, Tests for Convergence by Cauchy's nth root test, p test, comparison test, D'Alemberts Ratio test, Raabe's test, Leibnitz test, Absolute and Conditional Convergence, Range of Convergence.

Unit – V : Integral Calculus 8

Reduction Formulae, Beta and Gamma functions, Differentiation Under Integral Sign, Error Functions.

Unit – VI : Solid Geometry 8

Cartesian, Spherical, Polar and Cylindrical Co-ordinate Systems. Sphere, Cone and Cylinder

Tutorials

1. Basics & Problem solving of rank, LD & LI, Normal form.
2. Problem solving of Eigen values, Eigen vectors, Cayley-Hamilton theorem.
3. Leibnitz Theorem, Indeterminate forms.
4. Infinite Series, Taylor's & Maclaurine's Series.
5. Examples on Reduction Formulae, Beta & Gamma functions.
6. Examples on Right Circular Cone & Cylinder.

Text Books:

1. "Higher Engineering Mathematics", B.S. Grewal, Khanna Publishers.
2. Applied Mathematics (Volumes I and II) by P. N. Wartikar & J. N. Wartikar (Pune Vidyarthi Griha Prakashan, Pune)
3. Higher Engineering Mathematics by B.V. Ramana (Tata McGraw-Hill).

Reference Books:

1. Advanced Engineering Mathematics, 7e, by Peter V. O'Neil (Thomson Learning).
2. *Advance Engineering Mathematics* Erawin Kreyszig, Wiley India Pvt. Ltd New Delhi.
3. Advanced Engineering Mathematics, 2e, by M. D. Greenberg (Pearson Education).

Web Links:

- **Matrices:**
  https://www.youtube.com/watch?v=mYVbYBZZdW0
  https://www.youtube.com/watch?v=hbk01uhgsos
- ***Eigen value & Eigen Vectors***
  https://www.youtube.com/watch?v=XM4GU8hPoZs
  https://www.youtube.com/watch?v=P2pL5VThrzQ
- **Successive differentiation**
  https://www.youtube.com/watch?v=zWURS768QrA
- ***Leibnitz thm:***
  https://www.youtube.com/watch?v=67uJGwsZz-Q
- **Indeterminate forms:**
  https://www.youtube.com/watch?v=PNTnmH6jsRI
- **Infinite Series**
  http://ocw.mit.edu/courses/mathematics/18-01-single-variable-calculus-fall-2006/
  video- lectures/lecture-37-infinite-series/
  https://www.youtube.com/watch?v=qNZxf0j41tw
- **Gamma function:**
  www.youtube.com/watch?v=Vc8dIykQRhy
  www.youtube.com/watch?v=SYfLj-koGJO
- **DUIS:**
  www.youtube.com/watch?v=NpXWv2jR4nC

BEML110: Engineering Mathematics – II

Teaching Scheme	Examination Scheme (Theory)	Examination Scheme(Lab)
Lectures: 3 Hrs/Week	**Teachers Assessment Exam:** 20 Marks	**Internal(TW):** Nil
Tutorials: 1 Hr/Week	**Class Assessment Exam:** 20 Marks	**External(PR) :**Nil
	End Semester Exam: 60 Marks	**External(OR) :** Nil
Credit	**4**	**-------**

Course Objective : After completing this course student will able

1. To analyze and solve first order differential equations

2. To aware of the applications of first order differential equations and modeling of various physical systems such as Newton's Law of cooling and simple electrical circuits.
3. To design and analysis of continuous and discrete system where the knowledge of Fourier series and Harmonic analysis required.
4. To understand multiple integration.
5. To understand concept of Partial Differential Equation in Engineering Applications such as Electric circuit, Heat transfer etc.
6. To understand Stationary Values of functions (Maxima and Minima), arising in optimization problems.

Course Outcome:

1. To compute solutions for first order ordinary differential equations using different analytic techniques and able to model and solve various simple real world phenomenon governed by ordinary differential equations of first order.
2. Able to understand application of differential equation.
3. Able to trace the curve and use multiple integral to formulate various engineering problems and find its area and volume.
4. Students are able to find maxima & minima, critical points, points of inflection, Errors and Approximations.
5. It will help to develop analytical skills to provide solution to the simple engineering problems.
6. Apply the fundamentals of mathematics in various branches of engineering.

Course Contents	**Hrs**
Unit – I :Differential Equations	6
Definition, Order and Degree of DE, Formation of DE. Solutions of Variable separable, Homogeneous DE, Exact DE (without Integrating Factor method), Linear DE and reducible to these types.	
Unit – II :Applications of Differential Equations	6
Applications of DE to orthogonal trajectories, Rate of decay of radioactive materials, Newton's Law of Cooling, Kirchhoff's Law of Electrical Circuits, Simple harmonic motion, One–Dimensional Conduction of Heat.	
Unit – III : Fourier series	8
Definition, Dirichlet's conditions, Full Range Fourier Series, Half Range Fourier Series, Harmonic Analysis and Applications to Problems in Engineering.	
Unit – IV : Multiple Integral & Applications	8

Basics of Curve Tracing, Double Integration, triple integration, Applications to Area , Volume.

Unit – V : Partial Differential Equation 8

Partial derivatives of composite function, variable to be treated as constants, Euler's theorem on homogeneous functions of two & three variables, Implicit functions, Total Derivatives.

Unit – VI : Application of Partial Differential Equation 6

Jacobians and their applications, Errors and Approximations, Maxima and Minima of Functions of two variables, Lagrange's Method of undetermined multipliers.

Tutorials

1. Basics & Problem solving of Differential Equations.
2. Problem solving of Newton's Law of Cooling, Electrical Circuits, Conduction of Heat.
3. Examples on Fourier series.
4. Examples on Multiple Integral & Applications
5. Examples on Partial differential equations.
6. Examples on Error & Approximations, Maxima & Minima.

Text Books:

1) Higher Engineering Mathematics by B. S. Grewal (Khanna Publication, Delhi).
2) Higher Engineering Mathematics by B.V. Ramana (Tata McGraw-Hill).
3) Applied Mathematics (Volumes I and II) by P. N. Wartikar & J. N. Wartikar (Pune Vidyarthi Griha Prakashan, Pune)

Reference Books:

1) Advanced Engineering Mathematics by Erwin Kreyszig, Volume I & II (Wiley Eastern Ltd)
2) Advanced Engineering Mathematics, 7e, by Peter V. O'Neil (Thomson Learning).
3) Advanced Engineering Mathematics, Wylie C.R. & Barrett L.C. (McGraw-Hill, Inc.)

Weblink:

- **Ordinary Differential Equations:**
  www.youtube.com/watch?v=P7gVp333B6M
- **Linear Differential Equations:**
  www.youtube.com/watch?v=1FnBPmEWpus
- **Fourier series:**

www.youtube.com/watch?v=3bXH7AkIV6C

www.imperial.ac.uk/worksspace/mathematics/Public

- **Multiple Integral:**

  http://freevideolectures.com/Course/2267/Mathematics-I/28#

  http://www.learnerstv.com/video/Free-video-Lecture-1823-Maths.htm

- **Partial Differential Equations:**

  http://nptel.ac.in/courses/111103021/

  https://www.youtube.com/watch?v=PTvvoVLzVCE

BPHL102: Engineering Physics

Teaching Scheme	Examination Scheme (Theory)	Examination Scheme(Lab)
Lectures: 4 Hrs/Week	**Teachers Assessment Exam:** 20 Marks	**Internal(TW):** 25 Marks
Tutorials: 1 Hr/Week	**Class Assessment Exam:** 20 Marks	**External(PR) :** 25 Marks
Practical: 2 Hrs/Week	**End Semester Exam:** 60 Marks	**External(OR) :** Nil
Credit	**5**	**1**

Prerequisite : Class XII Knowledge on the course

Course Objective:

1. To understand fundamental principles of Engineering physics specifically concern to electron optics and quantum physics and their engineering applications.
2. To use various techniques for measurement, calculation, control and analysis of engineering problems based on the principles of Electron Optics, Ultrasonic, Acoustics, Laser, Band theory of solids, Quantum Mechanics, Superconductivity, and Nanophysics
3. To provides the basic ideas and gives the solution for developing mathematical and analytical abilities with higher precision.

Course Outcome: At the end of the course student will be able to

1. Solve the problems related to the applications of uniform & non uniform electric and magnetic fields and its use related devices for engineering applications.
2. Understand the nature and characterization of acoustics and its applications.
3. Demonstrate the knowledge of semiconductors and their applications.
4. Apply the concepts of light in optical fibers, light wave communication systems, and holography and for sensing physical parameters
5. Apply knowledge of physics in mechanics, wave properties, properties of matter and to solve simple qualitative and quantitative problems

6. Apply the concepts of physics in various branches of engineering

Course Contents	Hrs
Unit – I : Electron Ballistics	
Motion of charges in uniform electric and magnetic fields; Electron optics: Bethe's law; Electrostatic and magneto static focusing; Devices: CRT, CRO and Cyclotron	8
Unit – II : Ultrasonics & Acoustics of Building	
Ultrasonics: Introduction, Production of ultrasonics waves, Magnetostriction and Piezo electric method, Detection of ultrasonics waves, Applications Acoustics of Building: Basic requirement of acoustically good hall, Reverberation, Sabine formula for reverberation, factors affecting the architectural acoustics and their remedy.	8
Unit – III : Lasers and Holography	
Introduction, Absorption and Emission of Radiation, Characteristics of Laser light, Pumping Scheme, Population Inversion, metastable state, Types of Laser i) two level – semiconductor laser, ii)three level l – Ruby laser, iii)four level – He:Ne laser Applications of Lasers – Holography, Recording and Reconstruction of Image, Applications of Holography, Optical Fiber communication system	8
Unit – IV : Band Theory of Solids	
Introduction, Distinction between Insulators, Semiconductors and Conductors, Intrinsic Semiconductor, Extrinsic Semiconductor, Hall Effect, Fermi Distribution Function, Fermi level in Intrinsic and Extrinsic Semiconductors, band structure of PN junction diode under i) zero bias, ii) forward bias, iii) reverse bias, Working of transistor (NPN only) on the basis of band diagram, photovoltaic effect, working of solar cell on the basis of band diagram and its applications.	9
Unit – V : Quantum Mechanics	
Introduction, Wave particle duality, de Broglie waves, Phase and Group velocities, Heisenberg Uncertainty Principle, Wave function and its Physical Significance, Time Independent and Time dependent Schrodinger Equation, Applications of Schrodinger Equation (infinite potential well – with derivation of energy and wave function), Tunneling through potential barrier, Applications of Tunnel Effect.	9
Unit – VI : Advanced Trends in Physics	6

BPHL102: Engineering Physics

Part A: List of Practical (Any Six)

1. Application of Velocity filter using CRT: To determine e/m by Thomson's method.
2. Study of Lissajou's Figure using CRO
3. Ultrasonic interferometer for the determination of compressibility of liquid
4. Determination of band gap of a given semiconductor
5. Characteristics of Solar cell and Calculation of fill factor
6. Determination of thickness of wire using LASER.
7. Determination wavelength of Laser using Diffraction Grating.
8. Determination of electrical resistivity of semiconductor by using four probe method.

Part B:Mini Project Modeling

Every Students has to performed mini project in a group based on curriculum courses

Instructions to Student:

1. Maximum Three Students are permissible in each group
2. Project must be based on the contents of syllabus of subject.
3. Project report has to be prepared and attach in practical file individually.

Text Books:

1. Engineering Physics, Hitendra K. Malik & A. K. Singh, Tata McGraw Hill, New Delhi, 2010
2. Engineering Physics, Avadhanulu, Kshirsagar, S. Chand Publications
3. Engineering Physics, Guar, Gupta, Dhanpat Rai and Sons Publications

Reference Books:

1. Fundamentals of Physics, Resnick and Halliday, John Wiley and Sons.
2. Lectures on Physics, Volume 1, 2 and 3 by Richard P. Feynman, Narosa Publisers /
3. Pearson Education.
4. Laser and Non-Linear Optics, B. B. Laud (Oscar publication)

Web Links:

1. https://www.youtube.com/watch?v=Lcy3f3QkTIw (Electron Ballistics)
2. http://www.nptel.ac.in/courses/122107035/6 (Acoustics)
3. https://www.youtube.com/watch?v=HFvPzXr7rxU (Nanophysics)
4. https://www.youtube.com/watch?v=knVD1AfiozA (Fermi energy & Fermi level)
5. https://www.youtube.com/watch?v=T8WCr5axQXM (Energy Bands)
6. https://www.youtube.com/watch?v=GglT1RoBPzg (Superconductivity)

BCHP103: Engineering Chemistry

Teaching Scheme:	**Examination Scheme (Theory)**	**Examination Scheme(Lab)**
Lectures: 4Hrs/Week	**Teachers Assessment Exam:** 20 Marks	**Internal(TW):** 25 Marks
Tutorials:1 Hr/Week	**Class Assessment Exam :** 20 Marks	**External(PR) :**25 Marks
Practical: 2Hrs/Week	**End Semester Exam:** 60 Marks	**External(OR) :**Nil
Credit	**5**	**1**

Prerequisite : 12th Standard Curriculum

Course Objective:

1. Technology involved in improving quality of water for its industrial use.
2. The basic concept of Electro analytical techniques that facilitate rapid and reliable measurements.
3. Chemical structure of Polymers and its effect on various properties when used as engineering materials.
4. Study of Fossil fuel and derived fuels with its properties and applications.
5. The principles of chemical and electrochemical reactions causing corrosion and methods used for minimizing.
6. An insight in to Nano materials and advance materials aspect of modern chemistry.

Course Outcome:

1. To apply the knowledge of basic science in engineering and technology and also understand the concept of applied chemistry and analyze it with experiments.
2. The broad education necessary to understand the impact of engineering solutions in global, economic and in environmental context.
3. An ability to design and conduct experiments as well as to organize, analyze and interpret data.
4. An ability to use the techniques, skills and modern engineering tools necessary for engineering practice.
5. To apply the knowledge of advance engineering materials for varied engineering applications.
6. The significance of teaching the aforementioned course is realized in both research, and development of innovative technologies by the student's successful participation in various basic level research oriented programs, and competitions, both at the national and international levels..

Course Contents	Hrs
Unit – I : Water technology and Green chemistry	8

Impurities in water. Hardness of water &its determination by EDTA method. Alkalinity of water and its determination and Numerical on alkalinity and hardness. Ill effects of hard water in boilers. Boiler feed water treatment -1) Internal treatment-calgon and phosphate conditioning, 2) External treatment- a) Zeolite process & its numerical b) Ion exchange method. Desalination of brackish water/Purification of water by Reverse osmosis and Electro dialysis.

Green Chemistry: Introduction, Twelve Principles of green Chemistry Major uses- traditional and green path ways of synthesis of adipic acid, indigo dye.

Unit – II : Electro analytical techniques

Type of reference electrode (calomel electrode), indicator electrode (glass electrode), Ion selective electrode, Half-cell reaction and complete cell reaction.

Conductometery: Introduction, Kohlrausch's law, Conductivity cell, Measurement of conductance, applications-Counductometric titrations, Acid-Base Titrations, precipitation titration, Potentiometry: Introduction, Potentiometric titrations-differential plots. Applications- 8
redox titrations Fe^{2+}/Ce^{4+}titration. UV/Visible spectroscopy: Beer lambert's law, chromophore and auxochrome, types of electronic transitions. Instrumentation and principle- block diagram of single and double beam spectrophotometer. Applications of uv-visible spectroscopy.

Unit – III : Synthetic Organic Polymers

Introduction, functionality of monomer, polymerization-Free radical mechanism & step growth polymerization, Tm and Tg, Thermoplastic and Thermosetting polymers. Compounding of plastics. Preparation, properties & engineering applications of: Polyethylene (LDPE & HDPE) and Bakelite. Elastomers- Natural rubber-processing & vulcanization by sulphur. Synthetic rubbers-SBR. Specialty polymers: Engineering 8
thermoplastics- Polycarbonate, Biodegradable polymers- Poly (hydroxyl butarate-hydroxyvalanate), Conducting polymers- Polyacetylene, Liquid Crystal polymer-Kevlar.

Unit – IV : Fuel & Combustion

Fossil Fuels: Definition, Calorific values, Determination- Bomb calorimeter, Numerical Boy's gas calorimeter, Numerical Solid fuel-coal-Proximate analysis, Ultimate analysis & Numerical. Liquid fuels-Petroleum-composition and refining. Octane number of petrol, 8
Cetane number of diesel, Power alcohol, Biodiesel. Gaseous fuel-Composition, properties and applications of NG, CNG & LPG, Combustion- Chemical reactions, Calculations for air required. Numerical.

Fuel cell: Introduction, applications.

Unit – V: Corrosion science

Introduction. Types of corrosion- Dry corrosion- mechanism, Pilling-bed worth rule. Wet corrosion- mechanism. Factors influencing corrosion- Nature of metal, Nature of environment, Catholic and anodic protection, Use of corrosion Inhibitors Protective coatings: surface preparation 8

a) Metallic coatings:, Electroplating & Electro less plating.

b) Non-metallic coatings: chemical conversion coatings

Unit –VI : Advances in Engineering Chemistry

Nanomaterial: Graphite, Carbon nanotube (CNT) & Fullerenes- Structure, Properties, Applications, Lubricants: Introduction, classification of lubricants, (Liquid, semi– solid (Grease). Biomaterial: classification, Properties, Examples. Biosensor- Introduction, Classification, Applications. Smart Material: Introduction, Shape Memory Alloy and its Example, Advantages, Disadvantages, Applications. 8

BCHP103: Engineering Chemistry

Part A:List of Practical(Any Six)	**Hrs.**
1.Determination of hardness of water by EDTA method.	02
2.Determination of alkalinity of water.	0 2
3.To determine maximum wavelength of absorption of $CuSO_4$ / FeSO4, verify Beer's law and find unknown concentration in given sample	02
4.Titrationofmixture of weak acidands trong acid with strong base using conductometer.	02
5. Preparation of Urea-formaldehyde resin and its characterization.	02
6.Determination of molecular weight/radius of macromolecule polystyrene/polyvinylalcohol	02
7.Proximate analysis of coal	
8. Preparation of nickel coating on copper metal using electroplating & electro less plating	02
9.TO calculate the electrochemical equivalent of copper by electrolysis of copper sulphate solution using copper electrode.	02
10.Determination of acid value of given lubricating oil.	02

Part B:Mini Project Modeling

Every Students has to performed mini project in a group based on curriculum courses 02

Instructions to Student:

1. Maximum Three Students are permissible in each group
2. Project must be based on the contents of syllabus.
3. Project report has to be prepared and attach in practical file individually.

Text Books:

1. Engineering chemistry by O.G. Palana, Tata Mcgraw Hill Eduction Pvt. Ltd.
2. Engineering chemistry by Dr. S.S. Dara Dr. S.S.Umare, S. Chand & company ltd.

Reference Books:

1. Engineering chemistry by Wiley India Pvt. Ltd. First edition
2. Inorganic chemistry, 5e, by Shriver and Atkins, Oxford university press.
3. Shashi Chawala Text book of Engineering Chemistry Sudharani (Dhanpat Rai Publishing Company)

Laboratory Manual:

1. Vogels text book of Quantitative Chemical analysis ,6e,by Mendham, R.C.denney, J.D. Barnes, M.J. K. Thomas, Pearson Education Ltd.
2. Applied Chemistry Theory and Practice ,2e, by O. P. Virmani and A.K. Narula , New age International (P) Ltd.
3. Laboratory manual Engineering Chemistry by Dr. Sudharani (Dhanpat Rai Publishing Company.)

Web Links:

1. www.nptel.ac.in/course/105/04/02-water technology
2. www.nptel.ac.in/syllabus/syllabus.php?subjectId=103/08/00 -electro analytical technique
3. www.nptel.ac.in/courses/113/05028 -polymer
4. www.nptel.ac.in/courses/103/05/10/-fuel & combustion
5. www.nptel.ac.in/courses/113108051/ corrosion science
6 http://nptel.ac.in/course.php?disciplineId=102 – advance materials

BITL104: Programming in C

Teaching Scheme	**Examination Scheme (Theory)**	**Examination Scheme(Lab)**
Lectures:	**Teachers Assessment Exam:** 10 Marks	**Internal (TW) :** 25
2Hrs/Week	**Class Assessment Exam:** 10 Marks	**External (PR) :** 25
Practical: 2Hr/Week	**End Semester Exam:** 30 Marks	**External (OR)** : Nil
Credit	**2**	**1**

Prerequisite :

1. Basic Knowledge of Computer

Course Objective:

1. To make students aware of basics about computers, hardware, software & Operating system.
2. To understand the role of constants, variables, identifiers, operators, type conversion and other building blocks of C Language.
3. To understand the Use of conditional expressions and looping statements to solve problems associated with conditions and repetitions.
4. To understand concept of array and passing array through function
5. To understand the concept of structure and union
6. To develop programming skill in a student to write programs in C language.

Course Outcome:

1. Students are able to understand basic concepts of programming.
2. Students are able to understand the basic terminology used in 'C' programming.
3. Students are able to design programs involving decision structures and loops.
4. Students are able to use different data types in a computer program.
5. Students are able to apply functions and array in program.
6. Students are able to write, compile and debug programs in C language.

Course Contents **Hrs.**

Unit – I :Basics of Programming 4

Basics of programming: approaches to Problem solving, concept of algorithm and flow charts with e.g., types of computer languages: Machine language, assembly language and high level language, concept of assembler, compiler, loader and linker.

Unit – II : C Programming fundamentals 4

Types of programming language , Introduction to C language, tokens, character set, constants, variables, data types, keywords, expressions, operators in C and its types, standard input-output statements in C, structure of C-program.

Unit –III Conditional Program Execution 4

Conditional Program Execution: Applying if and switch statements, nesting if and else, restrictions on switch values, use of break and default with switch, Uses of while, do and for loops, multiple loop variables, assignment operators, using break and continue.

Unit – IV : Introduction to function and Arrays 4

Standard library functions and user defined functions, function declaration, function definition

and function call - call by value and call by reference, return statement, recursion, **Introduction to array**, One and Two Dimensional Arrays, Initialization, Operations on one & two dimensional arrays.

Unit –V Introduction to String 4

Definition of string, Declaration of string, Reading, Writing, String handling operations using and without using library functions, Examples of stings.

Unit – VI : Structure 4

Introduction to Structure definition. Initializing, Assigning values, passing of structure as arguments, Unions, Programming Examples. **Standard C preprocessors,** defining and calling macros, Storage Classes with types.

Practical/Assignments	**Hrs.**
1. Study of Operating Systems – Window & Linux with their Commands	2
2. Write programs to implement simple/basic concepts of C.	2
3. Write programs to implement decision making and control statements in C – if-else, nested if else, if-else-if and switch-case statement.	2
4. Write programs to implement loops in C – while, do-while.	2
5. Write programs to implement for loop in C.	2
6. Write programs to implement string operations in C – strlen(), strcpy(), strcat(), strrev() etc.	2
7. Write programs to implement string operations in C without using library functions.	2
8. Write programs to implement functions in C.	2
9. Write programs to implement of concept call by value & call by reference in C.	2
10. Write programs to implement of Array concept (One dimensional)	2
11. Write programs to implement of Array concept (Two dimensional)	2
12. Write programs to implement structures in C.	2
13. Write a programs to implement union in C.	2

Text Books:

1. E.Balagurusamy, “Programming in ANSI C” , Tata McGraw Hill
2. B.W. Kernighan, D.M. Ritchie, “The C Programming Language”, Prentice Hall of India.
3. Yeshwant Kanetkar, “Let Us C”, BPB Publication.

Reference Books:

1. R.G. Dromey, “How to Solve It By Computer”, Pearson Education
2. K. R. Venugopal, Sudeep R. Prasad, “Programming with C”, Tata McGraw Hill.
3. E.Balagurusamy,“Fundamentals of Computers”, Tata McGraw Hill

Web Links

1. www.w3schools.com
2. www.cprogromming.com
3. www.eskimo.com/~scs/cclass /notes/top.html
4. www.cprogrammingexpert.com/

BECL105: Basic Electronics Engineering

Teaching Scheme:	Examination Scheme (Theory)	Examination Scheme (Laboratory)
Lectures:2Hrs/Week	**Teachers Assessment Examination:** 10 Marks	**Internal(TW):** 25 Marks
Practical: 2 Hrs/Week	**Class Assessment Examination :** 10 Marks	**External(PR) :** 25Marks
	End Semester Examination: 30 Marks	**External(OR) :**Nil
Credit	**2**	**1**

Prerequisite : 12^{th} Physics

Course Objective:

1. To give the basic knowledge of basic components & circuit.
2. To study logic gates and their usages in digital circuits
3. To expose the student to working of power electronic devices and transducers
4. To introduce basic aspect of electronic communication system

Course Outcome ; After completion of this course student will be able to

1. Student can acquire the basic knowledge of electronic components and circuits.
2. To gain the concepts of Semiconductor physics
3. Students will be able to effectively employ basic knowledge for new application
4. To design and analyze basic electronic circuits
5. Students will be able to effectively employ technology for their use.
6. To measure the performance parameters of electronic circuits

Course Contents	Hrs
Unit – I : Diode Circuits	
Half wave rectifier, Full wave rectifier, D.C Regulated Power supply, Diode application: clipper, Clamper. LED Diodes and Photodiode.	4
Unit – II : BJT circuits	
BJT structure and its operation with normal biasing, DC operating point, DC load line	6

analysis in various operating region of BJT. Transistor as an amplifier in CE mode and as a switch.

Unit – III : Linear Integrated Circuit

Introduction to Op-Amp, Op-amp input modes and parameters, Op-Amp with negative feedback: summing amplifier, integrator, and differentiator, IC555 as a astable multivibrator. 6

Unit – IV: Basic Digital Electronics

Introduction to logic gates with their truth table, Boolean algebra, D Morgan's Law, Simplification of logical expressions, Sum of product & product of sum, Implementation of SOP (using 3 variable)on Karnaugh map and solving technique. Implementation of expression with basic gates. 6

Unit – V : Digital Electronics Fundamental

Number system: Binary, Gray, octal, Hex, Half adder, Full Adder, Mux, Demux, Flip-flop, Registers, Mod Counter, Sequential and combinational circuits. 4

Unit – VI : Power devices and Transducers

SCR, DIAC, Triac, Transducer like Thermocouple, RTD, thermister, load cell and its application like Digital thermometer, weighing machine. 6

BECP105: Basic Electronics Engineering

Part A :List of Practical(Any Ten)

1. Study of different electronics components.
2. Study of different electronics measuring devices.
3. Study of regulated DC power supply.
4. Study of V-I characteristics of Diode.
5. Study of Clipper circuits.
6. Study of Clamper circuits.
7. Study of single stage BJT common emitter amplifier circuit.
8. Study of Op-Amp circuits as i) Adder ii) Integrator
9. Study of i) MUX ii) Demux
10. Study of IC555 as a timer
11. Study of Half Adder
12. Study of Full Adder
13. Verify the truth tables of different digital ICs like: AND, OR, NAND, NOR.
14. Study of design of AND,OR by universal gate

15. Study of synchronous counter.
16. Study of asynchronous counter.
17. Study of V-I characteristics of SCR.
18. To design electronic circuit for given application
19. Use of PCB for making circuits.
20. Study of function generator to generate various signals like sinusoidal, triangular, ramp observe the waveform on CRO.

Part B-Mini Project Modeling

Every Students has to performed mini project in a group based on curriculum courses

Instructions to Student:

1)Maximum Three Students are permissible in each group

2) Project must be based on the contents of syllabus.

3) Project report has to be prepared and attach in practical file individuallyProject report has to be prepared and attach in practical file individually.

Text Books:

1. Electronic Devices & circuits – Floyd (Pearson Education India)
2. Modern digital Electronics- R.P. Jain(TMH Publication)
3. Electronics Instrumentation- H.S. Kalsi(Tata McGraw Hill)
4. Communication Electronics principle & Application-Frenzel ((Tata McGraw Hill)
5. Electronic Devices & circuits – salivahanan Tata McGraw Hill

Reference Books:

1. Jacob Miliman, C CHalkias, Chetan Parikh- Integrated Electronics.(Tata McGraw Hill)
2. Debashish De, Kamakhya Prasad Ghatak- Basic Electronics(Pearson Education)
3. J R Cogdell- foundation of Electronics(Pearson Education)

Web Links:

Unit I : PN junction diode & Rectifier

1. http://www.electronics-tutorials.ws/diode/diode_1.html
2. http://www.allaboutcircuits.com/textbook/semiconductors/chpt-3/introduction-to-diodes-and-rectifiers/

Clipper & Clamper

http://www.daenotes.com/electronics/devices-circuits/clipper-clamper

Unit II: BJT

1. Applicationhttp://www.electronics-tutorials.ws/transistor/tran_1.html
2. BJT CE Amplifier:http://www.electronics-tutorials.ws/amplifier/amp_2.html
3. BJT as a switch:http://www.electronics-tutorials.ws/transistor/tran_4.html

Unit III: Linear Integrated Circuit

1. Op amp Application:http://www.electronics-tutorials.ws/opamp/opamp_7.html
2. http://www.electronics-tutorials.ws/opamp/opamp_4.html

IC 555:

3. https://electrosome.com/astable-multivibrator-555-timer/

Unit IV: Basic Digital Electronic

http://www.electronics-tutorials.ws/counter/count_3.html

1. **Unit V:: Digital Electronics Fundamental**
2. Half & Full adderhttp://www.circuitstoday.com/half-adder-and-full-adder
3. http://www.radio-electronics.com/info/data/semicond/thyristor/structure-fabrication.php

Unit VI: Power Devices and Transducers

http://www.radio-electronics.com/info/cellulartelecomms/cellular_concepts/mobile-basics-

Transducers:http://www.electronics-tutorials.ws/io/io_1.html

BEEL106: Basic Electrical Engineering

Teaching Scheme	Examination Scheme (Theory)	Examination Scheme(Lab)
Lectures: 3 Hrs/Week	**Teachers Assessment Exam:** 20 Marks	**Continuous**
Tutorials: 1 Hr/Week	**Class Assessment Exam:** 20 Marks	**Assessment:** 25 Marks
Practical: 2 Hrs/Week	**End Semester Exam:** 60 Marks	**External(PR) :** 25 Marks
Credit	**4**	**1**

Course Objective:

1. To expose the undergraduate first-year engineering students to the fundamental laws of electricity and their applications in day-to-day life.
2. To lay a course foundation for the students who would be trained in the related core subjects like electrical, electronics, instrumentation and control, tele-communications etc.
3. Demonstrate the awareness on social issues like conservation of electrical energy, electrical safety etc.
4. Develop abilities to analyze circuits quantitatively.

Course Outcome:

1. Apply basic electric circuit laws to solve electric circuit problems and design basic D.C. electric circuit using circuit analysis techniques.
2. Apply basic A.C. electric circuit laws in solving A.C. circuit problems and able to perform A.C. power calculation.
3. Learner should understand and grasp the analytical treatment of electrical quantities with the help of phasor-algebra.
4. To understand the difference between DC and AC Systems and between Single-phase and three phase utility AC Source.
5. To understand functioning of basic electrical circuits, useful in domestic and industrial power supplies.
6. To train the learner in adequate experimentation related to high power electricity and in measurements of electrical quantities such as voltage, current and power

Course Contents	Hrs
Unit – I : D.C. Circuits	
Ohm's law, Simplification of networks using series - parallel combinations, Current and Voltage sources, Kirchhoff's laws, Superposition theorem, Thevenin's theorem, Maximum Power Transfer theorem.	07
Unit – II : Single Phase A.C. Circuits	
Concept of AC quantities, Concepts of cycle, Period, Frequency, Generation of alternating voltage and currents, RMS and Average value, Form factor, Crest factor, Phase and Phasor diagrams, AC through Pure resistance, Inductance &Capacitance, R-L , R-C and R-L-C series circuits, Power and Power factors.	07
Unit – III :Three Phase A.C. Circuits	
Three Phase Circuits:- Concept of three phase supply, Phase sequence, Concepts of line, Phase, Neutral etc., Power relations in a Three phase balanced Star and Delta connections, Three phase phasor diagrams.	06
Unit – IV : Fundamentals of Transformer	
Construction, Working Principle, EMF equation, Rating of transformer, Transformer on no load and on Full load, Transformer losses, Calculation of Efficiency and Regulation.	06
Unit – V : Work , Power and Energy	
Energy conversions from one form to another such as Electrical, Thermal and Mechanical, and Numerical problems based on different energy conversions in real life cases.	04

Unit – VI : Electrical Machines

Fundamentals of DC and AC Machines, DC Series and Shunt Motor, AC Single Phase Induction Motor, Stepper Motor, Servo Motor. 06

BEEP106: Basic Electrical Engineering

Part A:List of Practical/Assignments (Any Six)

1. Study of :
    a) Different wiring components, switches, holders, cables, tube circuit, CFL, Megger.
    b) Energy conservation and safety precautions.
2. Study of :
    a) Control of lamp from two switches.
    b) Study of staircase wiring.
3. Verification of Kirchhoff's laws.
4. Verification of Superposition theorem.
5. Verification of Thevenin's theorem.
6. Study of R. L. C. series circuits.
7. Verification of current relations in three phase balanced star and delta connected loads.
8. Single phase transformer:
    a) Voltage and Current ratio
    b) Efficiency and regulation by direct loading method.
9. Load test on DC series motor.

Part B-Mini Project Modeling

Every Student has to perform mini project in a group based on curriculum courses.

Instructions to Student:

1) Maximum Three Students are permissible in each group

2) Project must be based on the contents of syllabus of subject.

3) Project report has to be prepared and attach in practical file individually .

Text Books:

1. **Electrical Technology** Volume-I–B.L. Theraja, S.Chand and Company Ltd.,New Delhi.
2. **Basic Electrical Engineering**, V. K. Mehta , S. Chand and Company Ltd., New Delhi.
3. **Theory and problems of Basic Electrical Engineering**- I. J. Nagrath and Kothari, Prentice-Hall of India Pvt. Ltd.

Reference Books:

1. **Electrical Technology**- Edward Hughes, Seventh Edition, Pearson Education
2. **Elements of Electrical Technology**- H. Cotton, C.B.S. Publications
3. **Electric Machines** by AshfaqHussain - Dhanpatrai

Web Links:

Unit1: correlation on effect of temperature:

1. http://arxiv.org/ftp/arxiv/papers/0903/0903.1334.pdf

Unit-2: Single phase AC Circuit:

2. http://elearning.vtu.ac.in/13/ENotes/BEE/BasicElectricalNotes.pdf

Unit-3: Three Phase AC Circuit:

3. http://www.allaboutcircuits.com/textbook/alternating-current/chpt-10/three-phase-y-delta-configurations/

Unit4: Core construction of Transformer:

4. wapyoutub.com/download/video/How...**Transformer**.../vh_aCAHThTQ

Problems on Transformer:

5. https://www.youtube.com/watch?v=zg0piCo5ZTA
6. https://www.youtube.com/watch?v=9TTxUY0vNb8

Unit-5: Work , Power , Energy:

7. http://www.efm.leeds.ac.uk/CIVE/CIVE1140/
8. docs/mechanics_sec03_full_notes02.pdf

Unit-6: Electrical Machines:

9. https://www.rockwellautomation.com/resources/downloads/rockwellautomation/che/pdf/
10. Application_basics_operation_three_phase_induction_motors.pdf
11. http://www.solarbotics.net/library/pdflib/pdf/motorbas.pdf
12. http://www.baldor.com/Shared/manuals/1205-394.pdf

http://uotechnology.edu.iq/dep-ee/lectures/3rd/Communication/machine/PART%203.pdf

BCEL107: Engineering Mechanics

Teaching Scheme:	Examination Scheme (Theory)	Examination Scheme(Lab)
	Teachers Assessment Exam: 20 Marks	**Internal(TW):** 25 Marks
Lectures: 3 Hrs/Week	**Class Assessment Exam:** 20 Marks	**External(PR)** : 25 Marks
Tutorials: 1 Hrs/Week	**End Semester Exam:** 60 Marks	**External(OR)** :- Nil
Practical: 2 Hrs/Week		
Credit	**4**	**1**

Prerequisite: Knowledge of basic physics and geometry of XIIth standard

Course Objective:

1. Basic concepts of Mechanics for Static and Dynamics have to be implanted into the student.
2. To describe and be able to predict the conditions of rest or motion of the bodies under the action of forces
3. To understand the basic concepts of forces moments, couples in two dimensional force syst

Course Outcomes: After Completion of this course student will be able to

1. Understand the principle of work and energy
2. Comprehend the effect of friction on equilibrium.
3. Understand the laws of motion, the kinematics of motion and the interrelationship.

Course Content	Hrs
Unit – I : Coplanar Force System	
1.1 System of Coplanar forces:- Resultant of Concurrent forces, Parallel forces, Non Concurrent Non Parallel system of forces, Moment of force about a point, Couples, Lami's Theorem, Varignon's Theorem. Distributed Forces in plane, Resultant of general force system 1.2 Center of Gravity and Centroid for plane Laminas	6
Unit – II :Equilibrium of Force System	
2.1 Equilibrium of system of coplanar forces:- Condition of equilibrium for concurrent forces, parallel forces and Non concurrent Non Parallel general forces and Couples. 2.2 Analysis of plane trusses by using Method of joints and Method of sections.	6
Unit – III : Analysis of Beams, Frames & Cables	
3.1 Beams: Types of beams, Types of supports, Types of loading. 3.2 Frames : Analysis of Trusses &Frames	6
Unit – IV : Friction	
4.1 Friction: Dry Friction, Laws of friction, angle of friction & resultant reaction, wedge friction, ladder friction, belt friction. 4.2 Kinematics- Basic concepts, equation of motion for constant acceleration and motion under gravity. Variable acceleration and motion curves.	6
Unit – V : Dynamics	
A] Kinematics of Particle: - Velocity & acceleration in terms of rectangular co-ordinate system, Rectilinear motion, Motion along plane curved path, Tangential & Normal component of acceleration, Motion curves (a-t, v-t, s-t curves), Projectile motion.	6

B] Kinetics of a Particle: Force and Acceleration:-Introduction to basic concepts, Newton's Second law of motion. D'Alemberts Principle.

Unit – VI : Principle of Work Energy & Impulse Momentum

A] Work energy principle for particle: Work, Power, Energy, conservative forces & Potential Energy, Conservation of Energy, Work energy principle for motion of particle. 6

B] Impulse momentum principle for particle: Linear Impulse & Momentum, Conservation of momentum, Direct central impact & coefficient of restitution, Impulse momentum principle

Assignments :

Analytical solution of at least four problems / question on each unit based on above syllabus

BCEP107: Engineering Mechanics

Part A :List of Experiments (Any Six)

1. Study of law of parallelogram of forces
2. To Determine the Reaction at The Supports of Simply Supported Beam
3. To determine coefficient of Friction using Belt Friction
4. Verification of law of polygon of forces by graphical method.
5. Study of Lami's Theorem
6. To Determine the Moment of Inertia of Fly-Wheel.
7. To study kinematics of curvilinear motion of a particle
8. To find coefficient of restitution

Text Books:

1. F. L. Singer, Engineering Mechanics, Third Edition, Harper Publication, 2012
2. Engineering Mechanics – Statics and Dynamics by A Nelson, Tata McGraw Hill Education private Ltd, New Delhi 2009.

Reference Books:

1. Vector Mechanics for Engineers, Tata McGraw Hill Company Beer & Johnston, 2012, 9th Edition.
2. Engineering Mechanics, Pearson Education Asia Pvt. Ltd., Iriving K. Shames, 2009, 4th Edition.
3. Engineering Mechanics, Prentice Hall, R.C.Hibbler, 2003, Tenth Edition
4. Engineering Mechanics, DhanpatRai Publishing Company, S. Ramamrutham, 2009, 9th Edition.
5. Engineering Mechanics, DhanpatRai Publishing Company, R. K. Rajput, 2011, 3rd Edition
6. Engineering Mechanics, S. Chand Publication , R.S. Khurmi& Gupta,30july 2015.

Web Links:

Unit I : Resultant of concurrent force System

1. http://www.ae.msstate.edu/vlsm/forcesys/concurrent_force_systems/resultant.html
2. http://www.brainchamp.net/parallelogram-law-of-coplanar-concurrent-forces/
3. http://www.slideshare.net/guestb54490/concurrent-forces

Lamis theorem

1. http://me-mechanicalengineering.com/lamis-theorem/
2. http://www.tutorvista.com/content/physics/physics-iii/motion-laws/lamis-theorem.php
3. http://encyclopedia2.thefreedictionary.com/Lami's+theorem

Varignos theorem

1. nptel.ac.in/courses/Webcourse-contents/IIT-%20Guwahati/.../lec1.htm
2. me-mechanicalengineering.com/varignons-theorem
3. fsinet.fsid.cvut.cz/en/u2052/node40.htm

Moment & couple

1. www.mathalino.com/reviewer/engineering-**mechanics**/**moment**-force
2. web.mit.edu/4.441/1_lectures/1_lecture5/1_lecture5.html
3. physicsnet.co.uk/a-level-physics-as-a2/mechanics/moments/

Unit II : Analysis of structure (join method & section method)

1. www.mathalino.com › Engineering Mechanics › Analysis of Structures
2. www.thelearningpoint.net/home/...**mechanics/analysis-of-structure**
3. www.ce.memphis.edu/3121/notes/notes_03b.pd
4. https://en.wikipedia.org/wiki/**Structural_analysis**

Unit III : Beam & types of beam & FBD

1. https://en.wikipedia.org/wiki/**Beam**_(structure)
2. www.ecourses.ou.edu/cgi-bin/ebook.cgi?topic=me&chap_sec
3. https://www.quora.com/What-are-the-**types-of-beams**

Unit IV : Friction

1. study.com/academy/.../what-is-friction-definition-formula-forces.html
2. www.physicsclassroom.com › Physics Tutorial › Newton's Laws

Unit V : Dynamics

1. http://www.real-world-physics-problems.com/curvilinear-motion.html
2. http://nptel.ac.in/courses/122103010/md07_experiment/module2/lectures/lect4/slides/slide1.htm
3. www.iitg.ac.in/kd/Lecture%20Notes/ME101-Lecture27-KD.pdf
4. study.com/academy/lesson/projectile-motion-definition-and-examples.html
5. https://www.khanacademy.org/...newtons-laws/newtons-laws.../ne...
6. www.crackthehack.com/bnd/epress/2012/.../d-alemberts-principle-and-its-applications...

Unit VI : Principle of Work-Energy & Impulse

1. https://www.khanacademy.org/.../work...energy/work...energy.../...
2. www.spumone.org/courses/dynamics-notes/impulse_momentum/
3. https://www.coursera.org/.../module-12-define-coefficient-of-restitution-solve-an-imp...

BMEL108 : Basic Mechanical & Engineering Graphics

Teaching Scheme:	Examination Scheme (Theory)	Examination Scheme(Lab)
Lectures: 2 Hrs/Week	**Teachers Assessment Exam:** 20 Marks	**Internal(TW):** 25 Marks
Practical: 2 Hrs/Week	**Class Assessment Exam:**20 Marks	**External(PR) :** 25Marks
	End Semester Exam: 60 Marks	**External (OR) : Nil**
Credit	**2**	**1**

Prerequisite:

1. XIIth Physics and its principles.
2. Basic Geometry and concepts.

Course Objective:

1. To describe the scope of mechanical engineering in multidisciplinary industries.
2. To understand and identify common machine elements with their functions and power transmission devices.
3. To learn conventional machine tools , manufacturing processes and understand the design in mechanical engineering.
4. To develop imagination power of student of physical objects to be represented on paper for engineering communication in technical field.
5. To develop the manual drawing skill, drawing interpretation skill.
6. To develop the physical realization of the dimension of the objects.

Course Outcomes:

1. The students will understand the mechanical engineering in general; they will get information of power transmission shafts, keys, coupling, bush, ball bearing, friction clutches, and brakes.
2. The Students will get information of Individual & group drives, gear train, gear drive etc.
3. The Student will get information of basic Manufacturing processes as well as working principle and types of operations with block diagram of Lathe Machine, Drilling Machine, Grinding Machine.
4. The student will get idea of first & third angle method of projection, projection of lines which are inclined to both planes i.e. H.P & V.P. by first angle method of projection.

5. The student will able to draw Engineering Curves, Projection of Solids, Section of Solids and Development of Solids on sheets with their imagination power; they acquire knowledge of method of drawings adapted all over the world and able to read sheets in engineering field, their dimensioning.
6. The students will get idea of Auto-CAD software which is user friendly to draw 2D and 3D object with uniform dimensioning.

Course Contents	Hrs
Unit – I : Basic Mechanical Devices	
A] Machine Elements : Power transmission shafts, coupling, bush and ball bearing and friction clutches, brakes (Types & application only) **B] Drives :** Individual and group drives, belt drive, chain drive, rope drive, gear drive and Spur Gear Drive arrangement with gear train (Types & application only)	4
Unit – II: Manufacturing Processes & Machine Tools	
A] Manufacturing Processes Basic Manufacturing Processes overviews, Sheet metal forming processes : drawing and bending, Sheet metal Cutting processes : Blanking, Piercing ,Metal Joining Processes : Welding , Soldering , Brazing methods and application **B] Machine Tools& Operations:** Basic Elements, Working Principle, Types of Operations with Block Diagram**:** Lathe Machine, Drilling Machine.	6
Unit – III : Projection of Lines, Projection of Solids, Development of Solid & Orthographic Projection	
A] Introduction to lines and **Engineering Curves** -Ellipse, Parabola, Hyperbola by Focus Directrix and Rectangle Method **B]** Introduction to projection of solids and section of solids and Development of Solid(Prism and Pyramid Maximum with six sides) **C] Orthographic projections** of given pictorial view by First Angle Method of Projections.	8
Unit – IV : Isometric Projection & Auto-CAD	
A] Introduction to Isometric View with the example of Cube Isometric axes, scale, Isometric Projection and Isometric Views. Drawing isometric views of simple solids and objects dimensioning-only Length, width and height of Isometric views. **B] Introduction to AutoCAD**, Commands, AutoCAD drawing of simple 2D objects	6

Engineering Management Law Schools Other Courses
NAGPUR PUNE JALGAON AMRAVATI AHMEDNAGAR CHHINDWARA
RAISONI GROUP OF INSTITUTIONS

BMEP 108: Elements of Mechanical & Engineering Graphics

Part A- List of Practical/Assignments (Any Eight Out of which 9 & 10 compulsory)	Hrs.
1. Study of power transmitting Elements – Gears, Couplings, Bearings	2
2. Study of Automobile Clutches.	1
3. Study of Mechanical Brakes.	1
4. Study, demonstration & working of Lathe Machine	2
5. Study ,demonstration & working of Drilling Machine	2
6. Four problems on Projection of lines	4
7. Two problems on Projection of Solids	4
8. Four problems on Engineering Curves and Development of Lateral Surfaces.	4
9. AutoCAD Drawing- 2 Problem on orthographic	4
10. AutoCAD Drawing- 2 Problem on Isometric Projection	4

Part B-Mini Project Modeling

Every Students has to performed mini project in a group based on curriculum courses

Instructions to Student:

1. Maximum Three Students are permissible in each group
2. Project must be based on the contents of syllabus.
3. Project report has to be prepared and attach in practical file individually.

Text Books:

1. N. D. Bhatt & V. M. Panchal, Engineering Drawing, Plane and Solid Geometry, Charotor Publication House, Anand, Gujrat, India.
2. Dhananjay A. Jolhe, Engineering Drawing with an Introduction to Auto CAD, Tata Mcgraw- hill Publishing Co. Ltd., New Delhi, India.
3. G. Shanmugam S. Ravindran " Basic Mechanical Engineering",Tata McGraw- Hill Publisher Co. Ltd.
4. R. K. Purohit " Foundation of Mechanical Engineering" , Scientific Publishers.

Reference Books :

1. K. Venugopal, Engineering Drawing and Graphics, New Age Publication.
2. N. B. Shaha and B. C. Rana, Engineering Drawing, Pearson Education.
3. C. Jensen, J. D. Helsel and D. R. Short, "Engineering Drawing and Design", Tata McGraw-Hill Education Pvt. Ltd., New Delhi, 2012
4. Surinder kumar , " Basics of Mechanical Engineering". Ane Books Pvt. Ltd., New Delhi, 2011
5. T. J. Parbhu , V. Jaiganesh and S. Jebaraj, " Basic Mechanical Engineering" , Scitech Publications (India) Pvt. Ltd. Chennai, 2010.

Weblinks :

Unit – I

- https://www.google.co.in/webhp?sourceid=chrome-instant&ion=1&espv=2&ie=UTF-8#q=machine+Elements+Shaft+%2C+keys%2C+Coupling
- http://www.codecogs.com/library/engineering/theory_of_machines/belt-and-rope-drives-brakes.php

Unit – II

- https://en.wikipedia.org/wiki/List_of_manufacturing_processes
- http://www.egr.msu.edu/~pkwon/me478/operations.pdf

Unit – III

- http://nptel.ac.in/courses/112103019/20
- http://www.iitg.ernet.in/rkbc/ME111/Lecture4%20Engineering%20Curves%20and%20Theory%20of%20projections.pdf
- http://nptel.ac.in/courses/112103019/29
- http://www.iitg.ernet.in/rkbc/ME111/Lecture11%20Sections%20of%20solids.pdf
- http://www.engineeringessentials.com/ege/ortho/ortho_page2.htm

Unit – IV

- http://home.iitk.ac.in/~cvrm/TA101_L12_IsometricProjections_Basics.pdf
- http://cms.cerritos.edu/uploads/engt/autocad%20basics.pdf

BHUL109: Environmental Studies and Professional Ethics

Teaching Scheme:	**Examination Scheme (Theory)**	**Examination Scheme (Lab)**
Lectures: 2 Hrs/Week	**Teachers Assessment Exam:** Nil	**Internal(TW):** Nil
Tutorial: Nil	**Class Assessment Exam:** Nil	**External(PR) :**Nil
	End Semester Exam: Nil	**External(OR) :** Nil
Credit	**Audit Course**	

Course Objective: After completing the course students wil be able to

1. Understand fundamental concepts of Environmental systems
2. Understand fundamental concepts from the social sciences and humanities underlying environmental thought and governance.

Course Outcome: At the end of the course the student shall be able to:

1. Understand the concepts and methods and their applications in environmental problem-solving.
2. To get knowledge about impact of different types of pollutions.
3. To get knowledge about effect of water pollution on health and different energy recourses.
4. Demonstrate self confidence and self esteem.
5. Present appropriate etiquettes, style, manners and graceful personality.

Course Contents **Hrs**

Unit – I : Environmental Science, Climate Change and need of public awareness

Definition, scope importance and objectives, guiding principle of Environmental studies, climate change and Need for public awareness. Concept of ecosystem biotic & abiotic components, types of ecosystems. Explain different ecosystems- forest, grassland, desert, aquatic. 4

Unit – II : Pollution and Waste Management

Air Pollution & Automobile Pollution: Definition, Effects – Global Warming, Acid rain & Ozone layer depletion, Animal husbandry, controlling measures. 4

Solid Waste Management - E-Waste Management & Biomedical Waste Management - Sources, Characteristics & Disposal methods.

Unit – III : Natural Resources, Material Cycles and Energy

Natural Resources - Water resources – Availability & Quality aspects, Water borne diseases &water induced diseases, Fluoride problem in drinking water. 4

Wealth Material Cycles – Phosphorous Cycle, Carbon Cycle, Nitrogen Cycle & Sulphur Cycle.

Energy – Different types of energy, Conventional sources & Non-Conventional sources of energy. with examples such as Solar energy and Hydro electric energy.

UNIT-IV: Ethics, Value System & Value Education

Ethics:

Behavioral Values, Code of Conduct in College Premises, Addiction, Patriotism – Building respect for the Country, National Anthem and National Flag, Ragging, Respect for Individuals & Environment, Peer – Pressure & Support, Moral Uprightness, Importance of Altruism, Living by the Rules. 4

Value System & Value Education:

Understanding how value system affects behavior and perception, Difference between Values, Moral & Ethics, Concept of Equality, Acceptance, Humility. Importance of Value education for College Student, Understanding the meaning of Vishwas : Differentiating between intention and competence, How to resolve ethical dilemma, “Right” and “Wrong” Action

UNIT-V: Copyrights, Corruption & Integrity and Goal Setting ,Self Improvement and Self Analysis 8

Introduction, Moral Obligations, Copyright Infringement, Patent Law, Case Study Analysis

Goal Setting:

- The importance and benefits of proper goal setting is explained to the students. The following topics are covered: S.M.A.R.T. Goals, Principles of Goal Setting, Steps for Goal

- Setting Activity. Grooming & Body Language: The students are trained on various aspects of self-grooming and body-language.
- Attitude Development: Types of Attitude, How society affects attitude, Importance of right attitude, Activity.
- Vocabulary Building, Public Speaking & Extempore: Vocabulary Building, Crosswords, Word & Meaning, Spellings, Conversation Practice, Extempore Practice, Intonation, Speech Anxiety.

Self Analysis:

- Self Awareness& Mindfulness: Being Self Aware, Self Awareness in relationships, SWOT, Developing Self Awareness, Self Mastery, JoHari Window.

Mini Project Modeling

Every Students has to performed mini project or a survey report in a group based on following topics.

1.Air pollution

2.Noice pollution

3. water treatment

4.Sewage treatment

5.Human Rights ACTs.(right to equality, education, own a private land, other constitutional rights)

6.Recent studies on minimization of solid waste.(electronic waste, biomedical waste, plastic waste etc)

7. Latest existing status regarding rural development. (sanitary, agricultural, lifestyle, use of technical knowledge for improving different perspects of life, health awareness of both humans and animals)

8. Green building

9. Effects of Global warming

10. Impacts of climate change

Instructions to Students

1. Maximum Three Students are permissible in each group

2. Project must be based on the contents of syllabus.

3. Project report has to be prepared and attach in practical file individually.

Reference Books:

1. A textbook of Environment and Ecology – by Shashi Chawla
2. Textbook for Enviornmental Studies for Undergraduate Courses of all Branches of Higher Education by eran barucha.
3. Solid waste management- by chandrappa, Ramesh, Brown and Jeff.
4. A Textbook of Environmental Chemistry & Pollution Control: S SDara, S. Chand & Company, New

Delhi (2002).

5. "Essentials of Ecology & Environment Science" by Rana. S.V.S.; EPI Publications.
6. Gleick, H.P.1993. Water in crisis, Pacifics Institute for Studies in Dev., Environment & Security. Stockholm Env. Institute. Oxford Univ. Press.473p
7. Robert Schuller, Success Never Ends, Failure is Never Final, Revised Edition, Paperback, 1990 Page 14 of 323
8. Allen Pease, Body Language b, First Edition, Paperback, 2005

BMEP111: Workshop

Teaching Scheme:	Examination Scheme: (Theory)	Examination Scheme:(Lab)
Lectures: Nil	**Teachers Assessment Exam:** Nil	**Continuous Assessment:**
Practical: 2Hr/Week	**Class Assessment Exam:** Nil	50 Marks
Tutorial: Nil	**End Semester Exam:** Nil	
Credit	_	**1**

Course Objective:

1. To introduce to names, uses and setting of hand tools for Fitting, Carpentry and Welding used in mechanical engineering workshop.
2. To introduce students to components and PCB making so as to be able to do work related to Mini-Model making in Electronics workshop.

Course Outcome: At the end of this course student are able to

1. Understand and demonstrate workshop safety regulations.
2. Use tools and processes in fitting, carpentry and welding operations.
3. Demonstrate knowledge of component identification and PCB making.

Course Contents	Hrs
Unit – I : Utility Tools	
Carpentry – 1 Job	
Introduction to wood working, kinds of woods, hand tools and machines. Types of joints, wood turning. Pattern making, types of patterns, contraction, draft and machining allowances.	4
Term work to include one job involving joint and woodturning.	
Fitting – 1 Job	
Types of fits, concepts of interchangeability, datum selection, location layout, marking, cutting, shearing, chipping, sizing of metals, drilling and tapping.	4

Term work to include one job involving fitting to size, male-female fitting with drilling and tapping. 4

Sheet Metal Practice – 1 Job

Introduction to primary technology processes involving bending, punching and drawing various sheet metal joints, development of joints.

Term work to include a utility job in sheet metal.

Joining – 1 Job

Includes making temporary and permanent joints between similar and dissimilar material by processes of chemical bonding, mechanical fasteners and fusion technologies. 4

Term work includes one job involving various joining processes like riveting. Joining of plastics, welding, brazing etc.

Unit – II : Demonstrations (Any Four)

Assembly and Inspection

Assembly and Disassembly of some products, tools etc. Videos of advancement in manufacturing technology. Inspection of various components using different measuring instruments. Introduction to measuring equipment used in Quality Control.

Safety in Workshop

Fire hazards, electric short circuit- causes and remedies. Machine protection, Human protection, Accident prevention methods, developing ability to observe safe working habits.

Forging

Hot working, cold working processes, forging materials, hand tools and appliances, hand forging, power forging. 2

Moulding

Principles of moulding, methods, core & core boxes, preparation of foundry sand, casting, plastic moulding.

Plumbing

Types of pipe joints, threading dies, Pipe fitting.

PCB Making

Layout drawing, positive and negative film marking, PCB etching and drilling.

Machine Tools

Turing, Milling, Grinding, Planning – Machines, Tools and Accessories.

Note: All demonstrations to be engaged by teaching faculty and corresponding teaching load be shown in the time table for respective teaching faculty.

Submissions :

Two jobs as mentioned above.

Brief write-up with illustration / sketches on the demonstration (not more than 3 pages for each demonstration.)

Text Books:

Chaudhary, Hazra, "Elements of Workshop Technology,: Volume I & II Media Promoters and Publishers, Mumbai.

Course in Workshop Technology Volume-I, B. S. Raghuwanshi, Laxmi Publication-Revised Edition

BFYP112: MINI MODELING

Teaching Scheme	**Examination Scheme: (Theory)**	**Examination Scheme: (Laboratory)**
Lectures: Nil	**Teachers Assessment Examination:** Nil	**Continuous Assessment:** 50 Marks
Practicals: 2 Hrs./Week	**Class Assessment Examination:** Nil	
Tutorials: Nil	**End Semester Examination :**Nil	
Credit	**----**	**1**

Prerequisite: 12th Science Basics

Course Objective : After completing this course student will able

1. To understand different phase of model development.
2. To learn various techniques of model development.

Course Outcome: student shall be able to:

1. Developing the skills of planning and designing to develop a working Mini Model.
2. Implement knowledge of concepts learnt and workshop practices to prepare a model.
3. Use innovative ideas and convert these into physical models.

Sr. No	Themes for Mini Modeling (value addition Venture)
1	Mechatronics
2	Modeling a) AutoCAD/Autodesk b) Nx4/Ansys/CATIA/Uni Graphics c) Metro Rail/Automobiles

3 Transducers and sensors
   a) Simulink
   b) Lab view
4 Energy conversion and conservation
5 Renewable energy sources
6 Energy Audit
7 Alternate fuels
8 Environmental issues related projects
9 Environmental Audit
10 Designing application based projects PCB Fabrication
11 Agriculture Based Projects
12 Design of web page
13 Bio-Engineering

BHUL113 : Communication Skill

Teaching Scheme:	**Examination Scheme (Theory)**	**Examination Scheme (Lab)**
Lectures: 2Hr/Week	**Teachers Assessment Exam:**10 Marks	**Internal(TW):** Nil
Tutorials: Nil	**Class Assessment Exam:**10 Marks	**External(PR) :**Nil
	End Semester Exam: 30 Marks	**External(OR) :** Nil
Credit	**2**	_

Course Objective:

1. To develop an understanding in the students regarding communication skills
2. To develop the four essential communication skills in the students i.e. reading, writing, listening and speaking
3. To develop the vocabulary and English proficiency of the students
4. Train students to common words, phrases relevant to the immediate communication tasks
5. Enable students to comprehend the concept of communication.
6. Teach students the four basic communication skills – Listening, Speaking, Reading and Writing

Course Outcome: At the end of the course the student shall be able to:

1. The students will develop an understanding regarding communication skills.
2. Development of the four essential communication skills in i.e. –reading, writing, Listening and speaking in students.
3. Enhancement of vocabulary and English proficiency of the students.

Course Contents	Hrs
Unit – I : INTRODUCTION TO COMMUNICATION	
Importance of Communication; Importance of Communicating effectively in English; Communication Process , Channels of communication; Barriers to effective communication, Need of communication skills for Engineers.	2
Unit – II : TECHNICAL COMMUNICATION	
Introduction to Technical Communication; differences between General and Technical Communication; importance of Technical Communication; Technical Communication Skills – Listening, Speaking, Reading, Writing	2
Unit – III : LISTENING SKILLS	
Listening Process; Hearing and Listening; Poor listening habits; Traits of a good listener; Types of Listening Principles of Communication – Communication as coding and decoding – signs and symbols – verbal and non –verbal symbols – Language AND communication; language VS communication – media/channels for communication.	4
Unit – IV : SPEAKING SKILLS	
Phonetics and Diction – Theory and Practical; Body Language; Miscellaneous tips and techniques on speaking. Articles reading.	3
Unit – V : READING SKILLS	
Reading Comprehension Techniques for good comprehension, Interpreting charts and tables, Practical Exercises; Developing reading speed – Theory and Practical; Loud Reading – Practical Exercises in class	3
Unit – VI : TECHNICAL WRITING	
Characteristics of Technical Writing – introduction, characteristics, techniques; Choice of right words, phrases and sentences; Principles of paragraph writing	2
Unit – VII : WRITING BUSINESS LETTERS AND EMAILS	
Business Letters – The 7 Cs of Letter Writing, structure of business letters, writing business letters (applications, enquiry, quotations, complaints, cover letters); Writing professional emails	2
Unit – VIII: OTHER WRITTEN COMMUNICATION	
Writing reports, proposals, press release, articles, essays; drafting of Notices and Advertisements (for newspapers); note-making	2
Unit – IX: VOCABULARY DEVELOPMENT	2

Effective use of dictionary; etymology; homophones and homonyms; synonyms and antonyms; words frequently confused or miss spelt, idioms and phrases

Unit – X: BASICS OF FUNCTIONAL ENGLISH GRAMMAR **2**

Parts of Speech – introduction, prepositions; articles; tenses; narration; punctuation; voice

Text Books:

1. Mason, Margaret M. Examine Your English, Hyderabad: Orient Longman, 1980
2. Sharma, R.S. Technical Writing. Delhi: Radha Publication, 1999
3. Sudarsanam, R. Understanding Technical English. Delhi: Sterling Publishers Pvt. Ltd., 1992
4. Gannon, Robert, Edt. Best Science Writing: Readings and Insights. Hyderabad: University Press (India) Limited, 1991
5. M. Ashraf Rizvi, Effective Technical Communication, First Edition, Tata McGraw Hill, 2012
6. P C Wren and H Martin, High School English Grammar and Composition, Revised First Edition, S Chand, 2005
7. Meenakshi Raman & Sangeeta Sharma, Communication – Principles & Practice, First Edition, Oxford University Press, 2011

Web Reference Links:

- http://www.youtube.com/watch?v=egeyiUpFsaw
- http://www.youtube.com/watch?v=8Oos1qoYe4o
- http://www.youtube.com/watch?v=9Y88Zw7eWZc
- http://www.youtube.com/watch?v=_pFTsGzGuOk
- http://www.youtube.com/watch?v=eB9Bq3YJGcA
- http://www.youtube.com/watch?v=UWBSlMaplT0
- http://www.youtube.com/watch?v=VFrp9ROB44c&feature=pyv&ad=4735114004&kw=success
- http://www.youtube.com/watch?v=e4g0op2P_yY
- http://www.youtube.com/watch?v=AFGNKJruxdg

BIDL101: Bio Systems in Engineering

Teaching Scheme	Examination Scheme (Theory)	Examination Scheme (Lab)
Lectures:2Hrs/Week	**Teachers Assessment Exam :**Nil	**Continuous Assessment:** Nil
Tutorials: Nil	**Class Assessment Exam:** Nil	**External(PR) :**Nil
	End Semester Exam: Nil	

Credit	**Audit Course**	**-------**

Course Objective :

This course introduces general biological concepts

1. It helps students to understand importance of biological concepts in engineering fields.
2. To understand application of engineering concepts in medical instrumentation.

Course Outcome:

Upon successful completion of the course, students will be able to

1. Use bioinstrumentation, required in cellular or molecular biology investigations.
2. Apply the concepts of engineering in different streams of biomedical field.

Course Contents	Hrs
Basics of Biology: Introduction to Human Anatomy and Physiology, The Nervous System, Cardiovascular System. **Biomedical Instrumentation:** Bioelectric Signals, Biomedical Instrumentation System, Biomedical transducers, Electrodes and Their Characteristics. Bio-imaging techniques, ECG, Computer aided ECG, X-Ray, MRI, CT Scan, Blood pressure measurement instrument. **Applications of Biomedical Engineering.**	24

Text Books:

1. "Joseph J. Carr and John M. Brown, "**Introduction to Biomedical Equipment Technology**", 4 th Edition, Prentice Hall, 2000.
2. R. Rangayan, "**Biomedical Signal Analysis**", Wiley 2002**.**

Reference Books:

1. R.S.Khandpur, "**Handbook of Biomedical Instrumentation**", Tata McGraw Hill, New Delhi, 2003, Edition-II.
2. Sörnmo, "**Bioelectrical Signal Processing in Cardiac & Neurological Applications**", Elsevier.
3. "**Biomedical Instrumentation** Arumugam,Anuradha Publishers,2002,First Edition

****

G H Raisoni College of Engineering and Management, Pune
(An Autonomous Institute Affiliated to Savitribai Phule Pune University)
Gat No. 1200, Domkhel Road, Wagholi, Pune-412207

Department of Information Technology

Under Graduate (UG) Course Book

S.Y. B.Tech (IT)

Semester- III/IV

| Engineering | Management | Law | Schools | Other Courses |
• NAGPUR • AMRAVATI • AHMEDNAGAR • PUNE • JALGAON • RAIPUR •
RAISONI GROUP OF INSTITUTIONS

G H Raisoni College of Engineering and management, Pune

(An Autonomous Institute Affiliated to Savitribai Phule Pune University)

Gat No.1200, Domkhel Road, Wagholi, Pune-412207

Department of Information Technology

Academic Year: 2016-17

Under Graduate (UG) Course Book

SY. B.Tech (IT)

Semester- III/IV

Ms. Apashabi Pathan
Autonomy Coordinator (IT)

Ms. Poonam Gupta
BoS (IT), Chairman

Dr. Simran Khiani
H.O.D. (IT)

INDEX

About IT Department

- Involvement of Experts from IITs, NITs, Govt. Colleges, Reputed Industries, Alumni and Students in development of curriculum
- Choice Based Credit System (CBCS)
- Choice of Electives
- Remedial Teaching
- Sponsorship for Publications and IPR
- Industry Internship
- Provision of Credit Transfer Scheme (CTS)
- Peer Teaching Scheme
- Teacher Guardian Scheme (TGS)
- Various Clubs and Hobby Modules
- Proficiency Courses
- Industry Supported Labs.
- MOUs with Industries.

G. H. RAISONI COLLEGE OF ENGINEERING & MANAGEMENT
PUNE

INSTITUTE VISION AND MISSION

VISION

To achieve excellent standards of quality education by keeping pace with rapidly changing technologies and to create technical manpower of global standards with capabilities of accepting new challenges.

MISSION

Our efforts are dedicated to impart quality and value based education to raise satisfaction level of all stakeholders. Our strength is directed to create competent professionals. Our endeavor is to provide all possible support to promote research and development activities.

DEPARTMENT VISION AND MISSION

VISION

To evolve as a center of excellence by developing a competent team of engineers, researchers, academicians, entrepreneurs and to prepare them ready for accepting rapid advancements in the field of Information Technology.

PUNE

MISSION

The department strives to:

M1: Achieve excellence in teaching learning process by imparting quality and value based education to the students through rigorous implementation of innovations in IT curriculum.

M2: To produce competent IT professionals to contribute towards advancement of engineering and technology for the betterment of society.

M3: To encourage faculty and students to get involved in outcome based research and development activities

Program Educational Objectives

PEO1 : To prepare the graduates to apply their knowledge to formulate, analyze ,design and implement feasible solutions to real life problems

PEO2: To prepare the graduates for getting engaged in higher studies and research in the latest trends of IT industry

PEO3: To prepare the graduates to exhibit professionalism, ethics, soft skills and team work

PEO4: To prepare graduates with the ability to communicate effectively and work successfully in multi-disciplinary teams to succeed in varied range of careers

Program Specific Outcomes (PSOs)

PSO1: Graduates will possess an in-depth knowledge of fundamental and application oriented courses in Information Technology such as programming languages, networking, databases, data mining, distributed computing and information security.

PSO2: Graduates will have an ability to plan, deploy and test the accessible research resources for real life applications and to provide solutions with new innovative ideas.

PSO3: Graduates will demonstrate capability to work in teams and professional work environments along with the ability to use state of the art technologies and tools.

Program Outcomes (POs)

Engineering Graduates will be able to:

1. **Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
2. **Problem analysis**: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

3. **Design/development of solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
4. **Conduct investigations of complex problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
5. **Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.
6. **The engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
7. **Environment and sustainability**: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
8. **Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
9. **Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
10. **Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
11. **Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one"s own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
12. **Life-long learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

PUNE

Department of Information Technology
S. Y. B. Tech.

Semester-III

Course Code	Name of the course	Teaching Scheme				Credits	Evaluation Scheme					Total	Duration of Paper
							Theory			Practical			
		L	T	P	Total		TAE	CAE	ESE	INT	EXT		
BCOL201	Data Structures	3	1	-	4	4	20	20	60	-	-	100	3
BCOP201	Data Structures	-	-	4	4	2	-	-	-	25	25	50	3
BCOL203	Computer Architecture &Organization	3	-	-	3	3	20	20	60	-	-	100	3
BEML204	Engineering Mathematics –III	3	1	-	4	4	20	20	60	-	-	100	3
BITL201	Digital Electronics & Logic Design	3	-	-	3	3	20	20	60	-	-	100	3
BITP201	Digital Electronics & Logic Design	-	-	2	2	1	-	-	-	25	-	25	-
BITL202	Object Oriented Programming	3	1	-	4	4	20	20	60	-	-	100	3
BITP202	Object Oriented Programming	-	-	4	4	2	-	-	-	25	25	50	3
BITP203	Internet Technologies Lab	-	-	2	2	1	-	-	-	25	-	25	-
MBL102	General Proficiency:-II: Foreign Language	1	-	2	3	Audit Course	-	-	-	-	-	-	-
Total		16	3	14	33	24	100	100	300	100	50	650	21

PUNE

Department of Information Technology

S. Y. B. Tech.

Semester-IV

Course Code	Name of the course	Teaching Scheme				Credits	Evaluation Scheme					Total	Duration of Paper
							Theory			Practical			
		L	T	P	Total		TAE	CAE	ESE	INT	ET		
BCOL202	Microprocessor Based Systems	4		-	4	4	20	20	60	-	-	100	3
BCOP202	Microprocessor Based Systems	-	-	2	2	1	-	-	-	25	25	50	3
BCOL303	Theory of Computation	3	1	-	4	4	20	20	60	-	-	100	3
BITL204	Graph Theory & Combinatorics	3	1	-	4	4	20	20	60	-	-	100	3
BCOL205	Operating system	4		-	4	4	20	20	60	-	-	100	3
BCOP205	Operating system	-	-	4	4	2	-	-	-	25	25	50	3
BITL205	Data Communication	4			4	4	20	20	60	-	-	100	3
MBL203	General Proficiency:-III: Hobby classes	1	-	2	3	Audit course	-	-	-	-	-	-	-
Total		19	2	8	29	23	100	100	300	50	50	600	21

PUNE

Department of Information Technology

Detailed Syllabus

S. Y. B. Tech.
Semester-III

G. H. RAISONI COLLEGE OF ENGINEERING & MANAGEMENT
PUNE

Department of Information Technology

S. Y. B. Tech.

Semester-III

Course Code	Name of the course	Teaching Scheme				Credits	Evaluation Scheme					Total	Duration of Paper
							Theory			Practical			
		L	T	P	Total		TAE	CAE	ESE	INT	EXT		
BCOL201	Data Structures	3	1	-	4	4	20	20	60	-	-	100	3
BCOP201	Data Structures	-	-	4	4	2	-	-	-	25	25	50	3
BCOL203	Computer Architecture &Organization	3	-	-	3	3	20	20	60	-	-	100	3
BEML204	Engineering Mathematics –III	3	1	-	4	4	20	20	60	-	-	100	3
BITL201	Digital Electronics & Logic Design	3	-	-	3	3	20	20	60	-	-	100	3
BITP201	Digital Electronics & Logic Design	-	-	2	2	1	-	-	-	25	-	25	-
BITL202	Object Oriented Programming	3	1	-	4	4	20	20	60	-	-	100	3
BITP202	Object Oriented Programming	-	-	4	4	2	-	-	-	25	25	50	3
BITP203	Internet Technologies Lab	-	-	2	2	1	-	-	-	25	-	25	-
MBL102	General Proficiency:-II: Foreign Language	1	-	2	3	Audit Course	-	-	-	-	-	-	-
	Total	16	3	14	33	24	100	100	300	100	50	650	21

PUNE

G.H. Raisoni College of Engineering & Management, Pune
Second Year of Information Technology (2017 Course)
BCOL201 DATA STRUCTURES

Teaching Scheme:	Credit	Examination Scheme:
TH: 03 Hours/Week TU:01 Hour/Week	04	TAE: 20 Marks CAE: 20 Marks ESE: 60 Marks

Prerequisite:- Programming in C

Course Objectives:

1. To gain knowledge about basic concepts of data structures.
2. To learn the representation, implementation and applications of linear data structures.
3. To acquire knowledge of stacks and queues with their applications.
4. To aware about the concepts of trees with their applications.
5. To learn and design the algorithm for graphs with their applications.

Course Outcomes:

Graduates shall be able to:

1. Describe the concepts of Data Structure
2. Apply the concepts of linked list, searching and sorting
3. Develop algorithms using stack and queues
4. Identify the applications of data structure
5. Create applications using data structure

4Course Contents

Unit I — Review of C — 07 Hours

Functions: Parameter passing call by value and call by reference, scope rules, functions and pointers, function returning pointer and pointer to function, String manipulations using arrays, pointer to pointer. Structure and Union: Passing and returning structure as parameter for function, structure and pointer, Recursion: Definition, writing recursive functions & how recursion works.

Unit II — Sorting and searching techniques — 07 Hours

Need of sorting and searching, sorting order & stability in sorting.

Sorting Techniques: Algorithms for Bubble sort, Selection sort, Insertion sort, Shell sort, Radix sort, Quick sort and Merge sort.

Analysis of Bubble, Insertion and Quick sorting technique for best, worst and average case, Concept of Internal & External sorting.

Searching Techniques: Algorithms for Sequential search, Binary search, Fibonacci search & concept of Index Sequential search, analysis of sequential and binary searching technique for best, worst and average case.

Unit III — Linear Data Structures using Link List Organization — 08 Hours

Limitations of static memory allocation. Dynamic memory allocation in C. Concept of linked organization, Singly linked list, Doubly linked list, Circular linked list. Operations like insertion, deletion, traversal & other operations on these data structures. **Applications:** Representation & manipulation of polynomials using circular linked lists, Application of doubly linked list in dynamic storage management.

Unit IV — Stacks and Queue — 07 Hours

Stacks: Concept of stack as ADT, Representation and implementation of stack using sequential & linked organization.

Applications of Stacks:, Arithmetic expression conversion & evaluation, reversing a string, parsing : well- formed parenthesis checking.

Queues: Concept of queue as ADT, Representation and implementation of linear queue & circular queue using sequential organization.

Applications of Queues: Job scheduling, Queue simulation, Categorizing data,

Types of Queue: Priority Queue, DEQUE.

Unit V	Trees	09 Hours
Basic tree concepts, binary trees and their properties, representation using linked organization, full and complete binary trees, converting tree to a binary tree, binary tree traversals, Binary search trees & operations. BST as an ADT, Threaded binary trees, Insertion and deletion of nodes in in-order threaded binary tree, pre-order, in-order and post order traversals of in-order threaded binary tree, AVL tree, and applications of trees: Gaming and Expression trees.		
Unit VI	**Graphs**	**07 Hours**
Graph as an ADT, operations, graphs storage structures: Adjacency list, Adjacency Matrix, Traversals: DFS, BFS, Minimum spanning trees: Kruskal‟s and Prim‟s. Algorithm for shortest path and topological sorting.		

Books:

Text:

1. Horowitz,Sahani, “Fundamentals of Data Structures in C” second edition, Universities Press.

Reference:

1. Thomos H. Corman, Charls E. Leiserson, Ronald E. Rivest, Clifford Stein,“Introduction to Algorithms”, Third Edition, Prentice Hall India Learning Pvt. Ltd.
2. Data Structures using c,Aron M. Tanenbaum, Pearson Education, 1 Edition(2003).

G.H.Raisoni College of Engineering & Management, Pune
Second Year of Information Technology (2017 Course)
BCOP201 DATA STRUCTURES

Teaching Scheme:	Credit	Examination Scheme:
PR: 04 Hours/Week	02	Cont. Ass: 25 Marks

		Ext. : 25 Marks **Total: 50 Marks**

Guidelines for Instructor's Manual

The instructor„s manual is to be developed as a hands-on resource and reference. The instructor's manual need to include prologue (about University/program/ institute/ department/foreword/ preface etc), University syllabus, conduction & Assessment guidelines, topics under consideration-concept, objectives, outcomes.

Guidelines for Student's Lab Journal

The laboratory assignments are to be submitted by student in the form of journal. Journal consists of prologue, Certificate, table of contents, and **handwritten write-up** of each assignment (Title, Objectives, Problem Statement, Outcomes, software & Hardware requirements, Date of Completion, Assessment grade/marks and assessor's sign, Theory- Concept, conclusion/analysis).

As a conscious effort and little contribution towards Green IT and environment awareness, attaching printed papers as part of write-ups and program listing to journal may be avoided.

Guidelines for Lab /TW Assessment

Continuous assessment of laboratory work is done based on overall performance and lab performance of student. Each lab assignment assessment should assign grade/marks based on parameters with appropriate weightage. Suggested parameters for overall assessment as well as each lab assignment assessment include- timely completion, performance, innovation, efficiency, punctuality and neatness.

Guidelines for Laboratory Conduction

The instructor is expected to frame the assignments by understanding the prerequisites, technological aspects, utility and recent trends related to the topic. The assignment framing policy need to address the average students and inclusive of an element to attract and promote the intelligent students. The instructor may set multiple sets of assignments and distribute among batches of students. It is appreciated if the assignments are based on real world problems/applications.

Guidelines for Practical Examination

Both internal and external examiners should jointly set problem statements. During practical assessment, the expert evaluator should give the maximum weightage to the satisfactory implementation of the problem statement. The supplementary and relevant questions may be asked at the time of evaluation to test the student„s for advanced learning, understanding of the fundamentals, effective and efficient implementation. So encouraging efforts, transparent evaluation and fair approach of the evaluator will not create any uncertainty or doubt in the minds of the students. So adhering to these principles will consummate our team efforts to the promising start of the student's academics.

Course Objectives:---

1. To understand the Basic concepts of data structures.
2. To learn the representation, implementation and applications of linear data structures.
3. To understand the concepts of stacks and queues with their applications.
4. To understand the concepts of trees with their applications.

Course Outcomes:-

Student shall be able to:

1. Implement the basic concepts of data structure
2. Apply the concepts of linked list, stack, queue, trees and graph
3. Develop applications using concepts of data structure

Sr.No	List of Laboratory Assignments
1	Write a program to perform Set operations - Union, Intersection, Difference, and Symmetric Difference.
2	Write a program to perform various string operations such as Copy, Length, Reversing, Palindrome, and Concatenation and to find occurrence substring with and without using library functions.
3	Implement Sorting Methods using functions- Bubble Sort, Selection Sort and Quick Sort.
4	Implement Sorting Methods using Insertion Sort, and Shell Sort, and Merge Sort.
5	Implement Searching Methods-Sequential Search, Binary Search.

6	Write a menu driven program to perform following operations on SLL: Create, Insert – Start, end, between, Search & delete -- Start, end, between, Reverse without creating temporary list, Display.
7	Perform polynomial addition using a CLL.
8	Implement Stack using an array and use this stack to perform conversion of an expression from infix to postfix form.
9	Implement Stack using a linked list. Use this stack to perform evaluation of a postfix expression.
10	Implement binary tree using linked list and perform recursive and non-recursive traversals.
11	Implement in-order threaded binary tree using linked list and perform traversals.
12	Implement graph using adjacency list or matrix and perform DFS and BFS.
13	Implement graph using adjacency matrix and generate minimum spanning tree using Prim‟s algorithm.
14	Determine single source shortest paths for a graph represented using adjacency matrix.
15	Mini Project - Implement the Mini Project of Student Database using Linked list for following requirements: a. Creation of Student Database in memory containing student ID, Name, Name Initials, Address, Contact No and Date of Birth .b. Insertion, Deletion, Modification of student record for a given student ID.c. Sorting on name initials and searching a particular student record on name initials.

G.H.Raisoni College of Engineering & Management, Pune
Second Year of Information Technology (2017 Course)
BCOL203 COMPUTER ARCHITECTURE & ORGANIZATION

Teaching Scheme:	Credit	Examination Scheme:
TH: 03 Hours/Week	03	TAE: 20 Marks CAE: 20 Marks ESE: 60 Marks

Prerequisite:- Basics of Electronics Engineering

Course Objectives:

1. To introduce basic fundamental units of a computer system.
2. To perform arithmetic operations using various algorithms.
3. To develop skills to understand control unit design.
4. To build concepts of memory system.
5. To study communication of I/O devices.
6. To enhance knowledge of parallel system.

Course Outcomes:

Upon successful completion of the course, students will be able to

1. Describe fundamental units of Computer System
2. Analyze organization and design of memory system
3. Identify different ways of communicating with I/O devices and interfaces
4. Analyze the working of serial and parallel system

Course Contents

Unit I Basic Structure of Computers 07 Hours

The Evaluation of Computers, VLSI Era, Processor architecture, Performance Measures, System Architecture, Functional Units, Basic operational concepts, Von Neumann Architecture, Bus architecture, Addressing modes, Execution of a Complete Instruction.

Unit II Data Path Unit 08 Hours

Scalar Data Types, Fixed and Floating point numbers, Signed numbers, Integer Arithmetic, 2‟s complement method for multiplication, Booths Algorithm, Division, Restoring and Non Restoring algorithms, Floating point representations, IEEE standards, Floating point arithmetic.

Unit III Processing Unit 06 Hours

Basic Concept, Hardwired control, Micro programmed Control, Coprocessor, Pipeline Control, Pipeline Performance

Unit IV Memory Organization 08Hours

Characteristics of memory, Internal and External Memory, Types of memory: ROM: PROM, EPROM, EEPROM, RAM: SRAM, DRAM, SDRAM,RDRAM, Cache Memory, Organization and Mapping Techniques, Replacement Algorithms, Cache Coherence, MESI protocol. Virtual Memory, Associative Memory

Unit V Input /Output Organization 07 Hours

I/O mapped I/O and memory mapped I/O, interrupts and interrupts handling mechanisms, vectored interrupts, synchronous vs. asynchronous data transfer, Direct Memory, Access computer peripheral: I/O devices such as magnetic disk, magnetic tape, CDROM, USB systems.

Unit VI Parallel Organizations 07 Hours

Superscalar Processors, Multiple Processor Organizations, Symmetric Multiprocessors, Clusters, Non -uniform Memory Access, Vector Computations, Bus allocation Schemes. **RISC**: Instruction execution characteristics, use of large register file, compiler based register optimization, RISC architecture and pipelining. RISC Vs CISC.

Books:

Text:

1. John Hayes, 'Computer Architecture and Organization", McGraw Hill, 3rd Edition
2. V.C.Hamacher, Z.G.Vranesic and S.G.Zaky, „Computer Organization", McGraw Hill, 5th edition, 2002.

Reference:

1. A. S. Tanenbaum, “Structured Computer Organization” 4th Edition, Pearson Education
2. M Mano, “Computer System and Architecture”, Pearson Education
3. W. Stallings, “Computer Organization & Architecture”, Pearson Education

G. H. RAISONI COLLEGE OF ENGINEERING & MANAGEMENT
PUNE

G.H.Raisoni College of Engineering & Management, Pune
Second Year of IT Engineering (2017 Course) BEML204:
ENGINEERING MATHEMATICS III

Teaching Scheme:	Credit	Examination Scheme:
TH: 03 Hours/Week TU:01 Hour/Week	04	TAE: 20 Marks CAE: 20 Marks ESE: 60 Marks

Prerequisite:- --

Course Objectives:

After completing this course, student will have adequate mathematical background, conceptual clarity, computational skills and algorithm design for problem solving related to:

1. Linear differential equations of higher order applicable to Control systems, Computer vision and Robotics.
2. To introduce Partial Differential Equations and its applications in the field of Electronics and Telecommunication engineering.
3. Transform techniques such as Fourier transform, Z-transform and applications to Image processing.
4. To introduce Vector differentiation and integration required in Electro-Magnetics and Wave theory.
5. Complex functions, conformal mappings and contour integration applicable to Image processing, Digital filters and Computer graphics

Course Outcomes:

1. Identify the various methods in Differential equations, Vector Calculus, Complex variables and Transforms that applies to the problems in Computer / IT engineering.

2. Interpret the root concepts of mathematics required for the analysis of problems in Computer / IT engineering field.

3. Solve the problems in Computer / IT engineering field using above concepts .

4.Analyze complex problems in practice, categorize it into parts and infer the relation between them

Course Contents

Unit I	Linear Differential Equations (LDE) and Applications	09 Hours
LDE of nth order with constant coefficients, Method of variation of parameters, Cauchy„s & Legendre„s DE, Simultaneous & Symmetric simultaneous DE. Modeling of Electrical circuits.		
Unit II	Partial Differential Equation & Its Applications	08 Hours
Partial Differential equation of first order first degree i.e. Lagrange‟s form. Linear non homogeneous Partial Differential equation of nth order with constant coefficient, method of separation of variables. Application to transmission lines.		
Unit III	Z-Transforms & Fourier Transforms	07 Hours
The Z transform- definition & properties, inverse & relation with Laplace Transform, Application to z transform to solve difference equations with constant coefficients. Fourier Transforms: Fourier Integral theorem, Fourier transforms and their simple properties.		
Unit IV	Vector Differentiation	06 Hours
Physical Interpretation of Vector Differentiation, Vector Differential Operator: Gradient, Divergence& curl, Directional Derivative, Solenoidal, Irrotational and Conservative Fields, Scalar Potential.		
Unit V	Vector Integration	06 Hours
Line, Surface and Volume integrals, Work-done, Green‟s Lemma , Gauss‟s Divergence Theorem,		
Stokes Theorem, Applications to Problems in Electromagnetic Field.		
Unit VI	Complex Variables	09 Hours

Functions of Complex variables, Analytic functions, Cauchy-Riemann equations, Conformal mapping, Bilinear transformation, Cauchy„s integral theorem, Cauchy„s integral formula, Laurent„s series, and Residue theorem.

Books:

Text:

1. B. S. Grewal, “Higher Engineering Mathematics” Khanna Publication, 43th edition.
2. H. K. Dass, „Engineering Mathematics‟, S. Chand Publication 20e, New Delhi,

Reference:

1. Chandrika Prasad, „Mathematics for Engineer‟, S Chand Publication, 8th edition
2. PeterV. O'Neil, “Advanced EngineeringMathematics”, 7e, CengageLearning
3. Jain, R.K. and Iyengar,S.R.K, Advanced Engineering Mathematics, 3rd Edition, New Delhi, Narosa Publishers, 2007
4. Erwin Kreyszig, “Advanced Engineering Mathematics”, 9e, Wiley India

G.H.Raisoni College of Engineering & Management, Pune
Second Year of Information Technology (2017 Course)
BITL201 DIGITAL ELECTRONICS & LOGIC DESIGN

Teaching Scheme:	Credit	Examination Scheme:
TH: 03 Hours/Week	03	TAE: 20 Marks CAE: 20 Marks ESE: 60 Marks

Prerequisites: Basic Electronics Engineering

Course Objective:

1. To Possess knowledge and skills in designing of different code convertors.
2. To develop, design and implement skills of combinational and sequential circuits .
3. To learn and understand basics of Programmable Logic Devices.
4. Use the knowledge of digital electronics concept to design a digital system.
5. Understand basic digital design techniques.
6. To introduce digital logic design software such as VHDL.

Course Outcome:

Upon completion of the course, graduates will be able to -

1. Summarize the basic concepts of digital electronics and design combinational & sequential circuits.
2. Implement various types of state machines.
3. Classify various logic families and illustrate various gates.
4. Design & develop an application using VHDL .

Course Contents

UNIT – I : **NUMBER SYSTEM AND CODES** **8 Hours**

Introduction, Binary number System, Sign-Magnitude representation, One's and Two's complement representation, Binary arithmetic, 2's complement arithmetic,Octal number System, Hexadecimal number System, BCD code, Excess-3 code, Graycode. Code conversion, Boolean algebra: Basic theorems and properties, K-Map:Representation of truth-table, SOP form, POS form, Simplification of logical functions,Minimization of SOP forms using K- Map. Code converters

UNIT – II : **COMBINATIONAL & SEQUENTIAL LOGIC CIRCUITS** **8 Hours**

Part A: Half- Adder, Full Adder, Half Subtractor, Full Subtractor, Binary adder (IC 7483),look ahead carry generator Introduction to MSI functions & chips - Multiplexers (IC 74153), Decoder / Demultiplexer(IC 74138), Encoder

Part B: Introduction of flip-flop (F.F), 1 bit memory cell, clocked S-R F.F., J-K F.F. race around condition, M/S J-K F.F, flip-flop truth table, excitation table, flip-flop conversion, flip flop characteristics. T and D F.F, Design of 4 – bit UP-Down ripple counter using J-K flip-flop, Design of Synchronous 3 bit up/down counter, mod-n counters (IC -7490)

UNIT – III : **DESIGN OF SEQUENTIAL CIRCUITS** **7 Hours**

Shift register (SISO, SIPO, PISO & PIPO), 4 bit bi-directional universal shift register, application of shift registers (Ring counter, Sequence generator,Johnson's counter.) Introduction to PLD‟s:- ROM, PAL,PLA, Applications of PLAs to implement combinational and sequential logic circuits Introduction to :FPGA, CPLD.

UNIT – IV : **LOGIC FAMILIES** **6 Hours**

Characteristics of Digital ICs: Speed, Power dissipation, fan-out, current and voltage parameters, noise margin, operating temperature etc., TTL: Operation of TTL NAND gate, Standard TTL, TTL Characteristics, Active pull-up, Wired-AND, totem pole, open collector, Unconnected Inputs. CMOS Logic: CMOS Inverter,CMOS characteristics.

UNIT – V : **ALGORITHMIC STATE MACHINES** **6 Hours**

Algorithmic State Machines: Finite State Machines (FSM) and ASM, ASM charts, notations, construction of

<table>
<tr><td colspan="3">ASM chart and realization for sequential circuits, Sequence Generator, Types of Counters.</td></tr>
<tr><td>UNIT – VI :</td><td>INTRODUCTION TO VHDL AND PROGRAMMING</td><td>6 Hours</td></tr>
<tr><td colspan="3">Introduction to VHDL - Library, Package, Entity, Architecture, Data Objects (Variable, signal & constant), Data Types (scalar, composite array type & predefined data types, Attributes (necessity and use. event attribute) VHDL Modeling styles – Dataflow, behavioral & structural VHDL statements - Concurrent Statements (With Select, When Else), Sequential Statements (if else, case)VHDL design Examples - Multiplexer, binary adder, counter, shift register</td></tr>
<tr><td colspan="3">Books:</td></tr>
<tr><td colspan="3">Text:
1. R. Jain, “Modern Digital Electronics”, 3rd Edition, Tata McGraw-Hill, 2003, ISBN 0 – 07 – 049492 – 4
2. “A VHDL Primer”, J. Bhaskar, Englewood Cliffs, Prentice Hall, 1994, ISBN-13: 978-0131814479, 2nd Edition</td></tr>
<tr><td colspan="3">Reference:
1. Digital Design", M. Mano, Pearson Education, 2002, ISBN - 81 - 7808 - 555 – 0, 3rd Edition.
2. Malvino, D.Leach “ Digital Principles and Applications”, 5th edition, Tata McGraw Hill</td></tr>
</table>

G.H. Raisoni College of Engineering & Management, Pune
Second Year of Information Technology (2017 Course)
BITP201 DIGITAL ELECTRONICS &LOGIC DESIGN

Teaching Scheme:	Credit	Examination Scheme:
TH: 02 Hours/Week	01	Cont. Ass: 25 Marks Ext. : -- Total: 25 Marks

Guidelines for Instructor's Manual

The instructor„s manual is to be developed as a hands-on resource and reference. The instructor's manual need to include prologue (about University/program/ institute/ department/foreword/ preface etc), University syllabus, conduction & Assessment guidelines, topics under consideration-concept, objectives, outcomes.

Guidelines for Student's Lab Journal

The laboratory assignments are to be submitted by student in the form of journal. Journal consists of prologue, Certificate, table of contents, and **handwritten write-up** of each assignment (Title, Objectives, Problem Statement, Outcomes, software & Hardware requirements, Date of Completion,
Assessment grade/marks and assessor's sign, Theory- Concept, conclusion/analysis).
As a conscious effort and little contribution towards Green IT and environment awareness, attaching printed papers as part of write-ups and program listing to journal may be avoided.

Guidelines for Lab /TW Assessment

Continuous assessment of laboratory work is done based on overall performance and lab performance of student. Each lab assignment assessment should assign grade/marks based on parameters with appropriate weightage. Suggested parameters for overall assessment as well as each lab assignment
assessment include- timely completion, performance, innovation, efficiency, punctuality and neatness.

Guidelines for Laboratory Conduction

The instructor is expected to frame the assignments by understanding the prerequisites, technological aspects, utility and recent trends related to the topic. The assignment framing policy need to address the average students and inclusive of an element to attract and promote the intelligent students. The instructor may set multiple sets of assignments and distribute among batches of students. It is appreciated if the assignments are based on real world problems/applications.

Guidelines for Practical Examination

Both internal and external examiners should jointly set problem statements. During practical assessment, the expert evaluator should give the maximum weightage to the satisfactory implementation of the problem statement. The supplementary and relevant questions may be asked at the time of evaluation to test the student„s for advanced learning, understanding of the fundamentals, effective and efficient implementation. So encouraging efforts, transparent evaluation and fair approach of the evaluator will not create any uncertainty or doubt in the minds of the students. So adhering to these principles will consummate our team efforts to the promising start of the student's academics.

Pre-requisite: NA

Course Objectives:

1. To Possess knowledge and skills in designing of different code convertors
2. To develop, design and implement skill of combinational and sequential circuits
3. To learn and understand basics of Programmable Logic Devices
4. Use the knowledge of digital electronics concept to design a digital system
5. Understand basic digital design techniques.
6. To introduce digital logic design software such as VHDL Programming.

Course Outcomes:

Upon completion of the course, graduates will be able to -

1. Summarize the basic concepts of digital electronics and design combinational & sequential circuits.
2. Implement various types of state machines.
3. Classify various logic families and illustrate various gates.
4. Design & develop an application using VHDL .

Sr.No	List of Laboratory Assignments
1	Design (truth table, K-map) and implementation of 4 bit Code converters. i. Binary to gray and vice versa ii. BCD to Excess-3 and vice versa
2	Multiplexer - e.g. 16:1 Mux using 4:1 Mux (IC 74153) &. Decoder – (IC 74138)HA/FA.
3	Verify the truth table of one bit and two bit comparators using logic gates and IC(7485).
4	BCD adder –using IC 7483
5	Synchronous 2 bit up down Counter
6	Ripple (asynchronous) mod –N counter using IC 7490.
7	Design (State diagram, state table, K map, Bush table & Bush diagram) and implementation of Sequence Generator (with & without bushing) shift register IC 74194.
8	Full adder using behavioral &structure modeling in VHDL
9	4:1 multiplexer using dataflow &structure modeling in VHDL

G. H. RAISONI COLLEGE OF ENGINEERING & MANAGEMENT PUNE

G.H. Raisoni College of Engineering & Management, Pune
Second Year of Information Technology (2017 Course)
BITL202: OBJECT ORIENTED PROGRAMMING

Teaching Scheme:	Credit	Examination Scheme:
TH: 03Hours/Week	04	TAE: 20 Marks
Tu: 01 Hours/Week		CAE: 20 Marks
		ESE: 60 Marks

Prerequisite:- Programming in C

Course Objectives:

1. To learn and understand the difference between object oriented programming and procedural programming.
2. To understand the concepts of dynamic memory allocation & functions.
3. To be aware about the concepts of constructor, destructor & operator overloading.
4. To learn and understand the concepts of inheritance and polymorphism.
5. To recognize the console I/O operations & templates.
6. To learn advanced techniques such as exception handling and file handling.

Course Outcomes:

After successful completion of the course, students should be able to:

1. Describe the fundamental characteristics of Object oriented programming.
2. Understand & choose appropriate methods to solve a problem.
3. Design & develop a solution for real life problems using object oriented concepts.

Course Contents

Unit I	Principles Of Object Oriented Programming	08 Hours

Introduction of Procedure oriented programming, object oriented programming paradigm.

Fundamental of object oriented programming: objects, classes, data members, methods, messages, data encapsulation, data abstraction and information hiding, inheritance, polymorphism, benefits of OOP, application of OOP.

Beginning with C++: Introduction of C++, Simple C++ Program, Structure of C++, Creating Source File, Compiling and Linking, cin, cout, iostream, and namespace.

Unit II	Function in C++	08 Hours

Tokens, identifiers and constant, keywords, data types, operators, variables, expression and control structure, static and dynamic memory allocation, default and constant argument.

Function in C++: Introduction, function prototype, call by reference, return by reference, inline function, defining member functions.

Unit III	Constructors and Operator overloading	08 Hours

Constructor: Introduction to constructor, types of constructors (default, parameterized and copy constructor), destructors

Operator Overloading: Introduction to operator overloading, rules of operator overloading, unary and binary operator overloading, operator overloading using friend function and using member function, type of conversion.

Unit IV	Inheritance and polymorphism	06 Hours

Inheritance: Introduction, Need of inheritance, types of inheritance , ambiguity in multiple inheritance, base and derived classes, member access control, virtual base class

Polymorphism: Introduction, pointer, pointers to object, this pointer, pointer to derived classes, virtual function and pure virtual function. **Console I/O operations:** Introduction, C++ stream, C++ streams classes, I/O operations formatted and unformatted I/O operations **Templates:** Class templates, class templates with multiple parameters, function templates, function templates with multiple parameters.		
Unit V	**Console I/O operations and Templates**	**06 Hours**
Console I/O operations: Introduction, C++ stream, C++ streams classes, I/O operations formatted and unformatted I/O operations **Templates:** Class templates, class templates with multiple parameters, function templates, function templates with multiple parameters		
Unit VI	**Exceptions and File handling**	**08 Hours**
Exception handling: introduction, basic of exception handling, mechanism of exception handling: try, catch, throw **File handling:** Introduction, Classes for file stream operations, file operations: open, close, read, write, detect end of file, file modes, File pointers and their manipulations, error handling during file operations.		
Books:		
Text: 1. Object oriented programming with C++, E Balagurusamy, 4th edition, TMH 2. Object Oriented Programming in C++ -Robert Lafore, edition, Galgotia publications 3. The Complete Reference C++, Herbert Schildt, 4th Edition, TMH		

G. H. RAISONI COLLEGE OF ENGINEERING & MANAGEMENT PUNE

G.H. Raisoni College of Engineering & Management, Pune Second Year of Information Technology (2017 Course) BITP202: OBJECT ORIENTED PROGRAMMING		
Teaching Scheme: **TH: 04 Hours/Week**	**Credit** **02**	**Examination Scheme:** **Cont. Ass: 25 Marks** **Ext. : 25 Marks** **Total: 50Marks**

Guidelines for Instructor's Manual

The instructor„s manual is to be developed as a hands-on resource and reference. The instructor's manual need to include prologue (about University/program/ institute/ department/foreword/ preface etc), University syllabus, conduction & Assessment guidelines, topics under consideration-concept, objectives, outcomes.

Guidelines for Student's Lab Journal

The laboratory assignments are to be submitted by student in the form of journal. Journal consists of prologue, Certificate, table of contents, and **handwritten write-up** of each assignment (Title, Objectives, Problem Statement, Outcomes, software & Hardware requirements, Date of Completion, Assessment grade/marks and assessor's sign, Theory- Concept, conclusion/analysis).

As a conscious effort and little contribution towards Green IT and environment awareness, attaching printed papers as part of write-ups and program listing to journal may be avoided.

Guidelines for Lab /TW Assessment

Continuous assessment of laboratory work is done based on overall performance and lab performance of student. Each lab assignment assessment should assign grade/marks based on parameters with appropriate weightage. Suggested parameters for overall assessment as well as each lab assignment assessment include- timely completion, performance, innovation, efficiency, punctuality and neatness.

Guidelines for Laboratory Conduction

The instructor is expected to frame the assignments by understanding the prerequisites, technological aspects, utility and recent trends related to the topic. The assignment framing policy need to address the average students and inclusive of an element to attract and promote the intelligent students. The instructor may set multiple sets of assignments and distribute among batches of students. It is appreciated if the assignments are based on real world problems/ applications.

Guidelines for Practical Examination

Both internal and external examiners should jointly set problem statements. During practical assessment, the expert evaluator should give the maximum weightage to the satisfactory implementation of the problem statement. The supplementary and relevant questions may be asked at the time of evaluation to test the student„s for advanced learning, understanding of the fundamentals, effective and efficient implementation. So encouraging efforts, transparent evaluation and fair approach of the evaluator will not create any uncertainty or doubt in the minds of the students. So adhering to these principles will consummate our team efforts to the promising start of the student's academics.

Course Objectives:	
1. To learn and understand the difference between object oriented programming and procedural programming. 2. To understand the concepts of dynamic memory allocation & functions. 3. To be aware of concepts of constructor, destructor & operator overloading. 4. To learn and understand the concept of inheritance and polymorphism. 5. To recognize the console I/O operations & templates. 6. Learn advanced techniques such as exception handling and file handling.	
Course Outcomes: After successful completion of the course, students should be able to: 1. Describe the fundamental characteristics of Object oriented programming. 2. Understand & choose appropriate methods to solve a problem. 3. Design & develop a solution for real life problems using object oriented concepts.	

Sr. No	**List of Laboratory Assignments**
1	Apply following problem solving steps for given problem statement: i. Identify the problem ii. Understand the problem iii. Find the alternative solutions iv. Select the best solution v. List the input vi. Result(output)
2	Implementation of Class, object, member functions and array of object for given statement.
3	Create constructor and destructor for given problem statement.
4	Identify and implement different classes and member function using inheritance for given statement.
5	Implementation of Virtual function.
6	Implement the formatted IO function for given statement.
7	Implementations of file handling operation using file stream such as create, open, read, write and close the file.
8	Debugging of code.(Final Project implementation)

G.H.Raisoni College of Engineering & Management, Pune
Second Year of Information Technology (2017 Course)
BITP203 Internet Technologies Lab

Teaching Scheme:	Credit	Examination Scheme:
PR: 02 Hours/Week	01	Cont. Ass: 25 Marks Ext: -- Total: 25 Marks

Guidelines for Instructor's Manual

The instructor„s manual is to be developed as a hands-on resource and reference. The instructor's manual need to include prologue (about University/program/ institute/ department/foreword/ preface etc), University syllabus, conduction & Assessment guidelines, topics under consideration-concept, objectives, outcomes.

Guidelines for Student's Lab Journal

The laboratory assignments are to be submitted by student in the form of journal. Journal consists of prologue, Certificate, table of contents, and **handwritten write-up** of each assignment (Title, Objectives, Problem Statement, Outcomes, software & Hardware requirements, Date of Completion, Assessment grade/marks and assessor's sign, Theory- Concept, conclusion/analysis).

As a conscious effort and little contribution towards Green IT and environment awareness, attaching printed papers as part of write-ups and program listing to journal may be avoided.

Guidelines for Lab /TW Assessment

Continuous assessment of laboratory work is done based on overall performance and lab performance of student. Each lab assignment assessment should assign grade/marks based on parameters with appropriate weightage. Suggested parameters for overall assessment as well as each lab assignment

assessment include- timely completion, performance, innovation, efficiency, punctuality and neatness.

Guidelines for Laboratory Conduction

The instructor is expected to frame the assignments by understanding the prerequisites, technological aspects, utility and recent trends related to the topic. The assignment framing policy need to address the average students and inclusive of an element to attract and promote the intelligent students. The instructor may set multiple sets of assignments and distribute among batches of students. It is appreciated if the assignments are based on real world problems/applications.

Guidelines for Practical Examination

Both internal and external examiners should jointly set problem statements. During practical assessment, the expert evaluator should give the maximum weightage to the satisfactory implementation of the problem statement. The supplementary and relevant questions may be asked at the time of evaluation to test the student„s for advanced learning, understanding of the fundamentals, effective and efficient implementation. So encouraging efforts, transparent evaluation and fair approach of the evaluator will not create any uncertainty or doubt in the minds of the students. So adhering to these principles will consummate our team efforts to the promising start of the student's academics.

Course Objectives:---

1. To discuss concepts ,principles & methods of web Engineering
2. To develop learning ability of Scripting Languages.
3. Identify the basic constructs, technique and issues related to application development.
4. To develop technical competency for CGI & Perl language.
5. To understand the engineering aspect of web technology.
6. To understand and apply Web development processes.

Course Outcomes:-

Upon completion of the course, graduates will be able to,

1. Implement the concepts ,principles& methods of web engineering
2. Implement programs using Scripting languages.
3. Demonstrate the basic constructs, techniques and issues related to application development
4. Demonstrate technical competency for CGI & Perl language.
5. To design and develop website using current Web technologies.
6. Apply the principles & methods to develop complex web applications.

Sr.No	List of Laboratory Assignments
1	Design a simple page and put two text inputs and a Submit button into it. Ask for the user's name, address, city, state, zip. Arrange things neatly in a borderless table so everything lines up and looks nice and neat.
2	Create a Table of Student Information in HTML using appropriate fields.
3	Create Registration form for social network site.
4	Design a Web Page using Image & give link to image.
5	Create a Frame [Page contains two frames] first frame should contain simple form & second frame should contain simple Table.
6	Design a Web page to show Java script validation.
7	Design a web page using Java Script Event Handling.
8	Design a web page to demonstrate the cascading style sheet in HTML.
9	Design a Web Page using Perl language for class record.
10	Write XML code for student Database.
11	Design a website using Content management system of WordPress. Make the use of different plug-ins and themes of the WordPress.

G. H. RAISONI COLLEGE OF ENGINEERING & MANAGEMENT
PUNE

G.H.Raisoni College of Engineering & Management, Pune
Second Year of Information Technology (2017 Course)
MBL102 GENERAL PROFICIENCY - II : Foreign Language

Teaching Scheme:	Credit	Examination Scheme:
TH: 01 Hour/Week PR: 02 Hours/Week	Audit Course	--

Prerequisite:- Nil

Course Objectives:

1. To learn foreign languages to improve inter personal skills.
2. To enable improving business communications and having access to literature in globally recognized languages.
3. To help communicate at international forums and explore opportunities for employment

Course Outcomes:

Upon successful completion of the course, students will be able to

1. Communicate effectively in more than one globally recognized language like French, Spanish, German, Japanese, etc.
2. Interact with technical and business communities at international forums.

Course Contents:

Topics	Learning Goals	Activities
The Alphabets and accents	Pronunciations techniques	Worksheet and charts
Number	1 to	20
Greetings & Salutations,	Articles , Personal Pronoun Day	Daily routines forms of respects
Family and relations	timing Shapes and colors , Possessive	, Vocabulary Relations, Day of week
Weather and Seasons	Pronouns , Gender , Negative Sentence Climate , Fabrics & Clothes ,	Group Activities , Paragraph
House & Household things.	sizes , interrogatives , Basic verbs Describing neighborhood	writing including , Names of months , Seasons, Sky , Stars Furniture , Household articles,
Visit to supermarket	Present Tense Learning the shopping etiquettes	Colors Project on vocabulary of
	, vocabulary of food items , conversing with shopkeepers etc , Plurals	vegetables and fruits , Bakery products , Group Activity / Role play

G H Raisoni College of Engineering and Management, Pune

(An Autonomous Institute Affiliated to Savitribai Phule Pune University)

Gat No. 1200, Domkhel Road, Wagholi, Pune-412207

Department of

Information Technology

Under Graduate (UG) Course Book

S.Y. B.Tech (IT)

Semester- IV

Engineering | Management | Law | Schools | Other Courses

• NAGPUR • AMRAVATI • AHMEDNAGAR • PUNE • JALGAON • RAIPUR •

RAISONI GROUP OF INSTITUTIONS

Department of Information Technology
S. Y. B. Tech.

Semester-IV

Course Code	Name of the course	Teaching Scheme				Credits	Evaluation Scheme					Total	Duration of Paper
							Theory			Practical			
		L	T	P	Total		TAE	CAE	ESE	INT	ET		
BCOL202	Microprocessor Based Systems	4		-	4	4	20	20	60	-	-	100	3
BCOP202	Microprocessor Based Systems	-	-	2	2	1	-	-	-	25	25	50	3
BCOL303	Theory of Computation	3	1	-	4	4	20	20	60	-	-	100	3
BITL204	Graph Theory & Combinatorics	3	1	-	4	4	20	20	60	-	-	100	3
BCOL205	Operating system	4		-	4	4	20	20	60	-	-	100	3
BCOP205	Operating system	-	-	4	4	2	-	-	-	25	25	50	3
BITL205	Data Communication	4			4	4	20	20	60	-	-	100	3
MBL203	General Proficiency:-III: Hobby classes	1	-	2	3	Audit course	-	-	-	-	-	-	-
Total		19	2	8	29	23	100	100	300	50	50	600	21

G.H.Raisoni College of Engineering & Management, Pune
Second Year of Information Technology (2017 Course)
BCOL202 MICROPROCESSOR BASED SYSTEMS

Teaching Scheme:	Credit	Examination Scheme:
TH: 04 Hours/Week	04	TAE: 20 Marks CAE: 20 Marks ESE: 60 Marks

Prerequisite:- NA

Course Objectives:

1. To get familiar with the basic of microprocessor.
2. To gain knowledge about programming of microprocessor.
3. To acquire knowledge of basic peripherals and their interfacing with 8086 microprocessor
4. To identify and describe the recent advancements in microprocessor architectures
5. To expose student and gain more knowledge about Arduino technology
6. To increase student‟s thinking ability by produce new invention that can make people life easier

Course Outcomes:

Graduate shall be able to:

1. Understand the taxonomy of microprocessors and knowledge of contemporary microprocessors.
2. Demonstrate programming using the various addressing modes and instruction set of 8086 microprocessor
3. Understand the concept & types of interrupts
4. Understand architecture , memory management & multitasking of 80386 microprocessor
5. construct applications using a microcontroller (Arduino), using a number of different sensors, actuators and communication media.
6. make creative, imaginative physical applications.

Course Contents

Unit I	**Introduction to 8086 Microprocessor**	**08 Hours**
Building Concepts of Microprocessor, Introduction to 16, 32, 64 bit Microprocessor, Comparison of 8086 / 8088 CPU Architecture, Microprocessor Evolution - INTEL 8086 to Pentium with focus on- Clock Speed, Concurrent operation of EU and BIU, Register organization, Memory Organization & Interfacing.		
Unit II	**8086 Programming**	**08 Hours**
Addressing modes, Instruction set, Programming examples, Pseudo Opcodes, Assembler Directives, Macro and procedure, Introduction to Software and Hardware tools. [Cross assemblers, Logic analyzers, Emulators, Simulators		
Unit III	**Interrupt Structure**	**08 Hours**
Examples on Programming. Interrupt Structure , Interrupt service Routine, Interrupt Vector Table, Hardware and Software Interrupts, INTR ,NMI , Interrupt, Execution of an ISR, Priority of Interrupts.		
Unit IV	**Advanced Microprocessor**	**08 Hours**
80386 Architecture, Real and Protected Mode, Register Model, Memory Management Unit, Segmentation- support registers, logical to linear/physical address translation in real and		
Unit V	**Introduction Of ardiuno**	**08 Hours**

Getting Started Making the Sketch Do Your Bidding.,Using Mathematical Operators,Serial Communications, Simple Digital and Analog Input,Getting Input from Sensors,Visual Output Physical Output		
Unit VI	**Application Of ardiuno**	**08 Hours**
Audio Output, Remotely Controlling External Devices, Using Displays, ,using Time and Dates Communicating Using I2C and SPI, Wireless Communication, Ethernet and Networking Using, Modifying, and Creating Libraries		

Books:

Text:

1. A.K. Ray & K.M. Bhurchandi, Advanced Microprocessors and peripherals- Architectures, Programming and Interfacing, Third Edition, McGraw-Hill Education India Pvt.Ltd., 2007
2. Yu-cheng Liu, Glenn A.Gibson, Microcomputer systems: The 8086 / 8088 Family architecture, Programming and Design, Second Edition, Prentice-Hall, 2007
3. Arduino Cookbook, 2nd Edition O'Reilly Media December-2011

Reference Books :

1. Kenneth Ayala, The 8086 Microprocessor : Programming & Interfacing the PC, Second Edition, Cengage Delmar Learning, 1992
2. Barry B. Brey, The Intel Microprocessors: 8086/8088, 80186/80188, 80286, 80386, 80486, Pentium, Pentium Pro Processor, Pentium II, Pentium III, Pentium 4 and Core2 with 64 - bit Extensions, Eighth Edition,Pearson Education, 2009
3. Walter A. Triebel, Avtar Singh, The 8088 and 8086 Microprocessors: Programming, Interfacing, Software, Hardware, and Applications, Fourth Edition, Pearson, 2002
4. Roy W. Goody, Programming and Interfacing the 8086/8088 Microprocessor : A Product-Development Laboratory Process, Second Edition, Prentice Hall, 1992
5. Thomas P. Skinner, An Introduction to 8086/8088 Assembly Language Programming, Second Edition
6. Wiley, John & Sons, Incorporated, 1987

G. H. RAISONI COLLEGE OF ENGINEERING & MANAGEMENT PUNE

G.H.Raisoni College of Engineering & Management, Pune
Second Year of Information Technology (2017 Course)
BCOP202 MICROPROCESSOR BASED SYSTEMS LAB

Teaching Scheme:	Credit	Examination Scheme:
PR: 02 Hours/ Week	01	Cont. Ass: 25 Marks Ext. : 25 Marks Total: 50 Marks

Guidelines for Instructor's Manual

The instructor„s manual is to be developed as a hands-on resource and reference. The instructor's manual need to include prologue (about University/program/ institute/ department/foreword/ preface etc), University syllabus, conduction & Assessment guidelines, topics under consideration-concept, objectives, outcomes.

Guidelines for Student's Lab Journal

The laboratory assignments are to be submitted by student in the form of journal. Journal consists of prologue, Certificate, table of contents, and **handwritten write-up** of each assignment (Title,
Objectives, Problem Statement, Outcomes, software & Hardware requirements, Date of Completion, Assessment grade/marks and assessor's sign, Theory- Concept, conclusion/analysis).
As a conscious effort and little contribution towards Green IT and environment awareness, attaching printed papers as part of write-ups and program listing to journal may be avoided.

Guidelines for Lab /TW Assessment

Continuous assessment of laboratory work is done based on overall performance and lab performance of student. Each lab assignment assessment should assign grade/marks based on parameters with appropriate weightage. Suggested parameters for overall assessment as well as each lab assignment
assessment include- timely completion, performance, innovation, efficiency, punctuality and neatness.

Guidelines for Laboratory Conduction

The instructor is expected to frame the assignments by understanding the prerequisites, technological aspects, utility and recent trends related to the topic. The assignment framing policy need to address the average students and inclusive of an element to attract and promote the intelligent students. The instructor may set multiple sets of assignments and distribute among batches of students. It is appreciated if the assignments are based on real world problems/applications.

Guidelines for Practical Examination

Both internal and external examiners should jointly set problem statements. During practical assessment, the expert evaluator should give the maximum weightage to the satisfactory implementation of the
problem statement. The supplementary and relevant questions may be asked at the time of evaluation to test the student„s for advanced learning, understanding of the fundamentals, effective and efficient implementation. So encouraging efforts, transparent evaluation and fair approach of the evaluator will
not create any uncertainty or doubt in the minds of the students. So adhering to these principles will consummate our team efforts to the promising start of the student's academics.

Course Objectives:

1. To get familiar with the basic of microprocessor.
2. To gain knowledge about programming of microprocessor.
3. To acquire knowledge of basic peripherals and their interfacing with 8086 microprocessor
4. To identify and describe the recent advancements in microprocessor architectures
5. To expose student and gain more knowledge about Arduino technology
6. To increase student‟s thinking ability by produce new invention that can make people life easier

Course Outcomes:

Graduate shall be able to:

1. Understand the taxonomy of microprocessors and knowledge of contemporary microprocessors.
2. Demonstrate programming using the various addressing modes and instruction set of 8086 microprocessor
3. Understand the concept & types of interrupts
4. Understand architecture , memory management & multitasking of 80386 microprocessor

5. construct applications using a microcontroller (Arduino), using a number of different sensors, actuators and communication media.
6. make creative, imaginative physical applications.

Sr.No	List of Laboratory Assignments
1	To study the architecture of microprocessor 8086 & perform ALP program to print “Hello” and add array of N hexadecimal numbers stored in the memory. Accept input from the user. message.
2	a) Addition of two 8-bit numbers, b) Multiplication of two 16-bit numbers .
3	Write an ALP to accept a string and to display its length & Reverse string
4	Non-Over lapping program and overlapping Progarm
5	Write 8086 Assembly language program (ALP) to Concatenate and compare two strings entered by the user
6	Write a program to convert Hex to ASCII number & convert string having upper case characters to lower case
7	Write a program to convert 4-digit hex number into its equivalent BCD number. (A) HEX to BCD (B) EXIT. And BCD To HEX
8	Write a program to glow LED continuously using Arduino
9	Write a program to display the string “GHRCEM” on LCD using Arduino.
10	Write a program to beep a buzzer with a second delay using Arduino

G. H. RAISONI COLLEGE OF ENGINEERING & MANAGEMENT
PUNE

G.H. Raisoni College of Engineering & Management, Pune
Second Year of Information Technology (2017 Course)
BCOL303 THEORY OF COMPUTATION

Teaching Scheme:	Credit	Examination Scheme:
TH: 03 Hours/ Week Tu: 01 Hours/ Week	04	TAE: 20 Marks CAE: 20 Marks ESE: 60 Marks

Prerequisite:- Data Structures

Course Objectives:

1. To understand general idea of finite state and automata theory.
2. To get aware of regular languages, context free languages and its usefulness in finite state machines.
3. Able to develop skills to provide solutions to variety of real time applications which involve finite automata.

Course Outcomes:

Upon successful completion of the course, students will be able to

1. Explain basics of finite state and automata theory
2. Apply an appropriate technique for finite state problem
3. Compare relationship among machines, languages and grammar
4. Design Push Down Automata and Turing machine

Course Contents

Unit I	Formal Language & Automata Basic Concepts	06 Hours

closure, Languages in abstract, Defining languages, Klenne closure, Symbol /alphabets, string/word, Importance of Automata Theory. Automata- Formal Definition & Designing Finite Automata examples, Simplified Notation, Non determinism-Formal Definition & Designing Non deterministic Finite Automata,
Language Acceptor: Concept, Machine as a language acceptor, example, Machine as a string processor. Finite Automata- Formal Definition & Designing Finite Automata –basic examples, Simplified Notation.

Unit II	Finite automata & regular expressions	09 Hours

Finite Automata: DFA, NFA: Definition and description, Transition Function of a DFA and NFA. Є-NFA: Definition and description ,Transition Function of a NFA, Conversion of Є -NFA NFA , Conversion of NFA to DFA, Conversion of Є -NFA to DFA (direct method and subset construction method), Minimization of a DFA. Inter-conversion RE and FA: Construction of FA equivalent to RE using Arden‟s Theorem. Construction of RE equivalent to FA(RE to Є-NFA, Є-NFA to DFA).FA with output: Moore and Mealy machines -Definition, models, inter conversion.

Regular Expressions and Languages:

Regular expression, regular set, regular expressions, examples and FA. Identity Rules And Algebraic laws for R.E. Regular
languages and examples. Pumping lemma for regular languages. Properties of Regular Languages and FA: Closure and Decision properties, Limitations of FA. Limitations of R.E. Properties of Regular Languages and FA: Closure and Decision properties, Limitations of FA.

Unit III	Regular grammar & context free grammar	06 Hours

-Pumping lemma for regular sets- closure properties of regular sets- decision properties for regular sets, equivalence between regular language and regular grammar. Context – free languages – parse trees and ambiguity, reduction of CFGS, Chomsky and Griebach normal forms.

Unit IV	Push - down Automata (PDA)	07 Hours

non Determinism – acceptance by two methods and their equivalence, The Language of PDA, Equivalence of PDA's and CFG- CFG to PDA, conversion of PDA to CFG,CFLs and PDAs- closure and decision properties of CFLs Deterministic Push Down Automata (DPDA) - Regular language and DPDA, DPDA and CFL, Non-deterministic Push Down Automata (NPDA).

Unit V	Turing machines	12 Hours

The Turing Machine(TM)-Notation, the language of TM, TM and Halting, Extensions to basic TM, TM and Computers.
Post Machine: Introduction to Post Machines, Comparison between FA, PDA, Post Machine and TM. variants – recursively enumerable (r.e.) set – recursive sets, TM as computer of function – decidability and solvability – Halting Problem – reductions – Post correspondence Problem (PCP) and unsolvability of ambiguity problem of CFGs, Church‟s hypothesis, Introduction to

recursive function theory – primitive recursive and partial recursive functions.		
Unit VI	**Trends and Applications of Automata**	**04 Hours**
Recent trends in Theory of computation, Advanced topics & its Application-Attributed Grammar, Contextual Grammar, Concurrent Grammar, Formal methods in concurrency, Graph Grammar, Aspect of Concurrency in Graph Grammar, set theoretic approaches to Graph Grammar, Graph Grammar for parallel computation		
Books:		
Text: 1. Mishra and Chandrashekharan, „ Theory Of Computer Science‟ 2. Introduction of Automata Theory, Languages and computation- J.E. Hopcroft, J.D.Ulman, Pearson education. 3. Introduction to the Theory of Computation (2nd ed.), Sipser, Michael, Course Technology Inc, 2005.		
Reference Books 1. Reference: John Martin, „Introduction Of Automata Theory, Languages and computation‟ 2. Peter Linz, „Introduction to formal languages and automata‟,Norasa,2000.		

G. H. RAISONI COLLEGE OF ENGINEERING & MANAGEMENT
PUNE

G.H.Raisoni College of Engineering & Management, Pune
Second Year of Information Technology (2017 Course)
BITL204 GRAPH THORY AND COMBINATORICS

Teaching Scheme:	Credit	Examination Scheme:
TH: 03 Hours/ Week TU: 01 Hours/ Week	04	TAE: 20 Marks CAE: 20 Marks ESE: 60 Marks

Prerequisite:- Engineering Mathematics III

Course Objectives:

1. To use appropriate set, function and relation models to understand practical examples, and interpret the associated operations and terminologies in context.
2. Learn graphs and trees using different data structures.
3. Formulate problems precisely, solve the problems and applygroups and rings .
4. Introduce combinatorial structures and apply algebraic techniques to combinatorial problems.

Course Outcomes:

Upon successful completion of the course, students will be able to

1. Describe the fundamental concepts of discrete mathematics to solve the engineering problems.
2. Identify , select & apply the data structures to solve real life problems.
3. Apply the counting principles to determine probabilities.

Course Contents

Unit I	Logic and Set theory	09 Hours

Propositional logic, application of propositional logic, propositional equivalences, predicates and quantifiers, normal forms, mathematical induction, sets, finite and infinite sets, un-countable infinite set, set operation, function, cardinality of sets

Unit II	Number Theory	07 Hours

Divisibility and modular arithmetic, integer representations and algorithms, primes and greatest common divisors, solving congruence, applications of congruence

Unit III	Relation	08 Hours

Relation, closure of relation, warshall algorithm, equivalence relation, matrix of relation, transitive closure of relation, partial ordering relation, hasse diagram, recurrence relation, linear recurrence relation with constant coefficient

Unit IV	Groups and Rings	07 Hours

Algebraic systems, groups, semi group, monoid, subgroup, homomorphism, permutations groups, properties of cyclic groups, generator of group, quotient group,rings, fields, integral domain, group codes, : hamming distance

Unit V	Graphs Theory and Trees	08 Hours

Graph terminology, types of graph connected graphs, components of graph, incidence and adjacency matrices, isomorphism, cut vertices, cut edges, Euler graph, Hamiltonian path and circuits, Graph coloring, Chromatic number.

Tree: Definition, types of tree(rooted, binary), properties of trees, binary search tree, tree traversing
(preorder, inorder, postorder), Minimum Spanning trees.

Unit VI	Combinatorics	06 Hours

Definition of generating functions and examples, proof of simple combinatorial identities, Probability, G.F. $p(t) = \sum p_n t^n$, $E(x) = p'(t)$, examples.

Permutation, Combination,binomial coefficient & identifier, generation of permutation and combination

Books:

Text:

1. Kenneth Rosen. Discrete Mathematics and Its Applications, 7th Edition , McGraw Hill Publishing Co., 2012.
2. Discrete Mathematical structure with application to computer science by Trembley&Manohar (Mc. Graw Hill)
3. Discrete Mathematical Structure by Kolmann , Busby & Ross (PHI)

Reference:

1. C.L. Liu, „Element of Discrete Mathematics‟ 2nd second edition TMH 2000
2. John Truss , „Discrete Mathematics‟ Addison Wesley, 2000 .
3. K. D. Joshi, „Foundations of Discrete Mathematical‟ Willey Eastern.
4. M. L. Khanna , „Modern Algebra‟ , Jai PrakashNath& Company Meeru.

G. H. RAISONI COLLEGE OF ENGINEERING & MANAGEMENT
PUNE

G.H.Raisoni College of Engineering & Management, Pune
Second Year of Information Technology (2017 Course)
BCOL205 OPERATING SYSTEM

Teaching Scheme:	Credit	Examination Scheme:
TH: 04 Hours/ Week	04	TAE: 20 Marks CAE: 20 Marks ESE: 60 Marks

Prerequisite:- NA

Course Objectives:

1. To introduce general idea, structure and functions of operating system
2. To make aware of basic mechanisms used to handle processes, manages memory & manages storage devices and files.
3. To provide the details of designing operating systems

Course Outcomes:

Upon successful completion of the course, students will be able to

1. Explain the basics of operating system
2. Apply the concepts of process, memory, I/O devices
3. Evaluate the performance of memory system
4. Detect deadlock on advanced applications

Course Contents

Unit I	Introduction	06 Hours

Evolution of OS, Types of OS, Basic hardware support necessary for modern operating systems, services provided by OS, system programs and system calls, system design and implementation.

Unit II	Process Scheduling and Synchronization	08 Hours

Process concept, process control block, Types of scheduler, context switch, threads, multi-threading model, IPC concept, types of IPC, Goals of scheduling and different scheduling algorithms, Concurrency conditions, Critical section problem, software and hardware solution, semaphores, conditional critical regions and monitors, classical inter process communication problems.

Unit III	Deadlocks detection & avoidance	08 Hours

Deadlock definitions, Prevention, Avoidance, detection and Recovery, Goals of Protection, access matrix, Deadlock implementation, Recent trends in Operating System, Introduction to Advanced OS & its Application

Unit IV	Memory Management	07 Hours

Contiguous allocation, Relocation, Paging, Segmentation, Segmentation with paging, demand paging , Virtual Memory Concepts, page faults and instruction restart , page replacement algorithms , working sets , Locality of reference, Thrashing, Garbage Collection .

Unit V	File Systems	08 Hours

File systems: File concept, Access methods, Disk space management and space allocation strategies, directory structures, Recovery, Log-structured File System, disk arm scheduling strategies, File system of windows

,Linux, android.		
Unit VI	**Device Management**	**08 Hours**

Secondary-Storage Structure: Overview of Mass-Storage Structure, Disk Structure, Disk Attachment, Disk Scheduling, Disk Management, Swap-Space Management, RAID Structure.

I/0 Systems : Overview, I/0 Hardware, Application I/0 Interface, Kernel I/0 Subsystem, Transforming I/0 Requests to Hardware Operations, STREAMS.

Books:

Text:

1. Operating System concepts – Silberchatz & Galvin, Addison Wesley, 6th Edn.
2. Modern Operating Systems – Tanenbaum, Pearson Edn. 2ndedn.

Reference:

Operating Systems – S R Sathe, Macmillan Publishers, India, 2008

Operating System –Milan Milenkovik, McGraw-Hill, 1987

Operating Systems - 3rd Edition by Gary Nutt, Pearson Education.

G. H. RAISONI COLLEGE OF ENGINEERING & MANAGEMENT PUNE

G.H.Raisoni College of Engineering & Management, Pune
Second Year of Information Technology (2017 Course)
BCOP205 OPERATING SYSTEM LAB

Teaching Scheme:	Credit	Examination Scheme:
PR: 04 Hours/ Week	02	Cont. Ass: 25 Marks Ext. : 25 Marks Total: 50 Marks

Guidelines for Instructor's Manual

The instructor„s manual is to be developed as a hands-on resource and reference. The instructor's manual need to include prologue (about University/program/ institute/ department/foreword/ preface etc), University syllabus, conduction & Assessment guidelines, topics under consideration-concept, objectives, outcomes.

Guidelines for Student's Lab Journal

The laboratory assignments are to be submitted by student in the form of journal. Journal consists of
prologue, Certificate, table of contents, and **handwritten write-up** of each assignment (Title, Objectives, Problem Statement, Outcomes, software & Hardware requirements, Date of Completion, Assessment grade/marks and assessor's sign, Theory- Concept, conclusion/analysis).

As a conscious effort and little contribution towards Green IT and environment awareness, attaching printed papers as part of write-ups and program listing to journal may be avoided.

Guidelines for Lab /TW Assessment

Continuous assessment of laboratory work is done based on overall performance and lab performance of student. Each lab assignment assessment should assign grade/marks based on parameters with appropriate weightage. Suggested parameters for overall assessment as well as each lab assignment assessment include- timely completion, performance, innovation, efficiency, punctuality and neatness.

Guidelines for Laboratory Conduction

The instructor is expected to frame the assignments by understanding the prerequisites, technological aspects, utility and recent trends related to the topic. The assignment framing policy need to address the average students and inclusive of an element to attract and promote the intelligent students. The instructor may set multiple sets of assignments and distribute among batches of students. It is appreciated if the assignments are based on real world problems/applications.

Guidelines for Practical Examination

Both internal and external examiners should jointly set problem statements. During practical assessment, the expert evaluator should give the maximum weight age to the satisfactory implementation of the problem statement. The supplementary and relevant questions may be asked at the time of evaluation to test the student„s for advanced learning, understanding of the fundamentals, effective and efficient implementation. So encouraging efforts, transparent evaluation and fair approach of the evaluator will not create any
uncertainty or doubt in the minds of the students. So adhering to these principles will consummate our team efforts to the promising start of the student's academics.

Course Objectives:---

1. To introduce basics of shell programming concepts.
2. To develop skills to write shell scripts in Linux environment.
3. To design Shell scripts applications from simple to massive.

Course Outcomes:-

1. Understand and execute basic commands of shell scripts.
2. Apply basic operations in shell scripts to different applications.
3. Implement the concept of file systems using shell script.
4. Apply concept of creating new process from parent process.
5. Apply concept of virtual file and execute basic commands on it.

Sr.No	List of Laboratory Assignments
1	Study of Unix/Linux general purpose utility command list obtained from (man, who,cat, cd, cp, ps, ls, mv, rm, mkdir, rmdir, echo, more, date, time, kill, history, chmod,chown, finger, pwd, cal, logout, shutdown) commands.
2	Write a menu driven shell script program to develop a calculator.
3	Write a menu driven program for a) Find factorial of a no. b) Find greatest of three numbers c) print number in reverse order

4	Write a program for creating child process by fork () command.
5	Write an IPC program using pipe. Process A accepts a character string and Process B inverses the string. Pipe is used to establish communication between A and B processes using C.
6	Simulation of following CPU scheduling algorithms: a. FCFS b. SJF (preemptive and non-preemptive) c. Priority Scheduling (preemptive and non-preemptive) d. Round Robin Scheduling
7	Simulation of Memory allocation algorithms (First Fit, Best Fit , Next Fit)
8	Simulation of Page replacement algorithms (FIFO, LRU, Optimal)
9	Deadlock avoidance using Banker's Algorithm
10	Write a program in C for reader writer problem.
11	Installation of x code on MAC.
12	Write a program to create a simple calculator in swift.
13	Write a menu driven program in swift 1) check the number is even or odd 2) check the string is palindrome or not.
14	Write a program in swift that convert birth date into year, month and days.
15	Write a program to demonstrate different UI controllers.
16	Write an application to demonstrate the use of table control & views
17	Develop an iphone application in which user can insert, update and delete the record in database
18	Develop a program to generate a sign up form which contains following fields. Username, Password, Gender, Birth date, Country, Image, Submit, Terms and conditions. On successful registration attempt system must generate one alert message. (Label, Round rectangle button, Segmented control, Text field, Picker view, Data picker, Image view, Navigation)
19	Write an i-phone application which can play audio and video files.
20	Develop a medium size project using iOS programming with using all controllers, notifications, database & views
	Reference Book: 1. Unix Concepts and Applications By Sumitabha Das, ISBN 9780070635463,TMH 2. Beginning Linux Programming By Neil Matthew & Richard Stones,ISBN-978-81-265-1571-4,WILEY-INDIA. 3.UNIX Network Programming By Richard Stevens,ISBN- 978-81-203-0749-0,PHI 4.UNIX Systems Programming Communication, Concurrency and Threads 2nd Edition, Kay Robbins, Steve Robbins Jun 2003, Hardback, 912 pages ISBN13: 9780130424112

G.H.Raisoni College of Engineering & Management, Pune Second Year of Information Technology (2017 Course) BITL205 DATA COMMUNICATION		
Teaching Scheme: **TH: 04 Hours/ Week**	**Credit** **04**	**Examination Scheme:** **TAE: 20 Marks** **CAE: 20 Marks** **ESE: 60 Marks**

Prerequisite:-Basic Electronics Engineering

Course Objectives:

1. To introduce basics of data communication and techniques used to transfer data.
2. Identify various types of transmission media and interfaces in network
3. Introduce various analog and digital services for data communication
4. Understand various multiplexing techniques
5. Understand advanced techniques such as Data encoding and Compression.

Course Outcomes:

Upon successful completion of the course, students will be able to

1. Explain the basic concepts of data communication
2. Identify & categorize various types of transmission medias
3. Describe various analog & digital services of data communication.
4. Design & evaluate data communication problem using recent techniques.

Course Contents

Unit I	**Signals**	**08 Hours**

ANALOG AND DIGITAL: Analog and digital data, Analog and digital signals; periodic and aperiodic signals, time and frequency domains; composite signals: frequency spectrum and bandwidth; digital signals: decomposition of digital signal; transmission modes: Serial and Parallel transmission, Asynchronous and Synchronous Transmission, Simplex, Half-Duplex and Full-Duplex communication

Unit II	**Digital Communication**	**08 Hours**

Basic communication system, Bit rate/baud rate, Sampling Rate, How many Bits per Sample? , Shannon theorem, analog-to-digital conversion: pulse code modulation (pcm), dpcm,adpcm, dm,adm digital-to-digital conversion: Unipolar, Polar, Bipolar; Block encoding, Scrambling

Unit III	**Interfaces and Modems**	**08 Hours**

DIGITAL DATA TRANSMISSION: Parallel transmission, Serial Transmission; DTE-DCE INTERFACE: Data Terminal Equipment (DTE), Data Circuit-Terminating Equipment (DEC), Standards, EIA-232 Interface; OTHER INTERFACE STANDARDS: EIA-449, EIA-530

Unit IV	**Communication Media**	**07 Hours**

GUIDED MEDIA: Twisted pair cable, Coaxial cable, Optical Fiber cable; UNGUIDED MEDIA: Radio frequency allocation, Propagation of Radio waves, Terrestrial microwave, Satellite communication, Cellular Telephony; TRANSMISSION IMPAIRMENTS: Attenuation, Distortion, Noise; PERFORMANCE: Throughput, Propagation Speed, Propagation time		
Unit V	**MULTIPLEXING**	**07 Hours**
Frequency division multiplexing (FDM), time division multiplexing (TDM): Inverse Multiplexing, wave-division multiplexing, cdma, hspa. Hsupa, lte multiplexing applications: the telephone system: Common carrier services and hierarchies, Analog services, Digital Services, FTTC: FTTC in the Telephone Network, FTTC in the Cable TV Network.		
Unit VI	**Data Compression**	**07 Hours**
Huffman code, Run-Length Encoding, Relative Encoding, Lempel-Ziv Encoding, Image Compression, JPEG, MPEG, Recent trends and advanced topic on Data Communication		

Books:

Text:

1. Behrouz A. Forouzan , „Data Communications and Networking", 4th edition, Tata McGraw Hill
2. Kennedy, „Electronic communication Systems"

Reference:

1. William A. Shay, „Understanding Data Communications & Networks", 2nd Edition, Vikas Publishing House.
2. Fred Halsall, „Data communication", Pearson Education.
3. http://www.tutorialspoint.com/lte/lte_quick_guide.html

G.H. Raisoni College of Engineering & Management, Pune
Second Year of Information Technology (2017 Course)
MBL203 GENERAL PROFICIENCY - III : Hobby Classes

Teaching Scheme:	Credit	Examination Scheme:
TH: 01 Hours/Week **PR: 02 Hours/Week**	**Audit Course**	--

Hobby Classes

Course Objectives:

1. To enhance the inherent qualities of oneself and provide a platform to show hidden talents
2. To nurture one‟s special capability and interest in activities like sports, drama, singing etc.
3. To help express oneself and be more compatible with outer world in the hobby domain.
4. To enhance creativity & imagination to flow freely.

Course Outcomes:

Upon successful completion of the course students will be able to:

1. Explore and demonstrate the inherent talents within
2. Fruitfully engage themselves in creative activities during spare time.
3. Create balance between academic & work life.
4. Act as a stress buster in the stressed life.
5. Develop self-expression and communication skills.
6. Learn a new skill and increase self-confidence and boosts self esteem.

Topics	Activities
Stress management sessions	Yoga, pranayam, meditation, relaxation techniques
Outdoor activities	Nature walks, treks, cycling, horse riding
Painting	Canvas, fabric , Sketching, knife, glass
Music (vocals and instrument)	Singing, Guitar, Synthesizer, Harmonium, Piano, Flute
Dance	Bharatnatyam, Kathak
Indoor sports	Chess, carom, table tennis
Movie club	Motivational movies and documentaries to be shown
Other creative skills	Embroidery , knitting, use of making things from waste materials, photography, puzzle solving

Faculty of Engineering

Syllabus

T.E. (Information Technology) 2015 Course

(With effect from Academic Year 2017 - 18)

SAVITRIBAI PHULE PUNE UNIVERSITY

The syllabus is prepared by

B.O.S. in Information Technology, Savitribai Phule Pune University

I N D E X

PROGRAM EDUCATIONAL OBJECTIVES

The students of Information Technology course after passing out will

1. Possess strong fundamental concepts in mathematics, science, engineering and Technology to address technological challenges.
2. Possess knowledge and skills in the field of Computer Science and Information Technology for analyzing, designing and implementing complex engineering problems of any domain with innovative approaches.
3. Possess an attitude and aptitude for research, entrepreneurship and higher studies in the field of Computer Science and Information Technology.
4. Have commitment to ethical practices, societal contributions through communities and life-long learning.
5. Possess better communication, presentation, time management and teamwork skills leading to responsible & competent professionals and will be able to address challenges in the field of IT at global level.

PROGRAM OUTCOMES

The students in the Information Technology course will attain:

a. an ability to apply knowledge of mathematics, computing, science, engineering and technology;

b. an ability to define a problem and provide a systematic solution with the help of conducting experiments, analyzing the problem and interpreting the data;

c. an ability to design, implement, and evaluate a software or a software/hardware system, component, or process to meet desired needs within realistic constraints;

d. an ability to identify, formulate, and provide systematic solutions to complex engineering/Technology problems;

e. an ability to use the techniques, skills, and modern engineering technology tools, standard processes necessary for practice as a IT professional;

f. an ability to apply mathematical foundations, algorithmic principles, and computer science theory in the modeling and design of computer-based systems with necessary constraints and assumptions;

g. an ability to analyze and provide solution for the local and global impact of information technology on individuals, organizations and society;

h. an ability to understand professional, ethical, legal, security and social issues and responsibilities;

i. an ability to function effectively as an individual or as a team member to accomplish a desired goal(s);

j. an ability to engage in life-long learning and continuing professional development to cope up with fast changes in the technologies/tools with the help of electives, professional organizations and extra-curricular activities;

k. an ability to communicate effectively in engineering community at large by means of effective presentations, report writing, paper publications, demonstrations;

l. an ability to understand engineering, management, financial aspects, performance, optimizations and time complexity necessary for professional practice;

m. an ability to apply design and development principles in the construction of software systems of varying complexity.

T.E. (Information Technology) 2015 Course to be implemented from June 2017

SYLLABUS STRUCTURE

SEMESTER – I

Subject Code	Subject	Teaching Scheme			Examination Scheme					Total Marks	Credits
		Lecture	Tutorial	Practical	In-Sem. Paper	End-Sem. Paper	TW	PR	OR		
314441	Theory of Computation	4	--	--	30	70	--	--	--	100	4
314442	Database Management Systems	4	--	--	30	70				100	4
314443	Software Engineering &Project Management	3	--	--	30	70	--	--	--	100	3
314444	Operating System	4	--	--	30	70	--	--	--	100	4
314445	Human-Computer Interaction	3	--	--	30	70	--	--	--	100	3
314446	Software Laboratory-I		--	4	--	--	25	50	50	125	2
314447	Software Laboratory-II	--	--	4	--	--	25	50	--	75	2
314448	Software Laboratory-III	--	--	2	--	--	50	--	--	50	1
314449	Audit Course 3	--	--		--	--	--	--	--	**Grade**	
	Total	**18**	**--**	**10**	**150**	**350**	**100**	**100**	**50**	**750**	**23**
	Total of Part-I	**28 Hours**				**750**					

SEMESTER – II

Subject Code	Subject	Teaching Scheme			Examination Scheme					Total Marks	Credits
		Lecture	Tutorial	Practical	In-Sem. Paper	End-Sem. Paper	TW	PR	OR		
314450	Computer Network Technology	3	-	--	30	70	--	--	--	100	3
314451	Systems Programming	4	-	--	30	70	--	--	--	100	4
314452	Design and Analysis of Algorithms	4	-	-	30	70	--	--	--	100	4
314453	Cloud Computing	3	-	-	30	70	--	--	--	100	3
314454	Data Science & Big Data Analytics	4	-	-	30	70	--	--	--	100	4
314455	Software Laboratory-IV	--	--	2	--	--	25	--	25	50	1
314456	Software Laboratory-V	--	--	4	--	--	50	50	--	100	2
314457	Software Laboratory-VI	--	--	2	--	--	25	25	--	50	1
314458	Project Based Seminar	--	01	--	--	--	--	--	50	50	1
314459	Audit Course 4	--	--	--	--	--	--	--	--	**Grade**	
	Total	**18**	**01**	**08**	**150**	**350**	**100**	**75**	**75**	**750**	**23**
	Total of Part-II	**27 Hours**			**750**						

SEMESTER-I

314441: THEORY OF COMPUTATION

Teaching Scheme:
Lectures: 4 Hours/Week

Credits
04

Examination Scheme:
In-Semester : 30 Marks
End-Semester: 70 Marks

Prerequisites:

1. Discrete Structures.
2. Data structures and problem solving.

Course Objectives :

1. To understand problem classification and problem solving by machines.
2. To understand the basics of automata theory and its operations.
3. To study computing machines by describing, classifying and comparing different types of computational models.
4. Encourage students to study theory of computability and complexity.
5. To understand the P and NP class problems and its classification.
6. To understand the fundamentals of problem decidability and reducibility.

Course Outcomes :

1. To construct finite state machines to solve problems in computing.
2. To write mathematical expressions for the formal languages
3. To apply well defined rules for syntax verification.
4. To construct and analyze Push Down, Post and Turing Machine for formal languages.
5. To express the understanding of the decidability and decidability problems.
6. To express the understanding of computational complexity.

UNIT – I FINITE STATE MACHINES 08 Hours

Basic Concepts: Symbols, Strings, Language, Formal Language, Natural Language. Basic Machine and Finite State Machine.

FSM without output: Definition and Construction-DFA, NFA, NFA with epsilon-Moves, Minimization Of FA, Equivalence of NFA and DFA, Conversion of NFA with epsilon moves to NFA, Conversion of NFA With epsilon moves to DFA.

FSM with output: Definition and Construction of Moore and Mealy Machines, Inter-conversion between Moore and Mealy Machines.

UNIT – II REGULAR EXPRESSIONS 08 Hours

Definition and Identities of Regular Expressions, Construction of Regular Expression of the given L, Construction of Language from the RE, Construction of FA from the given RE using direct method, Conversion of FA to RE using Arden's Theorem, Pumping Lemma for RL, Closure properties of RLs, Applications of Regular Expressions.

UNIT – III CONTEXT FREE GRAMMAR AND LANGUAGES 08 Hours

Introduction, Formal Definition of Grammar, Notations, Derivation Process: Leftmost Derivation, Rightmost Derivation, derivation trees, Context Free Languages, Ambiguous CFG, Removal of ambiguity, Simplification of CFG, Normal Forms, Chomsky Hierarchy, Regular grammar, equivalence of RG(LRG and RLG) and FA.

UNIT IV PUSHDOWN AUTOMATA AND POST MACHINES 08 Hours

Push Down Automata: Introduction and Definition of PDA, Construction (Pictorial/ Transition diagram) of PDA, Instantaneous Description and ACCEPTANCE of CFL by empty stack and final state, Deterministic PDA Vs Nondeterministic PDA, Closure properties of CFLs, pumping lemma for CFL.

Post Machine- Definition and construction.

UNIT – V TURING MACHINES 08 Hours

Formal definition of a Turing machine, Recursive Languages and Recursively Enumerable Languages, Design of Turing machines, Variants of Turing Machines: Multi-tape Turing machines, Universal Turing Machine, Nondeterministic Turing machines. Comparisons of all automata.

UNIT – VI COMPUTATIONAL COMPLEXITY 08 Hours

Decidability: Decidable problems concerning regular languages, Decidable problems concerning context-free languages, Un-decidability, Halting Problem of TM, A Turing-unrecognizable language.
Reducibility: Un-decidable Problems from Language Theory, A Simple Un-decidable Problem PCP, Mapping Reducibility
Time Complexity: Measuring Complexity, The Class P, Examples of problems in P, The Class NP, Examples of problems in NP, NP-completeness.

Text Books

1. Michael Sipser, Introduction to the Theory of Computation, CENGAGE Learning, 3rd Edition ISBBN-13:978-81-315-2529-6.
2. Vivek Kulkarni, Theory of Computation, Oxford University Press, ISBN-13: 978-0-19-808458-7.

Reference Books

1. Hopcroft Ulman, Introduction to Automata Theory, Languages and Computations, Pearson Education Asia, 2nd Edition, ISBN: 9788131720479.
2. Daniell. A. Cohen, Introduction to Computer Theory, Wiley-India, ISBN: 978-81-265-1334-5.
3. K.L.P Mishra, N. Chandrasekaran, Theory of Computer Science (Automata, Languages and Computation), Prentice Hall India, 2nd Edition.
4. John C. Martin, Introduction to Language and Theory of Computation, TMH, 3rd Edition, ISBN: 978-0-07-066048-9.
5. Kavi Mahesh, Theory of Computation: A Problem Solving Approach, Wiley-India, ISBN: 978-81-265-3311-4.
6. Kavi Mahesh, Theory of Computation: A Problem Solving Approach, Wiley India, ISBN: 9788126533114
7. Daniel Cohen, Introduction to Computer Theory, Wiley India, ISBN: 9788126513345,2ed
8. Basavaraj S.Anami, Karibasappa K.G, Formal Languages and Automata Theory, Wiley India, ISBN: 9788126520107

314442 : DATABASE MANAGEMENT SYSTEMS

Teaching Scheme:	Credits	Examination Scheme:
Lectures: 4 Hours/Week	04	In-Semester : 30 Marks
		End-Semester: 70 Marks

Prerequisites:

1. Data structures.
2. Discrete structures.

Course Objectives :

1. To understand the fundamental concepts of database management. These concepts include aspects of database design, database languages, and database-system implementation.
2. To provide a strong formal foundation in database concepts, technology and practice.
3. To give systematic database design approaches covering conceptual design, logical design and an overview of physical design.
4. To be familiar with the basic issues of transaction processing and concurrency control.
5. To learn and understand various Database Architectures and Applications.
6. To understand how analytics and big data affect various functions now and in the future.

Course Outcomes :

1. To define basic functions of DBMS & RDBMS.
2. To analyze database models & entity relationship models.
3. To design and implement a database schema for a given problem-domain.
4. To populate and query a database using SQL DML/DDL commands.
5. Do Programming in PL/SQL including stored procedures, stored functions, cursors and packages.
6. To appreciate the impact of analytics and big data on the information industry and the external ecosystem for analytical and data services.

UNIT – I INTRODUCTION TO DBMS — 08 Hours

Introduction: Database Concepts, Database System Architecture, Data Modeling: Data Models, Basic Concepts, entity, attributes, relationships, constraints, keys.

E-R and EER diagrams: Components of E-R Model, conventions, converting E-R diagram into tables, EER Model components, converting EER diagram into tables, legacy system model.

Relational Model: Basic concepts, Attributes and Domains, Codd's Rules.

Relational Integrity: Domain, Entity, Referential Integrities, Enterprise Constraints, Schema Diagram.

Relational Algebra: Basic Operations, Selection, projection, joining, outer join, union, difference, intersection, Cartesian product, division operations (examples of queries in relational algebraic using symbols).

UNIT – II DATABASE DESIGN AND SQL — 08 Hours

Database Design: Functional Dependency, Purpose of Normalization, Data Redundancy and Update Anomalies, Single Valued Normalization: 1NF, 2NF, 3NF, BCNF. Decomposition: lossless join decomposition and dependency preservation, Multi valued Normalization (4NF), Join Dependencies and the Fifth Normal Form.

Introduction to SQL: Characteristics and advantages, SQL Data Types and Literals, DDL, DML, DCL, SQL Operators, Tables: Creating, Modifying, Deleting, Views: Creating, Dropping, Updating using Views, Indexes, Nulls SQL DML **Queries:** SELECT Query and clauses, Set Operations, Predicates and Joins, Set membership, Tuple Variables, Set comparison, Ordering of Tuples, Aggregate Functions, Nested Queries, Database Modification using SQL Insert, Update and Delete Queries.

UNIT – III QUERY PROCESSING AND DATABASE TRANSACTIONS 08 Hours

Query Processing: Overview, Measures of query cost, Evaluation of expression, Materialization and Pipelining algorithm. **Transaction:** Basic concept of a Transaction, Transaction Management, Properties of Transactions, Concept of Schedule, Serial Schedule, Serializability: Conflict and View, Cascaded Aborts, Recoverable and No recoverable Schedules. Concept of Stored Procedures, Cursors, Triggers, assertions, roles and privileges Programmatic SQL: Embedded SQL, Dynamic SQL, Advanced SQL-Programming in MYSQL.

UNIT – IV CONCURRENCY CONTROL AND ADVANCED DATABASES 08 Hours

Concurrency Control: Need, Locking Methods, Deadlocks, Time-stamping Methods, and Optimistic Techniques. **Recovery Methods:** Shadow-Paging and Log-Based Recovery, Checkpoints, Performance Tuning, Query Optimization with respect to SQL Database. **Database Architectures:** Centralized and Client-Server Architectures, 2 Tier and 3 Tier Architecture, Introduction to Parallel Databases, Key elements of Parallel Database Processing, Architecture of Parallel Databases, Introduction to Distributed Databases, Architecture of Distributed Databases, Distributed Database Design.

UNIT – V LARGE SCALE DATA MANAGEMENT 08 Hours

Emerging Database Technologies: Introduction to No SQL Databases- Internet Databases, Cloud Databases, Mobile Databases, SQLite Database, XML Databases, MongoDB.
Introduction to Big Data and XML: DTD, XML Schemas, XQuery, XPath.
JSON: Overview, Data Types, Objects, Schema, JSON with Java/PHP/Ruby/Python.
Hadoop: HDFS, Dealing with Massive Datasets-Map Reduce and Hadoop.
Introduction to HBase: Overview, HBase Data Model, HBase Region, Hive.

UNIT – VI DATA WAREHOUSING AND DATA MINING 08 Hours

Data Warehousing: Introduction, Evolution of Data Warehouse, Characteristics, Benefits, Limitation of Data Warehousing, Architecture and Components of Data Warehouse, Conceptual Models, Data Mart, OLAP.
Data Mining: Process, Knowledge Discovery, Goals of Data Mining, Data Mining Tasks, Association, Classification, Clustering, Big Data (Terminology and examples) Introduction to Machine learning for Big Data and Business Intelligence.

Text Books

1. Silberschatz A., Korth H., Sudarshan S, Database System Concepts, McGraw Hill Publication, ISBN-0-07-120413-X, Sixth Edition.
2. S. K. Singh, Database Systems: Concepts, Design and Application, Pearson Publication, ISBN-978-81-317-6092-5.

Reference Books

1. Thomas H Cormen and Charles E.L Leiserson, Introduction to Algorithm, PHI Publication, ISBN: 81-203-2141-3.
2. R. C. T. Lee, S S Tseng, R C Chang, Y T Tsai, Introduction to Design and Analysis of Algorithms, A Strategic approach, Tata McGraw Hill., ISBN-13: 978-1-25-902582-2. ISBN-10: 1-25-902582-9.
3. Anany Levitin, Introduction to the Design & Analysis of Algorithm, Pearson Publication, ISBN 81-7758-835-4.
4. Steven S Skiena, The Algorithm Design Manual, Springer, ISBN 978-81-8489-865-1, Second Edition
5. George T. Heineman, Gary Pollice, Stanley Selkow, Algorithms in a Nutshell, A Desktop Quick Reference, O'Reilly, ISBN: 9789352133611.
6. Gilles Brassard, Paul Bratle, Fundamentals of Algorithms, Pearson Publication, ISBN 978-81-317-1244-3.

314443 : SOFTWARE ENGINEERING AND PROJECT MANAGEMENT

Teaching Scheme:	Credits	Examination Scheme:
Lectures: 3 Hours/Week	03	In-Semester : 30 Marks
		End-Semester: 70 Marks

Prerequisites:

1. Problem solving and object oriented programming.
2. Fundamental of data structures.

Course Objectives :

1. To understand the nature of software complexity in various application domains, disciplined way of software development and software lifecycle process models.
2. To introduce principles of agile software development, the SCRUM process and agile practices.
3. To know methods of capturing, specifying, visualizing and analyzing software requirements.
4. To understand project management through life cycle of the project.
5. To understand current and future trends and practices in the IT industry.
6. To learn about project planning, execution, tracking, audit and closure of project.

Course Outcomes :

1. To identify unique features of various software application domains and classify software applications.
2. To choose and apply appropriate lifecycle model of software development.
3. To describe principles of agile development, discuss the SCRUM process and distinguish agile process model from other process models.
4. To analyze software requirements by applying various modeling techniques.
5. To list and classify CASE tools and discuss recent trends and research in software engineering.
6. To understand IT project management through life cycle of the project and future trends in IT Project Management.

UNIT – I INTRODUCTION TO SOFTWARE ENGINEERING — 06 HOURS

Nature of Software, Software Process, Software Engineering Practice, Software Myths, Generic Process model, Analysis and comparison of Process Models: Waterfall Model, Incremental Models, Evolutionary Models, Concurrent, Specialized Process Models, Personal and Team Process Models, Introduction to Clean Room Software Engineering.

Software Quality Assurance (SQA): Verification and Validation, SQA Plans, Software Quality Frameworks, ISO 9000 Models, CMM Models.

UNIT – II REQUIREMENT ANALYSIS — 06 HOURS

Requirements Capturing: requirements engineering (elicitation, specification, validation, negotiation, prioritizing requirements (Kano diagram) - real life application case study.

Requirements Analysis: basics, scenario based modeling, UML models: use case diagram and class diagram, data modeling, data and control flow model, behavioral modeling using state diagrams - real life application case study, software Requirement Specification.

UNIT – III PROJECT PLANNING — 06 HOURS

Project initiation, Planning Scope Management, Creating the Work Breakdown Structure, Effort estimation and scheduling: Importance of Project Schedules, Estimating Activity Resources, Estimating Activity Durations, Developing the Schedule using Gantt Charts, Adding Milestones to Gantt Charts, Using Tracking Gantt Charts to Compare Planned and Actual Dates, Critical Path Method, Program Evaluation and Review Technique (PERT) with examples. Planning Cost Management, Estimating Costs, Types of Cost Estimates, Cost Estimation Tools and Techniques, Typical Problems with IT Cost Estimates.

UNIT – IV AGILE DEVELOPMENT PROCESS 06 HOURS

Agile Development: Agile manifesto, agility and cost of change, agility principles, myth of planned development, toolset for the agile process.

Extreme Programming: XP values, process, industrial XP, SCRUM - process flow, scrum roles, scrum cycle description, product backlog, sprint planning meeting, sprint backlog, sprint execution, daily scrum meeting, maintaining sprint backlog and burn-down chart, sprint review and retrospective.

Agile Practices: test driven development, refactoring, pair programming, continuous integration, exploratory testing versus scripted testing

UNIT – V PROJECT MANAGEMENT 06 Hours

Project monitoring and control: tools for project management, Software tools like Microsoft project management or any other open source tools.

The Importance of Project Quality Management: Planning Quality Management, Performing Quality Assurance, Controlling Quality, Tools and Techniques for Quality Control (statistical control, six sigma)

The Importance of Project Risk Management, Planning Risk Management, Common Sources of Risk in IT Projects.

UNIT – VI RECENT TRENDS IN SOFTWARE ENGINEERING AND PROJECT MANAGEMENT 06 Hours

Software configuration management: SCM basics, SCM repository, SCM process, SCM tools such as GitHub, CASE – taxonomy, tool-kits, workbenches, environments, components of CASE, categories (upper, lower and integrated CASE tools).

Emerging software engineering trends: technology evolution, process trends, collaborative development, test-driven development, global software development challenges

Project Management trends: CRM, ERP: Basic concepts, Advantages and limitations, SAP, Business process reengineering, International Project Management, Case studies.

Text Books

1. Roger S Pressman, Software Engineering: A Practitioner's Approach, Mcgraw-Hill, ISBN: 0073375977, Seventh or Eighth Edition.
2. Joseph Phillips, IT Project Management –On Track From Start to Finish, Tata Mc Graw-Hill, ISBN13: 978-0-07106727-0, ISBN-10: 0-07-106727-2.

Reference Books

1. Pankaj Jalote, Software Engineering: A Precise Approach, Wiley India, ISBN: 9788126523115.
2. Marchewka, Information Technology Project Management, Wiley India, ISBN: 9788126543946.
3. Chris Dawson with Ben Straub, Building Tools with GitHub, O'Relly, Shroff publishers, ISBN: 978-93-5213-333-8.
4. C. Michael Pilato, Ben Collins-Sussman and Brian Fitzpatrick, Version Control with subversion, O'Relly, Shroff publishers, ISBN: 978-81-8404-728-8.
5. P.C. Tripathi, P.N. Reddy, Principles of Management, Tata McGrew Hill Education Private Limited, ISBN: 9780071333337, ISBN: 0071333339.

314444 : OPERATING SYSTEM

Teaching Scheme:
Lectures: 4 Hours/Week

Credits
04

Examination Scheme:
In-Semester : 30 Marks
End-Semester: 70 Marks

Prerequisites:

1. Computer Organization and Architecture.
2. Fundamentals of Data Structures.

Course Objectives :

1. To introduce basic concepts and functions of modern operating systems.
2. To understand the concept of process and thread management.
3. To understand the scheduling of processes and threads.
4. To understand the concept of concurrency control.
5. To understand the concept of I/O and File management.
6. To understand various Memory Management techniques.

Course Outcomes :

1. Fundamental understanding of the role of Operating Systems.
2. To understand the concept of a process and thread.
3. To apply the cons of process/thread scheduling.
4. To apply the concept of process synchronization, mutual exclusion and the deadlock.
5. To realize the concept of I/O management and File system.
6. To understand the various memory management techniques.

UNIT – I OVERVIEW OF OPERATING SYSTEM 08 HOURS

Operating System Objectives and Functions, The Evolution of Operating Systems, Developments Leading to Modern Operating Systems, Virtual Machines. BASH Shell scripting: Basic shell commands, shell as a scripting language.

UNIT – II PROCESS DESCRIPTION AND CONTROL 08 HOURS

Process: Concept of a Process, Process States, Process Description, Process Control (Process creation, Waiting for the process/processes, Loading programs into processes and Process Termination), Execution of the Operating System.
Threads: Processes and Threads, Concept of Multithreading, Types of Threads, Thread programming Using Pthreads.
Scheduling: Types of Scheduling, Scheduling Algorithms, and Thread Scheduling.

UNIT – III CONCURRENCY CONTROL 08 HOURS

Process/thread Synchronization and Mutual Exclusion: Principles of Concurrency, Requirements for Mutual Exclusion, Mutual Exclusion: Hardware Support, Operating System Support (Semaphores and Mutex), Programming Language Support (Monitors).
Classical synchronization problems: Readers/Writers Problem, Producer and Consumer problem, Inter-process communication (Pipes, shared memory: system V).
Deadlock: Principles of Deadlock, Deadlock Modeling, Strategies to deal with deadlock: The Ostrich Algorithm, Deadlock Prevention, Deadlock Avoidance, Deadlock detection and recovery, An Integrated Deadlock Strategy, Example: Dining Philosophers Problem.

UNIT – IV MEMORY MANAGEMENT 08 HOURS

Memory Management: Memory Management Requirements, Memory Partitioning: Fixed Partitioning, Dynamic Partitioning, Buddy System, Relocation, Paging, Segmentation.
Virtual Memory: Hardware and Control Structures, Operating System Software.

UNIT – V Input / Output And File Management 08 Hours

I/O Management and Disk Scheduling: I/O Devices, Organization of the I/O Function, Operating System Design Issues, I/O Buffering, Disk Scheduling(FIFO, SSTF, SCAN, C-SCAN, LOOK, C-LOOK), Disk Cache.

File Management: Overview, File Organization and Access, File Directories, File Sharing, Record Blocking, Secondary Storage Management.

UNIT – VI The LINUX Operating System 08 Hours

Linux Design Principles, Linux Booting Process, Kernel Modules, Process Management, Scheduling, Memory Management, File Systems, Input and Output, Inter-process Communication.

Text Books

1. William Stallings, Operating System: Internals and Design Principles, Prentice Hall, ISBN-10: 0-13-380591-3, ISBN-13: 978-0-13-380591-8, 8th Edition
2. Abraham Silberschatz, Peter Baer Galvin and Greg Gagne, Operating System Concepts, WILEY, ISBN 978-1-118-06333-0 , 9th Edition
3. Andrew S. Tanenbaum & Herbert Bos, Modern Operating System, Pearson, ISBN-13: 9780133592221, 4th Edition

Reference Books

1. Tom Adelstein and Bill Lubanovic, Linux System Administration, O'Reilly Media, ISBN-10: 0596009526, ISBN-13: 978-0596009526
2. Harvey M. Deitel, Operating Systems, Prentice Hall, ISBN-10: 0131828274, ISBN-13: 978-0131828278
3. Thomas W. Doeppner, Operating System in depth: Design and Programming, WILEY, ISBN: 978-0-471-68723-8
4. Mendel Cooper, Advanced Shell Scripting, Linux Documentation Project

314445 : HUMAN-COMPUTER INTERACTION

Teaching Scheme:
Lectures: 3 Hours/Week

Credits :
03

Examination Scheme:
In-Semester : 30 Marks
End-Semester: 70 Marks

Prerequisites :

1. Problem Solving and Object Oriented Technologies.

Course Objectives :

1. To introduce to the field of human-computer-interaction study.
2. To gain an understanding of the human part of human-computer-interactions.
3. To learn to do design and evaluate effective human-computer-interactions.
4. To study HCI models and theories.
5. To understand HCI design processes.
6. To apply HCI to real life use cases.

Course Outcomes :

1. To explain importance of HCI study and principles of user-centred design (UCD) approach.
2. To develop understanding of human factors in HCI design.
3. To develop understanding of models, paradigms and context of interactions.
4. To design effective user-interfaces following a structured and organized UCD process.
5. To evaluate usability of a user-interface design.
6. To apply cognitive models for predicting human-computer-interactions.

UNIT – I INTRODUCTION 06 Hours

What is HCI?, Disciplines involved in HCI, Why HCI study is important? The psychology of everyday things, Principles of HCI, User-centred Design.

UNIT – II UNDERSTANDING THE HUMAN 06 Hours

Input-output channels, Human memory, Thinking: Reasoning and Problem Solving, Human emotions, Individual differences, Psychology and Design.

UNIT – III UNDERSTANDING THE INTERACTION 06 Hours

Models of interaction, Ergonomics, Interaction styles, WIMP Interface, Interactivity, Context of interaction, User experience, Paradigms of Interactions.

UNIT – IV HCI - DESIGN PROCESS 06 Hours

What is interaction design?, The software design process, User focus, Scenarios, Navigation Design, Screen Design, Prototyping techniques, Wire-Framing, Understanding the UI Layer and Its Execution Framework, Model-View-Controller(MVC) Framework.

UNIT – V HCI - DESIGN RULES , GUIDELINES AND EVALUATION TECHNIQUES 06 Hours

Principles that support usability, Design standards, Design Guidelines, Golden rules and heuristics, Using toolkits, User interface management system (UIMS), Goals of evaluation, Evaluation Criteria, Evaluation through expert analysis, Evaluation through user participation, Choosing an Evaluation Method.

UNIT – VI HCI MODELS AND THEORIES 06 Hours

Goal and task hierarchy model, Linguistic model, Physical and device models, Cognitive architectures, Hierarchical task analysis (HTA), Uses of task analysis, Diagrammatic dialog design notations, Computer mediated communication, Ubiquitous Computing, Finding things on web Future of HCI.

Text Books:

1. Alan Dix (2008). Human Computer Interaction. Pearson Education. ISBN 978-81-317-1703-5.
2. Gerard Jounghyun Kim (20 March 2015). Human–Computer Interaction: Fundamentals and Practice. CRC Press. ISBN 978-1-4822-3390-2.

Reference Books:

1. Ben Shneiderman; Catherine Plaisant; Maxine Cohen; Steven Jacobs (29 August 2013). Designing the User Interface: Strategies for Effective Human-Computer Interaction. Pearson Education Limited. ISBN 978-1-292-03701-1.
2. Donald A. Norman (2013). The Design of Everyday Things Basic Books. ISBN 978-0-465-07299-6.
3. Jeff Johnson (17 December 2013). Designing with the Mind in Mind: Simple Guide to Understanding User Interface Design Guidelines. Elsevier. ISBN 978-0-12-411556-9.
4. Alan Cooper; Robert Reimann; David Cronin; Christopher Noessel (13 August 2014). About Face: The Essentials of Interaction Design. Wiley. ISBN 978-1-118-76658-3.
5. Alan Cooper (1 January 1999). The Inmates are running the Asylum, Sam's. ISBN 978-0-672-31649-4.
6. John M. Carroll (21 May 2003). HCI Models, Theories, and Frameworks: Toward a Multidisciplinary Science. Morgan Kaufmann. ISBN 978-0-08-049141-7.
7. Alan Cooper, Robert Reimann, David Cronin, Christopher Noessel, About Face: The Essentials of Interface Design,Wiley India, ISBN : 9788126559718,4th Ed
8. Rogers, Sharp, Preece, Interaction Design: Beyond Human Computer Interaction, Wiley India, ISBN: 9788126544912,3ed
9. Wilbert O.Galitz, The Essential Guide to user Interface Design, Wiley India, ISBN: 9788126502806

Web-links:

1. http://hcibib.org/
2. Andriod Design Guidelines - https://developer.android.com/guide/practices/ui_guidelines/index.html
3. iOS Human Interface Guidelines - https://developer.apple.com/ios/human-interface-guidelines/overview/design-principles/
4. MacOS Human Interface Guidelines - https://developer.apple.com/library/content/documentation/UserExperience/Conceptual/OSXHIGuidelines/

314446 : SOFTWARE LABORATORY - I

Teaching Scheme:	Credits	Examination Scheme:
Practical : 4 Hours/Week	02	Term Work : 25 Marks
		Practical : 50 Marks
		Oral : 50 Marks

Prerequisites:

1. Data structures and files.
2. Discrete Structure.
3. Software engineering principles and practices.

Course Objectives :

1. Understand the fundamental concepts of database management. These concepts include aspects of database design, database languages, and database-system implementation.
2. To provide a strong formal foundation in database concepts, recent technologies and best industry practices.
3. To give systematic database design approaches covering conceptual design, logical design and an overview of physical design.
4. To learn the SQL and NoSQL database system.
5. To learn and understand various Database Architectures and its use for application development.
6. To programme PL/SQL including stored procedures, stored functions, cursors and packages.

Course Outcomes :

1. To install and configure database systems.
2. To analyze database models & entity relationship models.
3. To design and implement a database schema for a given problem-domain
4. To understand the relational and document type database systems.
5. To populate and query a database using SQL DML/DDL commands.
6. To populate and query a database using MongoDB commands.

Guidelines for Instructor's Manual

1. The faculty member should prepare the laboratory manual for all the experiments and it should be made available to students and laboratory instructor/Assistant.

Guidelines for Student's Lab Journal

1. Student should submit term work in the form of handwritten journal based on specified list of assignments.
2. Practical Examination will be based on the term work.
3. Candidate is expected to know the theory involved in the experiment.
4. The practical examination should be conducted if and only if the journal of the candidate is complete in all respects.

Guidelines for Lab /TW Assessment

1. Examiners will assess the term work based on performance of students considering the parameters such as timely conduction of practical assignment, methodology adopted for implementation of practical assignment, timely submission of assignment in the form of handwritten write-up along with results of implemented assignment, attendance etc.
2. Examiners will judge the understanding of the practical performed in the examination by asking some questions related to theory & implementation of experiments he/she has carried out.
3. Appropriate knowledge of usage of software and hardware related to respective laboratory should be

checked by the concerned faculty member.

As a conscious effort and little contribution towards Green IT and environment awareness, attaching printed papers of the program in journal may be avoided. There must be hand-written write-ups for every assignment in the journal. The DVD/CD containing students programs should be attached to the journal by every student and same to be maintained by department/lab In-charge is highly encouraged. For reference one or two journals may be maintained with program prints at Laboratory.

Suggested List of Laboratory Assignments

Group A: Introduction to Databases (Study assignment – Any 2)

1. Study and design a database with suitable example using following database systems:
    - Relational: SQL / PostgreSQL / MySQL
    - Key-value: Riak / Redis
    - Columnar: Hbase
    - Document: MongoDB / CouchDB
    - Graph: Neo4J

    Compare the different database systems based on points like efficiency, scalability, characteristics and performance.

2. Install and configure client and server for MySQL and MongoDB (Show all commands and necessary steps for installation and configuration).

3. Study the SQLite database and its uses. Also elaborate on building and installing of SQLite.

Group B: SQL and PL/SQL

1. Design any database with at least 3 entities and relationships between them. Apply DCL and DDL commands. Draw suitable ER/EER diagram for the system.

2. Design and implement a database and apply at least 10 different DML queries for the following task. For a given input string display only those records which match the given pattern or a phrase in the search string. Make use of wild characters and LIKE operator for the same. Make use of Boolean and arithmetic operators wherever necessary.

3. Execute the aggregate functions like count, sum, avg etc. on the suitable database. Make use of built in functions according to the need of the database chosen. Retrieve the data from the database based on time and date functions like now (), date (), day (), time () etc. Use group by and having clauses.

4. Implement nested sub queries. Perform a test for set membership (in, not in), set comparison (<some, >=some, <all etc.) and set cardinality (unique, not unique).

5. Write and execute suitable database triggers .Consider row level and statement level triggers.

6. Write and execute PL/SQL stored procedure and function to perform a suitable task on the database. Demonstrate its use.

7. Write a PL/SQL block to implement all types of cursor.

8. Execute DDL statements which demonstrate the use of views. Try to update the base table using its corresponding view. Also consider restrictions on updatable views and perform view creation from multiple tables.

Group C: MongoDB

1. Create a database with suitable example using MongoDB and implement
   - Inserting and saving document (batch insert, insert validation)
   - Removing document
   - Updating document (document replacement, using modifiers, upserts, updating multiple documents, returning updated documents)

2. Execute at least 10 queries on any suitable MongoDB database that demonstrates following querying techniques:
   - find and findOne (specific values)
   - Query criteria (Query conditionals, OR queries, $not, Conditional semantics)
   - Type-specific queries (Null, Regular expression, Querying arrays)

3. Execute at least 10 queries on any suitable MongoDB database that demonstrates following:
   - $ where queries
   - Cursors (Limits, skips, sorts, advanced query options)
   - Database commands

4. Implement Map reduce example with suitable example.

5. Implement the aggregation and indexing with suitable example in MongoDB. Demonstrate the following:
   - Aggregation framework
   - Create and drop different types of indexes and explain () to show the advantage of the indexes.

Group D: Mini Project / Database Application Development

Student group of size 3 to 4 students should decide the statement and scope of the project which will be refined and validated by the faculty considering number of students in the group.
Draw and normalize the design up to at ER Diagram least 3NF in case of back end as RDBMS.

Suggested Directions for development of the mini project.

- Build a suitable GUI by using forms and placing the controls on it for any application. (E.g Student registration for admission, railway reservation, online ticket booking etc.). Proper data entry validations are expected.

- Develop two tier architecture and use ODBC/JDBC connections to store and retrieve data from the database. Make a user friendly interface for system interaction. You may consider any applications like employee management system, library management system etc.

- Implement the basic CRUD operations and execute a transaction that ensures ACID properties. Make use of commands like commit, save point, and rollback. You may use examples like transfer of money from one account to another, cancellation of e-tickets etc.

References

1. Ramon A. Mata-Toledo, Pauline Cushman, Database management systems, TMGH, ISBN: IS978-0-07-063456-5, 5th Edition.
2. Kristina Chodorow, MongoDB The definitive guide, O'Reilly Publications, ISBN:978-93-5110-269-4, 2nd Edition.
3. Dr. P. S. Deshpande, SQL and PL/SQL for Oracle 10g Black Book, DreamTech.
4. Ivan Bayross, SQL, PL/SQL: The Programming Language of Oracle, BPB Publication.
5. Reese G., Yarger R., King T., Williums H, Managing and Using MySQL, Shroff Publishers and Distributors Pvt. Ltd., ISBN: 81 - 7366 - 465 – X, 2nd Edition.
6. Dalton Patrik, SQL Server – Black Book, DreamTech Press.
7. Eric Redmond, Jim Wilson, Seven databases in seven weeks, SPD, ISBN: 978-93-5023-918-6.
8. Jay Kreibich, Using SQLite, SPD, ISBN: 978-93-5110-934-1, 1st edition.

314447 : SOFTWARE LABORATORY – II

Teaching Scheme:
Practical : 4 Hours/Week

Credits
02

Examination Scheme:
Term Work : 25 Marks
Practical : 50 Marks

Prerequisites:

1. C programming.
2. Fundamental of Data Structures.

Course Objectives :

1. To introduce and learn Linux commands required for administration.
2. To learn shell programming concepts and applications.
3. To demonstrate the functioning of OS basic building blocks like processes, threads under the LINUX.
4. To demonstrate the functioning of OS concepts in user space like concurrency control (process synchronization, mutual exclusion & deadlock) and file handling in LINUX.
5. To aware Linux kernel source code details.
6. To demonstrate the functioning of OS concepts in kernel space like embedding the system call in any LINUX kernel.

Course Outcomes :

1. To understand the basics of Linux commands and program the shell of Linux.
2. To develop various system programs for the functioning of operating system.
3. To implement basic building blocks like processes, threads under the Linux.
4. To develop various system programs for the functioning of OS concepts in user space like concurrency control and file handling in Linux.
5. To design and implement Linux Kernel Source Code.
6. To develop the system program for the functioning of OS concepts in kernel space like embedding the system call in any Linux kernel.

Guidelines for Instructor's Manual

1. The faculty member should prepare the laboratory manual for all the experiments and it should be made available to students and laboratory instructor/Assistant.

Guidelines for Student's Lab Journal

1. Student should submit term work in the form of handwritten journal based on specified list of assignments.
2. Practical Examination will be based on the term work.
3. Candidate is expected to know the theory involved in the experiment.
4. The practical examination should be conducted if and only if the journal of the candidate is complete in all respects.

Guidelines for Lab /TW Assessment

1. Examiners will assess the term work based on performance of students considering the parameters such as timely conduction of practical assignment, methodology adopted for implementation of practical assignment, timely submission of assignment in the form of handwritten write-up along with results of implemented assignment, attendance etc.
2. Examiners will judge the understanding of the practical performed in the examination by asking some questions related to theory & implementation of experiments he/she has carried out.
3. Appropriate knowledge of usage of software and hardware related to respective laboratory should be checked by the concerned faculty member.

As a conscious effort and little contribution towards Green IT and environment awareness, attaching printed papers of the program in journal may be avoided. There must be hand-written write-ups for every assignment in the journal. The DVD/CD containing students programs should be attached to the journal by every student and same to be maintained by department/lab In-charge is highly encouraged. For reference one or two journals may be maintained with program prints at Laboratory.

Suggested List of Laboratory Assignments

Assignment No. 1: Shell programming
Write a program to implement an address book with options given below:
a) Create address book. b) View address book. c) Insert a record. d) Delete a record.
e) Modify a record. f) Exit.

Assignment No. 2: Process control system calls: The demonstration of *FORK*, *EXECVE* and *WAIT* system calls along with zombie and orphan states.

a. Implement the C program in which main program accepts the integers to be sorted. Main program uses the *FORK* system call to create a new process called a child process. Parent process sorts the integers using sorting algorithm and waits for child process using *WAIT* system call to sort the integers using any sorting algorithm. Also demonstrate zombie and orphan states.

b. Implement the C program in which main program accepts an integer array. Main program uses the *FORK* system call to create a new process called a child process. Parent process sorts an integer array and passes the sorted array to child process through the command line arguments of *EXECVE* system call. The child process uses *EXECVE* system call to load new program that uses this sorted array for performing the binary search to search the particular item in the array.

Assignment No. 3: Implement multithreading for Matrix Multiplication using pthreads.

Assignment No. 4: Thread synchronization using counting semaphores. Application to demonstrate: producer-consumer problem with counting semaphores and mutex.

Assignment No. 5: Thread synchronization and mutual exclusion using mutex. Application to demonstrate: Reader-Writer problem with reader priority.

Assignment No. 6: Deadlock Avoidance Using Semaphores: Implement the deadlock-free solution to Dining Philosophers problem to illustrate the problem of deadlock and/or starvation that can occur when many synchronized threads are competing for limited resources.

Assignment No. 7: Inter process communication in Linux using following.

a. Pipes: Full duplex communication between parent and child processes. Parent process writes a pathname of a file (the contents of the file are desired) on one pipe to be read by child process and child process writes the contents of the file on second pipe to be read by parent process and displays on standard output.
b. FIFOs: Full duplex communication between two independent processes. First process accepts sentences and writes on one pipe to be read by second process and second process counts number of characters, number of words and number of lines in accepted sentences, writes this output in a text file and writes the contents of the file on second pipe to be read by first process and displays on standard output.

Assignment No. 8: Inter-process Communication using Shared Memory using System V. Application to demonstrate: Client and Server Programs in which server process creates a shared memory segment and writes the message to the shared memory segment. Client process reads the message from the shared memory segment and displays it to the screen.

Assignment No. 9: Implement an assignment using File Handling System Calls (Low level system calls like open, read, write, etc).

Assignment No. 10: Implement a new system call in the kernel space, add this new system call in the Linux kernel by the compilation of this kernel (any kernel source, any architecture and any Linux kernel distribution) and demonstrate the use of this embedded system call using C program in user space.

References

1. Das, Sumitabha, UNIX Concepts and Applications, TMH, ISBN-10: 0070635463, ISBN-13: 978-0070635463, 4th Edition.
2. Kay Robbins and Steve Robbins, UNIX Systems Programming, Prentice Hall, ISBN-13: 978-0134424071, ISBN-10: 0134424077, 2nd Edition.
3. Mendel Cooper, Advanced Shell Scripting Guide, Linux Documentation Project, Public domain.

314448 : SOFTWARE LABORATORY – III

Teaching Scheme:	Credits	Examination Scheme:
Practical : 2 Hours/Week	01	Term Work : 50 Marks

Preamble:

A major component of the course is a Graphical User Interface development. The objective is to develop a GUI by using concepts learned from Software Engineering and Project management. At the beginning of the course, Course Teacher will form project teams with maximum 3 members. During the semester, the project team will work together through all the phases of development cycle up to design, from an initial feasibility study to designing, after designing phase students will deploy the designed system and will make a series of presentations and reports of the work.

Prerequisites:

1. Programming fundamentals.
2. Problem solving skills.

Course Objectives :

1. To understand the nature of software complexity in various application domains, disciplined way of software development and software life cycle process models.
2. To introduce principles of agile software development, the SCRUM process and agile practices.
3. To know methods of capturing, specifying, visualizing and analyzing software requirements.
4. To understand concepts and principles of software design and architecture.
5. To understand user-centric design approach.
6. To apply principles of designing for effective user interfaces.

Course Outcomes :

1. To identify the needs of users through requirement gathering.
2. To apply the concepts of Software Engineering process models for project development.
3. To apply the concepts of HCI for user-friendly project development.
4. To deploy website on live webserver and access through URL.
5. To understand, explore and apply various web technologies.
6. To develop team building for efficient project development.

Guidelines for Instructor's Manual

1. The faculty member should prepare the laboratory manual for all the experiments and it should be made available to students and laboratory instructor/Assistant.

Guidelines for Student's Lab Journal

1. Student should submit term work in the form of handwritten journal based on specified list of assignments.
2. Practical Examination will be based on the term work.
3. Candidate is expected to know the theory involved in the experiment.
4. The practical examination should be conducted if and only if the journal of the candidate is complete in all respects.

Guidelines for Lab /TW Assessment

1. Examiners will assess the term work based on performance of students considering the parameters such as timely conduction of practical assignment, methodology adopted for implementation of practical

assignment, timely submission of assignment in the form of handwritten write-up along with results of implemented assignment, attendance etc.

2. Examiners will judge the understanding of the practical performed in the examination by asking some questions related to theory & implementation of experiments he/she has carried out.
3. Appropriate knowledge of usage of software and hardware related to respective laboratory should be checked by the concerned faculty member.

As a conscious effort and little contribution towards Green IT and environment awareness, attaching printed papers of the program in journal may be avoided. There must be hand-written write-ups for every assignment in the journal. The DVD/CD containing students programs should be attached to the journal by every student and same to be maintained by department/lab In-charge is highly encouraged. For reference one or two journals may be maintained with program prints at Laboratory.

Suggested List of Laboratory Assignments

Group A :Website Design (HTML5, CSS, Bootstrap)

Assignment No. 1: Using HTML5 layout tags develop informative page with sections which include various images, links to other pages for navigation, make use of all possible formatting (for example font, color etc.).

Assignment No. 2: Apply CSS properties Border, margins, Padding, Navigation, dropdown list to page created in first assignment.

Group B : Website GUI Validation (JavaScript, PHP)

Assignment No. 3: Create form in HTML with all form elements apply form validations (e.g. Email, mobile, Pin code, Password).

Assignment No. 4: Validate URL, Email, Required using functions empty, preg_match, filter_var in PHP.

Group C : Website Working (Java Servlet)

Assignment No. 5: Understand servlet life cycle, create login page and apply proper validations with appropriate messages using doGet()/ doPost() methods.

Group D : Website Development (Mini-Project)

Assignment No. 6: Develop website using any CMS tool which falls into one of the categories blog, social networking, News updates, Wikipedia, E-commerce store. Website must include home page, and at least 3 forms (with Validation), use at list HTML5, PHP, CSS/Bootstrap, JavaScript web technologies. No database support is needed. Deploy website on live webserver and access through URL.

Write a complete report of web development stages for the chosen topic and attach printout of the same with screen shots of web pages. Proper use of every technique used for web designing should be followed like for designing wireframe is used. Human computer interaction and user experience concepts learned from HCI should be applied while web development process.

Guidelines for Mini project

1. Project group of maximum 3 students should be formed.
2. Every group member should participate in every stage of the web development.

3. Proper compilation of the report should be attached in the file in printed format.
4. Use of CMS should be done for only Assignment no 6 (Mini Project).
5. At the end of the semester, group should give a presentation of the Mini Project.

References:

1. HTML, XHTML and CSS, Fourth Edition by Steven M. Schafer, Wiley India Edition. ISBN: 978- 81-265-1635-3.
2. Web Enabled Commercial Application Development Using HTML, JavaScript, DHTML and PHP, 4th Edition by Ivan Bayross, BPB Publications. ISBN: 9788183330084.
3. Professional Word Press: Design and Development by Brad Williams, David Damstra, Hal Stern, Wrox publications Web Technologies Black Book: HTML, JavaScript, PHP, Java, JSP, XML and AJAX by Kogent Learning Solutions Inc. ISBN: 9788126554560, 8126554568.
4. Wordpress for Web developers: An introduction to web professionals by Stephanie Leary, Apress Publications. ISBN: 9781430258667, 1430258667.

314449 : AUDIT COURSE 3

In addition to credits courses, it is recommended that there should be audit course (non-credit course). Audit course is for the purposes of self-enrichment and academic exploration. Audit courses carry no academic credit. Selection of the audit courses helps the learner to explore the subject of interest in greater details resulting in achieving objective of audit course's inclusion. Evaluation of audit course will be done at institute level. Method of conduction and method of assessment for audit courses is suggested.

Criteria:

The student registered for audit course shall be awarded the grade PP and shall be included such grade in the Semester grade report for that course, provided student has the minimum attendance as prescribed by the Savitribai Phule Pune University and satisfactory in-semester performance and secured a passing grade in that audit course. No grade points are associated with this 'PP' grade and performance in these courses is not accounted in the calculation of the performance indices SGPA and CGPA.

Guidelines for Conduction and Assessment(Any one or more of following but not limited to)

1. Lectures/ Guest Lectures
2. Visits (Social/Field) and reports
3. Demonstrations
4. Surveys
5. Mini Project
6. Hands on experience on Specific focused topic

Guidelines for Assessment (Any one or more of following but not limited to)

1. Written Test
2. Demonstrations/ Practical Test
3. Presentations
4. IPR/Publication
5. Report

Audit Course 3 Options

Course Code	Audit Course Title
AC3- I	Green Construction & Design
AC3-II	Leadership and Personality Development
AC3-III	Professional Ethics and Etiquettes
AC3-IV	Digital & Social Media Marketing

AC3- I : Green Construction & Design

Prerequisites:
1. General awareness of environment and eco system.

Course Objectives:
1. To motivate students for undertaking green construction projects, technical aspects of their design, obstacles to getting them done, and future directions of the field.
2. To increase awareness of green construction issues, so that students will know the range of existing knowledge and issues.
3. Proper use of energy, water and other resources without harming environment.
4. To reduce waste pollution and Environment Degradation.

Course Outcomes:
1. To understand the importance of environment friendly society.
2. To apply primary measures to reduce carbon emissions from their surroundings.
3. To learn role of IT solutions in design of green buildings.
4. To understand the use of software systems to complete statutory compliancesinvolved in the design of a new home or office building through green construction.

UNIT I
Introduction to Green Construction, need of green construction, Importance, Government Initiatives, your role in the Green Environment.

UNIT II
How to do Green Construction, Project Definition, Team Building, Education and Goal Setting, Documents and Specification.

UNIT III
Elements of Green Construction, Materials Construction Waste Management, Indoor Air Quality, Energy Efficiency.

UNIT IV
Indian Green Building Council (IGBC), Introduction to IGBC, IGBC rating system, Green building projects in India, Benefits of green building, effects on natural resources.

Team Projects:
Students will be formed into groups to research green construction and design in a particular construction context and report their results to the class. What are the particular obstacles and opportunities to integrating green construction techniques into the following sectors? Be sure to consider technical, social, political and economic issues:
1. Hotels (economy, luxury, resorts)
2. Hospitals
3. Retail(big box, malls, small scale downtown retail)
4. Office
5. Government
6. Schools
7. Universities
8. Housing
9. Transportation Stations (Airport Terminals, Train Stations)

References :

1. Kibert, C. (2008) Sustainable Construction: Green Building Design and Delivery, 2nd edition (Hoboken, NJ: John Wiley & Sons.
2. Handbook of Green Building Design and Construction 1st Edition, by Sam Kubba, eBook ISBN:9780123851291.
3. IGBC Green New Buildings Rating System, Version 3.0, Abridged Reference Guide September 2014.Available on internet https://igbc.in/igbc/html_pdfs/abridged/IGBC%20Green%20New%20Buildings%20Rating%20System%20(Version%203.0).pdf

Audit Course 3 - II : Leadership and Personality Development

Prerequisites:

1. Soft Skills.

Course Objectives:

1. To develop inter personal skills and be an effective goal oriented leader.
2. To develop personalities of students in order to empower them and get better insights into ones responsibilities in personal life to build better human being.
3. To develop professionals with leadership quality along with idealistic, practical and moral values.
4. To re-engineer attitude and understand its influence on behavior
5. To help Students evolve as leaders and effectively handle real life challenges in and across the dynamic environment.

Course Outcomes:

1. To exhibit responsible decision-making and personal accountability
2. To demonstrate an understanding of group dynamics and effective teamwork
3. To develop a range of leadership skills and abilities such as effectively leading change, resolving conflict, and motivating others.
4. To develop overall personality.

UNIT I

Personality Development: It Is Personality That Matters, Laws of Personality Development, Different Layers of Personality, How to Change Our Character, Influence of Thought, Take the Whole Responsibility on Yourself, How to Work? Attitude: Factors influencing Attitude, Challenges and lessons from Attitude, Personality Traits , Sharpening Memory Skills, Decision-Making, Negotiation and Problem-Solving

UNIT II

Techniques in Personality development :Self-confidence, Goal setting ,Stress Management : Introduction to Stress, Causes of Stress, Impact Management Stress, Managing Stress Conflict Management: Introduction to Conflict, Causes of Conflict, Managing Conflict ,Time Management: Time as a Resource, Identify Important Time Management Wasters, Individual Time Management Styles, Techniques for better Time Management, Meditation and concentration techniques, Self-hypnotism, Self-acceptance and self-growth.

UNIT III

Leadership Skills: Working individually and in a team, Levels of Leadership, Making of a leader, Types of leadership, Transactions Vs Transformational Leadership, VUCA Leaders, DART Leadership, Leadership Grid & leadership Formulation. Introduction to Interpersonal Relations, Analysis Relations of different ego states, Analysis of Transactions, Analysis of Strokes, Analysis of Life position.

UNIT IV

Group Dynamics &Team Building

Group Dynamics: Importance of groups in organization, and Team Interactions in group, Group Vs Teams, Team formation process, Stages of Group, Group Dynamics, Managing Team Performance & Team Conflicts. How to build a good team? Team work & Team building Interpersonal skills – Conversation, Feedback, Feed forward Interpersonal skills – Delegation, Humor, Trust, Expectations, Values, Status, Compatibility and their role in building team

References :

1. Barun K. Mitra; (2011), “Personality Development & Soft Skills”, First Edition; Oxford Publishers.2E, ISBN: 780199459742, ISBN:0199459746.
2. ShaliniVerma (2014); “Development of Life Skills and Professional Practice”; First Edition; Sultan

Chand (G/L) & Company. ISBN: 9789325974203, ISBN:9325974207.
3. John C. Maxwell (2014); “The 5 Levels of Leadership”, Centre Street, A division of Hachette Book Group Inc, ISBN: 9789350098714, ISBN:9350098717.
4. Basic Managerial Skills for All by E. H. McGrath, S. J., PHI Personality Development and Soft Skill, Mitra, Barun, Oxford University Press, ISBN: 9788120343146, ISBN:812034314X.
5. Personality Development by Rajiv K. Mishra. Rupa& Co.
6. How to deal with Stress by Stephen Palmer & Cary Cooper, Kogan Page India Pvt. Ltd., South Asian Edition Successful Time Management by Patrick Forsyth, Kogan Page.

Audit Course 3 – III : Professional Ethics and Etiquettes

Prerequisites:

1. Communication and Language Laboratory

Course Objectives:

1. To learn the rules of good behavior for today's most common social and business situations, including the common courtesies of life
2. To imbibe basic knowledge to make informed ethical decisions when confronted with problems in the working environment.
3. To develop an understanding of how a societal moral varies with culture and how this influences ethical thought and action
4. To develop an orientation towards business etiquettes and the proper etiquette practices for different business scenarios.
5. To learn the etiquette requirements for meetings, entertaining, telephone, and Internet business interaction scenario.

Course Outcomes:

1. To summarize the principles of proper courtesy as they are practiced in the workplace.
2. To describe ways to apply proper courtesy in different professional situations.
3. To practice appropriate etiquettes in the working environment and day to day life.
4. To learn and build proper practices for global corporate world.

UNIT I

An Overview of Ethics, What Is Ethics? Definition of Ethics ,The Importance of Integrity ,The Difference Between Morals, Ethics, and Laws, Engineering Ethics: Purpose of Engineering Ethics-Professional and Professionalism, Professional Roles to be played by an Engineer, Uses of Ethical Theories, Professional Ethics, Development of Ethics, Carol Gilligan's theory of moral development, Heinz's dilemma.

UNIT II

IT Professional Ethics, Ethics in the Business World , Corporate Social Responsibility , Improving Corporate Ethics , Creating an Ethical Work Environment, Including Ethical Considerations in Decision Making ,Ethics in Information Technology ,Common Ethical Issues for IT Users , Supporting the Ethical Practices of IT Users.

UNIT III

Business Etiquette, The ABC's of Etiquette, Developing a Culture of Excellence, The Principles of Exceptional Work Behavior, The Role of Good Manners in Business, Enduring Words Making Introductions and Greeting People: Greeting Components, The Protocol of Shaking Hands, Introductions, Introductory Scenarios, Addressing Individuals Meeting and Board Room Protocol: Guidelines for Planning a Meeting, Before the Meeting, On the Day of the Meeting, Guidelines for Attending a Meeting.

UNIT IV

Professional Etiquette, Etiquette at Dining. Involuntary Awkward Actions, How to Network, Networking Etiquette, Public Relations Office(PRO)'s Etiquettes, Technology Etiquette : Phone Etiquette, Email Etiquette, Social Media Etiquette, Video Conferencing Etiquette, Interview Etiquette, Dressing Etiquettes : for Interview, offices and social functions.

References :

1. George Reynolds, —Ethics in Information Technology, Cengage Learning, ISBN- 10:1285197151.
2. Business Etiquette for Dummies, 2nd Edition by Sue Fox, Wiley Publishing, Inc.

3. Charles E Harris, Micheal J Rabins, —Engineering Ethics, Cengagen Learning , ISBN- 13:978-1133934684.4th Edition.
4. PSR Murthy, —Indian Culture Values and Professional Ethics , BS Publications, ISBN- 10:9381075700. 2nd Edition.
5. Business Etiquette in Brief by Ann Marie Sabath, Adams Media Corporation, South Asian Edition, 1st Edition.

Audit Course 3 – IV : Digital & Social Media Marketing

Prerequisites:

1. Knowledge of Social Media Networking.

Course Objectives:

1. Get strategic understanding of Digital Marketing and Social Media Marketing.
2. Understand how to use it for branding and sales.
3. Understand its advantages & limitations.
4. Become familiar with Best Practices, Tools & Technologies.
5. Blend digital and social marketing with offline marketing.
6. Plan and manage digital marketing budget.
7. Manage Reporting & Tracking Metrics.
8. Understand the future of Digital Marketing and prepare for it.

Course Outcomes:

1. Develop a far deeper understanding of the changing digital landscape.
2. Identify some of the latest digital marketing trends and skill sets needed for today's marketer.
3. Successful planning, prediction, and management of digital marketing campaigns.
4. Implement smart management of different digital assets for marketing needs.
   Assess digital marketing as a long term career opportunity.

UNIT I

Digital Marketing, History of Digital Marketing, Importance of Digital Marketing, Effective use of Digital Marketing, Effects of wrong Digital Marketing, Digital Marketing to develop brands, Digital Marketing for sales, Digital Marketing for product and service development.

UNIT II

Techniques for effective Email Marketing and pitfalls, Various online email marketing platforms such as Campaign Monitor and Mail Chimp, Web content, web usability, navigation and design, Bookmarking and News Aggregators, Really Simple Syndication (RSS),Blogging, Live Chat, User Generated Content (Wikipedia etc),Multi-media - Video (Video Streaming, YouTube etc),Multi-media - Audio & Podcasting (iTunes etc), Multi-media - Photos/Images (Flickr etc),Google Alerts and Giga Alert (Brand, product and service monitoring online),Crowdsourcing, Virtual Worlds.

UNIT III

Search Engine Optimization (SEO), Search Engine Optimization (SEO) tips and techniques, Google Adwords, Google various applications such as 'Google Analytics', Maps, Places etc to enhance a brand's products, services and operations.

UNIT IV

Facebook &LinkedIn and other Social Media for a real marketing, Utilizing Facebook and LinkedIn's Advertising functionality and Applications, Brand reputation management techniques, Systems for 'buzz monitoring' for brands, products and services, Effective Public Relations (PR) online and business development.

References :

1. Vandana Ahuja, Digital Marketing, Oxford Press, ISBN: 9780199455447, 1st Edition.
2. Email Marketing: An Hour a Day, Wiley, Jeanniey Mullen, David Daniels, David Gilmour-ISBN: 978-0-470-38673-6, 1st Edition.
3. The New Rules of Marketing and PR, David Scott, Wiley India, ISBN: 978-1-119-07048-1, 1st Edition.

SEMESTER-II

314450 : COMPUTER NETWORK TECHNOLOGY

Teaching Scheme:
Lectures: 3 Hours/Week

Credits
03

Examination Scheme:
In-Semester : 30 Marks
End-Semester: 70 Marks

Prerequisites:

1. Foundation of Communication and Computer Networks.

Course Objectives :

1. To understand services offered at different layers of network.
2. To understand protocol used at different layers of network.
3. To fathom wireless network and different wireless standards.
4. To recognize differences in between different wireless networks and to learn different mechanism used at layers of wireless network.
5. To know the applications of network and use the understood concepts for new application development.
6. To explore recent trends in networking.

Course Outcomes :

1. To know Responsibilities, services offered and protocol used at each layer of network.
2. To understand different addressing techniques used in network.
3. To know the difference between different types of network.
4. To know the different wireless technologies and IEEE standards.
5. To use and apply the standards and protocols learned, for application development.
6. To understand and explore recent trends in network domain.

UNIT – I NETWORK LAYER **06 Hours**

Network Layer Services, IPv4 Addresses: Classful and Classless Addressing, Special Addresses, NAT, Subnetting, Supernetting, Delivery and Forwarding of IP Packet, Structure of Router, IPv4: Fragmentation, Options, Checksum, ARP: Address Mapping, ARP Protocol, RARP, DHCP, ICMPv4, Unicast Distance Vector Routing, Link State Routing, Unicast Routing Protocols: RIP,EIGRP,OSPF,BGP, IPv6 Addressing.

UNIT – II TRANSPORT LAYER **06 Hours**

Transport Layer Services, UDP: Datagram, Services, Applications, TCP: Services, Features, Segment, TCP Connection, Window in TCP, Flow control, Congestion Control, Congestion Control Algorithms, Leaky Bucket, Token Bucket and QoS, TCP Timers, Options, TCP Package, Applications, SCTP: Features, Services, Packet Format, Socket: TCP and UDP Socket, Applications.

UNIT – III APPLICATION LAYER **06 Hours**

Client Server Paradigm: Communication using TCP and UDP, Peer to Peer Paradigm, Application Layer Protocols: DNS, FTP, TFTP, HTTP, SMTP, POP, IMAP, MIME, Network Management: SNMP.

UNIT – IV WIRELESS STANDARDS **06 Hours**

Electromagnetic Spectrum: Spectrum Allocation, Radio Propagation Mechanism, Characteristics of Wireless Channel, Wireless LANs: Architectural Comparison, Characteristics, Access Control, IEEE 802.11: Architecture, MAC Sub Layer, Addressing Mechanism, Physical Layer, Bluetooth: Architecture, Layers, IEEE 802.16/WiMax: Services, Architecture, Layers, Differences between Bluetooth, IEEE 802.11 and IEEE 802.16.

UNIT – V ADHOC WIRELESS NEWTORK **06 Hours**

Infrastructure Network and Infrastructure-less Wireless Networks, Issues in Adhoc Wireless Network, Adhoc

Network MAC Layer: Design Issues, Design Goal, Classification, MACAW, Adhoc Network Routing Layer: Issues in Designing a Routing Protocol for Ad-hoc Wireless Networks – Classifications of Routing Protocols, DSDV, AODV, DSR, Adhoc Transport Layer: Issues in Designing a Transport Layer Protocol for Ad hoc Wireless Networks – Design Goals of a Transport Layer Protocol for Ad hoc Wireless Networks –Classification of Transport Layer Solutions, TCP over Adhoc Wireless Networks.

UNIT – VI RECENT TRENDS IN COMMUNICATION NETWORKS **06 Hours**

Satellite Network: Operation, GEO Satellites, MEO Satellites, LEO Satellites, Wireless Sensor Network: Functioning, Characteristics, Operation, Cluster Management, Computational Grid: Design, Issues, Internet of Things: Vision, Trends, Significance, Technical Building Blocks, Issues and Challenges, Applications, IoE. Software Defined Network: SDN Implication for research and innovation, Genesis of SDN, Characteristics of SDN, SDN Operations, SDN Devices, SDN Controllers, SDN Application, OpeFLow Overview, Network Function Virtualization: Introduction, Applications, Network Neutrality: Need, Requirements ([e] Reference from research papers and web)

Text Books

1. Behrouz A. Forouzan, TCP/IP Protocol Suite, McGraw Hill Education, ISBN: 978-0-07-070652-1, 4th Edition.
2. C. Siva Ram Murthy, B. S. Manoj, Adhoc Wireless Networks: Architecture and Protocols, Pearson Education, ISBN: 978-81-317-0688-6, 1st Edition.
3. Behrouz A. Forouzan, Data Communication and Networking, McGraw Hill Education, ISBN: 978-1-25-906475-3, 5th Edition.

Reference Books

1. Andrew S. Tanenbaum, David J. Wethrall, Computer Network, Pearson Education, ISBN: 978-0-13-212695-3.
2. Kurose Ross, Computer Networking: A Top Down Approach Featuring the Internet, Pearson Education, ISBN: 978-81-7758-878-1.
3. Charles E. Perkins, Adhoc Networking, Pearson Education, 978-81-317-2096-7.
4. Andrea Goldsmith, Wireless Communication, Cambridge University Press, ISBN:978-0-521-83716-3.
5. Mayank Dave, Computer Network, Cengage Learning, ISBN: 978-81-315-0986-9.
6. C. K. Toh, Ad Hoc Mobile Wireless Networks Protocols and Systems, Prentice Hall, ISBN: 978-01-324-42046.
7. Paul Goransson, Chuck Black, Software Defined Networks: A Comprehensive Approach, Morgan Kaufmann, ISBN: 978-0124166752.
8. Natalia Olifer, Victor Olifer, Computer Networks: Principles, Technologies and Protocols for Network Design, Wiley India, ISBN: 9788126509171
9. Kazem Sohraby, Daniel Minoli, Taieb Znati, Wireless Sensor Networks: Technology, Protocols and Applications, Wiley India, ISBN: 9788126527304
10. P. Nicopolitidis, M.S. Obaidat, G.I. Papadimitriou, A.S. Pomportsis, Wireless Networks, Wiley India, ISBN : 9788126522200

314451 : SYSTEMS PROGRAMMING

Teaching Scheme:
Lectures: 4 Hours/Week

Credits
04

Examination Scheme:
In-Semester : 30 Marks
End-Semester: 70 Marks

Prerequisites:

1. Computer Organization and architecture.
2. Processor Architecture and Interfacing.
3. Fundamentals of Data Structures, Data Structures and Files.
4. Theory of Computation: DFA, NFA, Regular expressions, Grammars.

Course Objectives :

1. To study and understand different system software like Assembler, Macro-processor and Loaders / Linkers.
2. To design and develop useful system software.
3. To study and understand compiler design.
4. To understand semantic analysis and storage allocation in compilation process.
5. To understand different code generation techniques.
6. To study different code optimization methods.

Course Outcomes :

1. To learn independently modern software development tools and creates novel solutions for language processing applications.
2. To design and implement assemblers and macro processors.
3. To use tool LEX for generation of Lexical Analyzer.
4. To use YACC tool for generation of syntax analyzer.
5. To generate output for all the phases of compiler.
6. To apply code optimization in the compilation process.

UNIT – I INTRODUCTION TO SYSTEMS PROGRAMMING AND ASSEMBLERS — 08 Hours

Introduction: Need of System Software, Components of System Software, Language Processing Activities, Fundamentals of Language Processing.

Assemblers: Elements of Assembly Language Programming, A simple Assembly Scheme, Pass structure of Assemblers, Design of Two Pass Assembler, Single pass assembler.

UNIT – II MACROPROCESSORS, LOADERS AND LINKERS — 08 Hours

Macro Processor: Macro Definition and call, Macro Expansion, Nested Macro Calls and definition, Advanced Macro Facilities, Design of two-pass Macro Processor.

Loaders: Loader Schemes, Compile and Go, General Loader Scheme, Absolute Loader Scheme, Subroutine Linkages, Relocation and linking concepts, Self-relocating programs, Relocating Loaders, Direct Linking Loaders, Overlay Structure.

UNIT - III INTRODUCTION TO COMPILERS — 08 Hours

Phase structure of Compiler and entire compilation process.

Lexical Analyzer: The Role of the Lexical Analyzer, Input Buffering. Specification of Tokens, Recognition of Tokens, Design of Lexical Analyzer using Uniform Symbol Table, Lexical Errors.

LEX: LEX Specification, Generation of Lexical Analyzer by LEX.

UNIT – IV PARSERS — 08 Hours

Role of parsers, Classification of Parsers: Top down parsers- recursive descent parser and predictive parser.

Bottom up Parsers – Shift Reduce: SLR, CLR and LALR parsers. Error Detection and Recovery in Parser. YACC specification and Automatic construction of Parser (YACC).

UNIT – V SEMANTIC ANALYSIS AND STORAGE ALLOCATION 08 Hours

Need, Syntax Directed Translation, Syntax Directed Definitions, Translation of assignment Statements, iterative statements, Boolean expressions, conditional statements, Type Checking and Type conversion.

Intermediate Code Formats: Postfix notation, Parse and syntax tress, Three address code, quadruples and triples.

Storage Allocation: Storage organization and allocation strategies.

UNIT – VI CODE GENERATION AND OPTIMIZATION 08 Hours

Code Generation: Code generation Issues. Basic blocks and flow graphs, A Simple Code Generator.

Code Optimization: Machine Independent: Peephole optimizations: Common Sub-expression elimination, Removing of loop invariants, Induction variables and Reduction in strengths, use of machine idioms, Dynamic Programming Code Generation.

Machine dependent Issues: Assignment and use of registers, Rearrangement of Quadruples for code optimization.

Text Books

1. D. M. Dhamdhere, Systems Programming and Operating Systems, Tata McGraw-Hill, ISBN 13:978-0-07-463579-7, Second Revised Edition.
2. Alfred V. Aho, Ravi Sethi, Jeffrey D. Ullman, Compilers Principles, Techniques and Tools, Addison Wesley, ISBN:981–235–885 - 4, Low Price Edition.
3. J. J. Donovan, Systems Programming, McGraw-Hill, ISBN 13:978-0-07-460482-3, Indian Edition.

Reference Books

1. Leland L. Beck, "System Software An introduction to Systems Programming", Pearson Education, ISBN13: 9788177585551.

314452 : DESIGN AND ANALYSIS OF ALGORITHMS

Teaching Scheme:	Credits	Examination Scheme:
Lectures: 4 Hours/Week	04	In-Semester : 30 Marks
		End-Semester: 70 Marks

Prerequisites:

1. Fundamentals of Data Structures, Data Structures and Files.
2. Discrete Structures.
3. Basic mathematics: Induction, probability theory, logarithms.

Course Objectives :

1. To understand the problem solving and problem classification.
2. To know the basics of computational complexity analysis and various algorithm design strategies.
3. To provide students with solid foundations to deal with a wide variety of computational problems.
4. To provide a thorough knowledge of the most common algorithms and data structures.
5. To analyze a problem and identify the computing requirements appropriate for its solutions.
6. To understand the design of parallel algorithms.

Course Outcomes :

1. To calculate computational complexity using asymptotic notations for various algorithms.
2. To apply Divide & Conquer as well as Greedy approach to design algorithms.
3. To practice principle of optimality.
4. To illustrate different problems using Backtracking.
5. To compare different methods of Branch and Bound strategy.
6. To explore the concept of P, NP, NP-complete, NP-Hard and parallel algorithms.

UNIT – I INTRODUCTION 08 Hours

Brute Force method: Introduction to Brute Force method & Exhaustive search, Brute Force solution to 8 queens' problem.
Proof Techniques: Minimum 2 examples of each: Contradiction, Mathematical Induction, Direct proofs, Proof by counterexample, Proof by contraposition.
Analysis of Algorithm: Efficiency- Analysis framework, asymptotic notations – big O, theta and omega.
Amortized Analysis: Aggregate, Accounting & Potential method with the example of stack operations.
Analysis of Non-recursive and recursive algorithms: Solving Recurrence Equations (Homogeneous and non-homogeneous).

UNIT – II DIVIDE AND CONQUER AND GREEDYMETHOD 08 Hours

Divide & Conquer: General method, Control abstraction, Merge sort, Quick Sort – Worst, Best and average case. Binary search, Finding Max-Min, Large integer Multiplication (for all above algorithms analysis to be done with recurrence).
Greedy Method: General method and characteristics, Prim's method for MST , Kruskal's method for MST (using nlogn complexity), Dijkstra's Algorithm, Optimal storage on tapes, Fractional Knapsack problem, Job Sequencing.

UNIT - III DYNAMIC PROGRAMMING 08 Hours

General strategy, Principle of optimality, 0/1 knapsack Problem, Bellman-Ford Algorithm , Multistage Graph problem, Optimal Binary Search Trees, Travelling Salesman Problem.

UNIT – IV BACKTRACKING 08 Hours

General method, Recursive backtracking algorithm, Iterative backtracking method. 8-Queen problem, Sum of subsets, Graph coloring, Hamiltonian Cycle , 0/1 Knapsack Problem.

UNIT – V BRANCH AND BOUND 08 Hours

The method, Control abstractions for Least Cost Search, Bounding, FIFO branch and bound, LC branch and bound, 0/1 Knapsack problem – LC branch and bound and FIFO branch and bound solution, Traveling sales person problem

UNIT – VI COMPUTATIONAL COMPLEXITY AND PARALLEL ALGORITHMS 08 Hours

Computational Complexity: Non Deterministic algorithms, The classes: P, NP, NP Complete, NP Hard, Satisfiability problem, Proofs for NP Complete Problems: Clique, Vertex Cover.

Parallel Algorithms: Introduction, models for parallel computing, computing with complete binary tree, Pointer doubling algorithm.

Text Books

1. Horowitz and Sahani, Fundamentals of computer Algorithms, Galgotia, ISBN 81-7371-612-9.
2. S. Sridhar, Design and Analysis of Algorithms, Oxford, ISBN 10 : 0-19-809369-1.

Reference Books

1. Thomas H Cormen and Charles E.L Leiserson, Introduction to Algorithm, PHI, ISBN:81-203-2141-3.
2. R. C. T. Lee, SS Tseng, R C Chang, Y T Tsai, Introduction to Design and Analysis of Algorithms, A Strategic approach, Tata McGraw Hill, ISBN-13: 978-1-25-902582-2. ISBN-10: 1-25-902582-9.
3. Anany Levitin, Introduction to the Design & Analysis of Algorithm, Pearson, ISBN 81- 7758-835-4.
4. Steven S Skiena, The Algorithm Design Manual, Springer, ISBN 978-81-8489-865-1.
5. George T. Heineman, Gary Pollice, Stanley Selkow, Algorithms in a Nutshell, A Desktop Quick Reference, O'Reilly, ISBN: 9789352133611.
6. Gilles Brassard, Paul Bratle, Fundamentals of Algorithms, Pearson, ISBN 978-81-317-1244-3.
7. Michael T. Goodrich, Roberto Tamassia, Algorithm Design: Foundations, Analysis and Internet Examples, Wiley India, ISBN: 9788126509867
8. Rod Stephens, Essential Algorithms: A Practical Approach to Computer Algorithms, Wiley India, ISBN: 9788126546138

314453 : CLOUD COMPUTING

Teaching Scheme:
Lectures: 3 Hours/Week

Credits
03

Examination Scheme:
In-Semester : 30 Marks
End-Semester: 70 Marks

Prerequisites:

1. Operating Systems.
2. Fundamentals of Computer Networks.

Course Objectives :

1. To become familiar with Cloud Computing and its ecosystem.
2. To learn basics of virtualization and its importance.
3. To evaluate in-depth analysis of Cloud Computing capabilities.
4. To give technical overview of Cloud Programming and Services.
5. To understand security issues in cloud computing.
6. To be exposed to Ubiquitous Cloud and Internet of Things.

Course Outcomes :

1. To understand the need of Cloud based solutions.
2. To understand Security Mechanisms and issues in various Cloud Applications
3. To explore effective techniques to program Cloud Systems.
4. To understand current challenges and trade-offs in Cloud Computing.
5. To find challenges in cloud computing and delve into it to effective solutions.
6. To understand emerging trends in cloud computing.

UNIT – I FUNDAMENTALS OF CLOUD COMPUTING 06 Hours

Origins and Influences, Basic Concepts and Terminology, Goals and Benefits, Risks and Challenges, Roles and Boundaries, Cloud Characteristics, Cloud Delivery Models, Cloud Deployment Models, Federated Cloud/Intercloud, Types of Clouds.

Cloud-Enabling Technology: Broadband Networks and Internet Architecture, Data Center Technology, Virtualization Technology, Web Technology, Multitenant Technology, Service Technology.

UNIT – II VIRTUALIZATION AND COMMON STANDARDS IN CLOUD COMPUTING 06 Hours

Implementation Levels of Virtualization, Virtualization Structures/Tools and Mechanisms, Types of Hypervisors, Virtualization of CPU, Memory, and I/O Devices, Virtual Clusters and Resource Management, Virtualization for Data-Center Automation.

Common Standards: The Open Cloud Consortium, Open Virtualization Format, Standards for Application Developers: Browsers (Ajax), Data (XML, JSON), Solution Stacks (LAMP and LAPP),Syndication (Atom, Atom Publishing Protocol, and RSS), Standards for Security.

UNIT - III CLOUD PROGRAMMING, ENVIRONMENTS AND APPLICATIONS 06 Hours

Features of Cloud and Grid Platforms, Programming Support of Google App Engine, Programming on Amazon AWS and Microsoft Azure, Emerging Cloud Software Environments, Understanding Core OpenStack Ecosystem.

Applications: Moving application to cloud, Microsoft Cloud Services, Google Cloud Applications, Amazon Cloud Services, Cloud Applications (Social Networking, E-mail, Office Services, Google Apps, Customer Relationship Management).

UNIT –IV CLOUD SECURITY AND ISSUES 06 Hours

Basic Terms and Concepts, Threat Agents, Cloud Security Threats and Attacks, Additional Considerations.

Cloud Security Mechanisms: Encryption, Hashing, Digital Signature, Public Key Infrastructure (PKI), Identity and Access Management (IAM), Single Sign-On (SSO), Hardened Virtual Server Images.
Cloud Issues: Stability, Partner Quality, Longevity, Business Continuity, Service-Level Agreements, Agreeing on the Service of Clouds, Solving Problems, Quality of Service, Regulatory Issues and Accountability.

UNIT – V UBIQUITOUS CLOUDS AND THE INTERNET OF THINGS 06 Hours

Cloud Trends in Supporting Ubiquitous Computing, Performance of Distributed Systems and the Cloud, Enabling Technologies for the Internet of Things (RFID, Sensor Networks and ZigBee Technology, GPS), Innovative Applications of the Internet of Things (Smart Buildings and Smart Power Grid, Retailing and Supply-Chain Management, Cyber-Physical System), Online Social and Professional Networking.

UNIT – VI FUTURE OF CLOUD COMPUTING 06 Hours

How the Cloud Will Change Operating Systems, Location-Aware Applications, Intelligent Fabrics, Paints, and More, The Future of Cloud TV, Future of Cloud-Based Smart Devices, Faster Time to Market for Software Applications, Home-Based Cloud Computing, Mobile Cloud, Autonomic Cloud Engine, Multimedia Cloud, Energy Aware Cloud Computing, Jungle Computing.
Docker at a Glance: Process Simplification, Broad Support and Adoption, Architecture, Getting the Most from Docker, The Docker Workflow.

Text Books

1. Jack J. Dongarra, Kai Hwang, Geoffrey C. Fox, Distributed and Cloud Computing: From Parallel Processing to the Internet of Things, Elsevier, ISBN :9789381269237, 9381269238, 1st Edition.
2. Thomas Erl, Zaigham Mahmood and Ricardo Puttini, Cloud Computing: Concepts, Technology & Architecture, Pearson, ISBN :978 9332535923, 9332535922, 1st Edition.

Reference Books

1. Srinivasan, J. Suresh, Cloud Computing: A practical approach for learning and implementation, Pearson, ISBN :9788131776513.
2. Brian J.S. Chee and Curtis Franklin, Jr., Cloud Computing: Technologies and Strategies of the Ubiquitous Data Center, CRC Press, ISBN :9781439806128.
3. Kris Jamsa, Cloud Computing: Saas, Paas, Iaas, Virtualization, Business Models, Mobile, Security, and More, Jones and Bartlett, ISBN :9789380853772.
4. John W. Ritting house, James F. Ransome, Cloud Computing Implementation, Management, and Security, CRC Press, ISBN : 978 1439806807, 1439806802.
5. Karl Matthias, Sean P. Kane, Docker: Up and Running, OReilly, ISBN:9781491917572, 1491917571.
6. Rajkumar Buyya, Christian Vecchiola, S. ThamaraiSelvi, Mastering Cloud Computing: Foundations and Applications Programming, McGraw Hill, ISBN: 978 1259029950, 1259029956.
7. Barrie Sosinsky, Cloud Computing Bible, Wiley, ISBN: 978 8126529803.
8. Gautham Shroff, Enterprise Cloud Computing, Cambridge, ISBN: 9781107648890.
9. Ronald L. Krutz and Russell D. Vines, Cloud Security: A Comprehensive guide to Secure Cloud Computing, Wiley, ISBN: 9788126528097.
10. Scott Adkins, John Belamaric, Vincent Giersch, Denys Makogon, Jason E. Robinson, OpenStack: Cloud Application Development, Wrox, ISBN :9781119194316.
11. Rajkumar Buyya, James Broberg, Andrzej Goscinski, Cloud Computing: Principles and Paradigms, Wiley India, ISBN: 9788126541256
12. Kailash Jayaswal, Jagannath Kallakurchi, Donald J. Houde, Cloud Computing Black Book ,Wiley Dreamtech,ISBN:9789351194187
13. Barrie Sosinsky, Cloud Computing Bible Wiley India, ISBN :9788126529803

314454 : DATA SCIENCE AND BIG DATA ANALYTICS

Teaching Scheme:	Credits	Examination Scheme:
Lectures: 4 Hours/Week	04	In-Semester : 30 Marks
		End-Semester: 70 Marks

Prerequisites:

1. Engineering and discrete mathematics.
2. Database Management Systems, Data warehousing, Data mining.
3. Programming skill.

Course Objectives :

1. To introduce basic need of Big Data and Data science to handle huge amount of data.
2. To understand the basic mathematics behind the Big data.
3. To understand the different Big data processing technologies.
4. To understand and apply the Analytical concept of Big data using R and Python.
5. To visualize the Big Data using different tools.
6. To understand the application and impact of Big Data.

Course Outcomes :

1. To understand Big Data primitives.
2. To learn and apply different mathematical models for Big Data.
3. To demonstrate their Big Data learning skills by developing industry or research applications.
4. To analyze each learning model come from a different algorithmic approach and it will perform differently under different datasets.
5. To understand needs, challenges and techniques for big data visualization.
6. To learn different programming platforms for big data analytics.

UNIT – I INTRODUCTION: DATA SCIENCE AND BIG DATA — 08 hours

Introduction to Data science and Big Data, Defining Data science and Big Data, Big Data examples, Data explosion, Data volume, Data Velocity, Big data infrastructure and challenges, Big Data Processing Architectures, Data Warehouse, Re-Engineering the Data Warehouse, Shared everything and shared nothing architecture, Big data learning approaches.

UNIT – II MATHEMATICAL FOUNDATION OF BIG DATA — 08 Hours

Probability theory, Tail bounds with applications, Markov chains and random walks, Pair wise independence and universal hashing, Approximate counting, Approximate median, The streaming models, Flajolet Martin Distance sampling, Bloom filters, Local search and testing connectivity, Enforce test techniques, Random walks and testing, Boolean functions, BLR test for linearity.

UNIT - III BIG DATA PROCESSING — 08 Hours

Big Data technologies, Introduction to Google file system, Hadoop Architecture, Hadoop Storage: HDFS, Common Hadoop Shell commands, Anatomy of File Write and Read, NameNode, Secondary NameNode, and DataNode, Hadoop MapReduce paradigm, Map Reduce tasks, Job, Task trackers - Cluster Setup – SSH & Hadoop Configuration, **Introduction to:** NOSQL, Textual ETL processing.

UNIT – IV BIG DATA ANALYTICS — 08 Hours

Data analytics life cycle, Data cleaning , Data transformation, Comparing reporting and analysis, Types of analysis, Analytical approaches, Data analytics using R, Exploring basic features of R, Exploring R GUI, Reading data sets, Manipulating and processing data in R, Functions and packages in R, Performing graphical analysis in R, Integrating R and Hadoop, Hive, Data analytics.

UNIT – V Big Data Visualization 08 Hours

Introduction to Data visualization, Challenges to Big data visualization, Conventional data visualization tools, Techniques for visual data representations, Types of data visualization, Visualizing Big Data, Tools used in data visualization, Propriety Data Visualization tools, Open –source data visualization tools, Analytical techniques used in Big data visualization, Data visualization with Tableau, **Introduction to:** Pentaho, Flare, Jasper Reports, Dygraphs, Datameer Analytics Solution and Cloudera, Platfora, NodeBox, Gephi, Google Chart API, Flot, D3, and Visually.

UNIT – VI BIG DATA TECHNOLOGIES APPLICATION AND IMPACT 08 Hours

Social media analytics, Text mining, Mogile analytics , Roles and responsibilities of Big data person, Organizational impact, Data analytics life cycle, Data Scientist roles and responsibility, Understanding decision theory, creating big data strategy, big data value creation drivers, Michael Porter's valuation creation models, Big data user experience ramifications, Identifying big data use cases.

Text Books

1. Krish Krishnan, Data warehousing in the age of Big Data, Elsevier, ISBN: 9780124058910, 1st Edition.
2. DT Editorial Services, Big Data, Black Book, DT Editorial Services, ISBN: 9789351197577, 2016 Edition.

Reference Books

1. Mitzenmacher and Upfal, Probability and Computing: Randomized Algorithms and Probabilistic Analysis, Cambridge University press, ISBN :521835402 hardback.
2. Dana Ron, Algorithmic and Analysis Techniques in Property Testing, School of EE.
3. Graham Cormode, Minos Garofalakis, Peter J. Haas and Chris Jermaine, Synopses for Massive Data: Samples, Histograms, Wavelets, Sketches, Foundation and trends in databases, ISBN :10.1561/1900000004.
4. A.Ohri, R for Business Analytics, Springer, ISBN:978-1-4614-4343-8.
5. Alex Holmes, Hadoop in practice, Dreamtech press, ISBN:9781617292224.
6. AmbigaDhiraj, Big Data, Big Analytics: Emerging Business Intelligence and Analytic Trends for Today's Business, Wiely CIO Series.
7. Arvind Sathi, Big Data Analytics: Disruptive Technologies for Changing the Game, IBM Corporation, ISBN:978-1-58347-380-1.
8. EMC Education Services, Data Science and Big Data Analytics- Discovering, analyzing Visualizing and Presenting Data.
9. Li Chen, Zhixun Su, Bo Jiang, Mathematical Problems in Data Science, Springer, ISBN :978-3-319-25127-1.
10. Philip Kromer and Russell Jurney, Big Data for chips, O'Reilly, ISBN :9789352132447.
11. EMC Education services, Data Science and Big Data Analytics, EMC2 Wiley, ISBN :978812655653-3.
12. Mueller Massaron, Python for Data science, Wiley, ISBN :9788126557394.
13. EMC Education Services, Data Science and Big Data Analytics, Wiley India, ISBN: 9788126556533
14. Benoy Antony, Konstantin Boudnik, Cheryl Adams,,Professional Hadoop, Wiley India, ISBN :9788126563029
15. Mark Gardener, Beginning R: The Statistical Programming Language ,Wiley India, ISBN :9788126541201
16. Mark Gardener, The Essential R Reference ,Wiley India, ISBN : 9788126546015
17. Judith Hurwitz, Alan Nugent, Big Data For Dummies, Wiley India, ISBN : 9788126543281

314455 : SOFTWARE LABORATORY – IV

Teaching Scheme:
Practical : 2 Hours/Week

Credits
01

Examination Scheme:
Term Work : 25 Marks
Oral : 25 Marks

Prerequisites:

1. Fundamentals of computer Networks.

Course Objectives :

1. To design and implement small size network and to understand various networking commands
2. To provide the knowledge of various networking tools and their related concepts
3. To understand various application layer protocols for its implementation in client/server environment
4. To understand network layer protocols and its implementations.
5. To explore and understand various simulations tools for network applications.
6. To understand the fundamentals of wireless networks and standards.

Course Outcomes :

1. To implement small size network and its use of various networking commands.
2. To understand and use various networking and simulations tools.
3. To configure various client/server environments to use application layer protocols
4. To understand the protocol design at various layers.
5. To explore use of protocols in various wired and wireless applications.
6. To develop applications on emerging trends.

Guidelines for Instructor's Manual

1. The faculty member should prepare the laboratory manual for all the experiments and it should be made available to students and laboratory instructor/Assistant

Guidelines for Student's Lab Journal

1. Student should submit term work in the form of handwritten journal based on specified list of assignments.
2. Practical Examination will be based on the term work.
3. Candidate is expected to know the theory involved in the experiment.
4. The practical examination should be conducted if and only if the journal of the candidate is complete in all respects.

Guidelines for Lab /TW Assessment

1. Examiners will assess the term work based on performance of students considering the parameters such as timely conduction of practical assignment, methodology adopted for implementation of practical assignment, timely submission of assignment in the form of handwritten write-up along with results of implemented assignment, attendance etc.
2. Examiners will judge the understanding of the practical performed in the examination by asking some questions related to theory & implementation of experiments he/she has carried out.
3. Appropriate knowledge of usage of software and hardware related to respective laboratory should be checked by the concerned faculty member.

As a conscious effort and little contribution towards Green IT and environment awareness, attaching printed papers of the program in journal may be avoided. There must be hand-written write-ups for every assignment in the journal. The DVD/CD containing students programs should be attached to the journal by every student and same to be maintained by department/lab In-charge is highly encouraged. For reference one or two journals may be maintained with program prints at Laboratory.

Suggested List of Laboratory Assignments

1. Explore and Study of TCP/IP utilities and Network Commands on Linux.

a)	Ping	g)	Tracert/Traceroute/Tracepath
b)	ipconfig / ifconfig	h)	NSlookup
c)	Hostname	i)	Arp
d)	Whois	j)	Finger
e)	Netstat	k)	Port Scan / nmap
f)	Route		

2.Using a Network Simulator (e.g. packet tracer) Configure

Sub-netting of a given network
Super-netting of a given networks.

3. Using a Network Simulator (e.g. packet tracer) Configure

A router using router commands,
Access Control lists – Standard & Extended.

4. Using a Network Simulator (e.g. packet tracer) Configure

EIGRP – Explore Neighbor-ship Requirements and Conditions, its K Values Metrics Assignment and Calculation,
RIPv2 and EIGRP on same network.
WLAN with static IP addressing and DHCP with MAC security and filters

5. Using a Network Simulator (e.g. packet tracer) Configure

VLAN, Dynamic trunk protocol and spanning tree protocol
OSPF – Explore Neighbor-ship Condition and Requirement, Neighbor-ship states, OSPF Metric Cost Calculation.
Network Address Translation : Static, Dynamic & PAT (Port Address Translation)

6. Socket Programming in C/C++ on Linux.

TCP Client , TCP Server
UDP Client , UDP Server

7. Introduction to server administration (server administration commands and their applications) and configuration any three of below Server : (Study/Demonstration Only)

FTP, Web Server, DHCP, Telnet, Mail, DNS

8. Using any open source Network Simulator, Implement

MANET / Wireless Sensor Network

9. Write a program using Arduino / Rasberry Pi Kit for Demonstration of IOT Application on any one of the following Topics.

Appliance Remote Control
Time Lapse Camera Controller
Security / Automation Sensors
The Traffic Light Controller
Temperature Controller

References

1. Andrew S. Tanenbaum, David J. Wethrall, Computer Network, Pearson Education, ISBN : 978-0-13-212695-3.
2. Kurose Ross, Computer Networking: A Top Down Approach Featuring the Internet, Pearson Education, ISBN :978-81-7758-878-1.

3. Charles E. Perkins, Adhoc Networking, Pearson Education, 978-81-317-2096-7.
4. Andrea Goldsmith, Wireless Communication, Cambridge University Press, ISBN:978-0-521-83716-3.
5. Mayank Dave, Computer Network, Cengage Learning, ISBN :978-81-315-0986-9.
6. C. K. Toh, Ad Hoc Mobile Wireless Networks Protocols and Systems, Prentice Hall, ISBN:978-01-324-42046.
7. Paul Goransson, Chuck Black, Software Defined Networks: A Comprehensive Approach, Morgan Kaufmann, ISBN:978-0124166752.

314456 : SOFTWARE LABORATORY - V

Teaching Scheme:	Credits	Examination Scheme:
Practical : 4 Hours/Week	02	Term Work : 50 Marks Practical : 50 Marks

Prerequisites:

1. Discrete Structure.
2. C/ C++ Programming.
3. Fundamentals of Data Structure and Files.

Course Objectives :

1. To learn the concepts of assembler to design and implement two pass assembler.
2. To study use of macros and its expansion process.
3. To understand lexical analyzer and parser and its applications in compiler design.
4. To learn the various algorithmic design paradigms.
5. To apply appropriate algorithmic strategy in problem solving.
6. To find the space and running time requirements of the algorithms.

Course Outcomes :

1. To design and implement two pass assembler for hypothetical machine instructions.
2. To design and implement different phases of compiler (Lexical Analyzer, Parser, Intermediate code generation)
3. To use the compile generation tools such as “Lex" and "YACC”.
4. To apply algorithmic strategies for solving various problems.
5. To compare various algorithmic strategies.
6. To analyze the solution using recurrence relation.

Guidelines for Instructor's Manual

1. The faculty member should prepare the laboratory manual for all the experiments and it should be made available to students and laboratory instructor/Assistant.

Guidelines for Student's Lab Journal

1. Student should submit term work in the form of handwritten journal based on specified list of assignments.
2. Practical Examination will be based on the term work.
3. Candidate is expected to know the theory involved in the experiment.
4. The practical examination should be conducted if and only if the journal of the candidate is complete in all respects.

Guidelines for Lab /TW Assessment

1. Examiners will assess the term work based on performance of students considering the parameters such as timely conduction of practical assignment, methodology adopted for implementation of practical assignment, timely submission of assignment in the form of handwritten write-up along with results of implemented assignment, attendance etc.
2. Examiners will judge the understanding of the practical performed in the examination by asking some questions related to theory & implementation of experiments he/she has carried out.
3. Appropriate knowledge of usage of software and hardware related to respective laboratory should be

checked by the concerned faculty member

As a conscious effort and little contribution towards Green IT and environment awareness, attaching printed papers of the program in journal may be avoided. There must be hand-written write-ups for every assignment in the journal. The DVD/CD containing students programs should be attached to the journal by every student and same to be maintained by department/lab In-charge is highly encouraged. For reference one or two journals may be maintained with program prints at Laboratory.

Suggested List of Laboratory Assignments

Group A: System Programming

1. Write a program to implement Pass-I of Two-pass assembler for Symbols and Literal processing (For hypothetical instruction set from Dhamdhere) considering following cases
   i. Forward references
   ii. DS and DC statement
   iii. START, EQU, LTORG, END.
   iv. Error handling: symbol used but not defined, invalid instruction/register etc.

2. Write a program to implement Pass-II of Two-pass assembler for output of Assignment 1 (The subject teacher should provide input file for this assignment)
3. Study Assignment for Macro Processor. (Consider all aspects of Macro Processor)
4. Write a program to implement Lexical Analyzer for subset of C.
5. Write a program to implement a Recursive Descent Parser .
6. Write a program to implement calculator using LEX and YACC.
7. Write a program for Intermediate code generation using LEX &YACC for Control Flow statement (Either While loop or Switch case)

Group B: Design & Analysis of Algorithms

1. Write a program to find Maximum and Minimum element in an array using Divide and Conquer strategy and verify the time complexity.
2. Write a program to solve optimal storage on tapes problem using Greedy approach.
3. Write a program to implement Bellman-Ford Algorithm using Dynamic Programming and verify the time complexity.
4. Write a program to solve the travelling salesman problem and to print the path and the cost using Dynamic Programming.
5. Write a recursive program to find the solution of placing n queens on chessboard so that no two queens attack each other using Backtracking.
6. Write a program to solve the travelling salesman problem and to print the path and the cost using Branch and Bound.

Note: All the assignments should be conducted on Latest version of Open Source/Proprietary Operating Systems, tools and Multi-core CPU supporting Virtualization and Multi-Threading.

References :

1. D. M. Dhamdhere, Systems Programming and Operating Systems, Tata McGraw-Hill, ISBN 13: 978-0-07-463579-7, Second Revised Edition.
2. Horowitz and Sahani, Fundamentals of computer Algorithms, Galgotia.,ISBN : 81-7371-612-9.

314457 : SOFTWARE LABORATORY - VI

Teaching Scheme:	Credits	Examination Scheme:
Lectures: 2 Hours/Week	01	Term Work : 25 Marks
		Practical : 25 Marks

Prerequisites:

1. Engineering and discrete mathematics.
2. Database Management Systems, Data warehousing, Data mining.
3. Programming skill.

Course Objectives :

1. To understand Big data primitives and fundamentals.
2. To understand the different Big data processing techniques.
3. To understand and apply the Analytical concept of Big data using R/Python.
4. To understand different data visualization techniques for Big Data.
5. To understand the application and impact of Big Data
6. To understand emerging trends in Big data analytics

Course Outcomes :

1. To apply Big data primitives and fundamentals for application development.
2. To explore different Big data processing techniques with use cases.
3. To apply the Analytical concept of Big data using R/Python.
4. To visualize the Big Data using Tableau.
5. To design algorithms and techniques for Big data analytics.
6. To design Big data analytic application for emerging trends.

Guidelines for Instructor's Manual

1. The faculty member should prepare the laboratory manual for all the experiments and it should be made available to students and laboratory instructor/Assistant.

Guidelines for Student's Lab Journal

1. Student should submit term work in the form of handwritten journal based on specified list of assignments.
2. Practical Examination will be based on the term work.
3. Candidate is expected to know the theory involved in the experiment
4. The practical examination should be conducted if and only if the journal of the candidate is complete in all respects.

Guidelines for Lab /TW Assessment

1. Examiners will assess the term work based on performance of students considering the parameters such as timely conduction of practical assignment, methodology adopted for implementation of practical assignment, timely submission of assignment in the form of handwritten write-up along with results of implemented assignment, attendance etc.
2. Examiners will judge the understanding of the practical performed in the examination by asking some questions related to theory & implementation of experiments he/she has carried out.
3. Appropriate knowledge of usage of software and hardware related to respective laboratory should be checked by the concerned faculty member

As a conscious effort and little contribution towards Green IT and environment awareness, attaching printed papers of the program in journal may be avoided. There must be hand-written write-ups for every assignment in the journal. The DVD/CD containing students programs should be attached to the journal by every student and same to be maintained by department/lab In-charge is highly encouraged. For reference one or two journals may be maintained with program prints at Laboratory.

Suggested List of Laboratory Assignments

Part A : Assignments based on the Hadoop

1. Hadoop Installation on a)Single Node b)Multiple Node

2. Design a distributed application using MapReduce which processes a log file of a system. List out the users who have logged for maximum period on the system. Use simple log file from the Internet and process it using a pseudo distribution mode on Hadoop platform.

3. Design and develop a distributed application to find the coolest/hottest year from the available weather data. Use weather data from the Internet and process it using MapReduce.

4. Write an application using HBase and HiveQL for flight information system which will include

   1) Creating, Dropping, and altering Database tables
   2) Creating an external Hive table to connect to the HBase for Customer Information Table
   3) Load table with data, insert new values and field in the table, Join tables with Hive
   4) Create index on Flight information Table 5) Find the average departure delay per day in 2008.

Part B : Assignments based on R and Python

1. Perform the following operations using R/Python on the Amazon book review and facebook metrics data sets
   5) Create data subsets
   6) Merge Data
   7) Sort Data
   8) Transposing Data
   9) Melting Data to long format
   10) Casting data to wide format

2. Perform the following operations using R/Python on the Air quality and Heart Diseases data sets
   1) Data cleaning
   2) Data integration
   3) Data transformation
   4) Error correcting
   5) Data model building

3. Integrate R/Python and Hadoop and perform the following operations on forest fire dataset
   1) Text mining in RHadoop
   2) Data analysis using the Map Reduce in Rhadoop
   3) Data mining in Hive

4. Visualize the data using R/Python by plotting the graphs for assignment no. 2 and 3

5. Perform the following data visualization operations using Tableau on Adult and Iris datasets
   1) 1D (Linear) Data visualization
   2) 2D (Planar) Data Visualization
   3) 3D (Volumetric) Data Visualization
   4) Temporal Data Visualization
   5) Multidimensional Data Visualization
   6) Tree/ Hierarchical Data visualization
   7) Network Data visualization

Part C : Case Study Assignment

1) Social Media Analytics
2) Text Mining/ Text Analytics
3) Mobile Analytics

References :

1. Big Data, Black Book, DT Editorial services, 2015 edition.
2. A.Ohri, "R for Business Analytics", Springer, 2012.
3. Robert I.Kbacoff , R in Action, Dreamtech press, Second edition
4. Alex Holmes, Hadoop in practice, Dreamtech press.
5. Online References for data set 1) http://archive.ics.uci.edu/ml/

314458 : PROJECT BASED SEMINAR

Teaching Scheme:
Tutorial : 1 Hour/Week

Credits
01

Examination Scheme:
Oral: 50 Marks

Introduction:

Graduates of final year IT program are supposed to design and implement projects through knowledge and skills acquired in previous semesters. Students should identify complex engineering problems and find effective, efficient and innovative ways of solving them through their projects.
In a technical seminar, students should aim to review literature in a focused way for identifying a complex problem to be attempted in their final year project. Seminar should make the student attain skills like (a) gathering of literature in specific area in a focused manner (b) effectively summarizing the literature to find state-of-the-art in proposed area (c) identifying scope for future work (d) presenting (arguing) the case for the intended work to be done as project (e) reporting literature review and proposed work in scientific way using good English.

Prerequisites:

1. Basic Communication, reading and writing skills.

Course Objectives :

1. To perform focused study of technical and research literature relevant to a specific topic.
2. To study, interpret and summarize literature scientifically.
3. To build independent thinking on complex problems.
4. To build collaborative work practices.
5. To communicate scientific information to a larger audience in oral and written form.
6. To use presentation standards and guidelines effectively.

Course Outcomes :

1. To Gather, organize, summarize and interpret technical literature with the purpose of formulating a project proposal.
2. To write a technical report summarizing state-of-the-art on an identified topic.
3. Present the study using graphics and multimedia presentations.
4. Define intended future work based on the technical review.
5. To explore and enhance the use of various presentation tools and techniques.
6. To understand scientific approach for literature survey and paper writing.

Guidelines for Project Based Seminars

1. A project group consisting of 3 to 4 students shall identify problem(s) in Computer Engineering / Information Technology referring to recent trends and developments in consultation with institute guide.
2. The group must review sufficient literature (reference books, journal articles, conference papers, white papers, magazines, web resources etc.) in relevant area on their project topic as decided by the guide.
3. Internal guide shall define a project statement based on the study by student group.
4. Students should identify individual seminar topic based on the project undertaken in consultation with guide.
5. Seminar topics should be based on project undertaken. Guide should thoughtfully allocate seminar topics on different techniques to solve the given problem (project statement), comparative analysis of the earlier algorithms used or specific tools used by various researchers.
6. Research articles could be referred from IEEE, ACM, Science direct, Springer, Elsevier, IETE,CSI or

from freely available digital libraries like Digital Library of India (dli.ernet.in), National Science Digital Library, JRD Tata Memorial Library, citeseerx.ist.psu.edu, getcited.org, arizona.openrepository.com, Open J-Gate, Research Gate, worldwidescience.org etc.

7. The group shall present the study as individual seminars in 20 – 25 minutes.

Guidelines for Seminar Report

1. Each student shall submit two copies of the seminar report in a prescribed format duly signed by the guide and Head of the department/Principal.
2. First chapter of a project group may talk about the project topic. At the end of the first chapter individual students should begin with introduction of seminar topic and its objectives.
3. Broad contents of review report (20-25 pages) shall be
   i. Introduction of Project Topic
   ii. Motivation, purpose and scope of project and seminar
   iii. Related work (of the seminar title) with citations
   iv. Discussion (your own reflections and analysis)
   v. Conclusions
   vi. Project definition. (Short version of RUP's vision document if possible).
   vii. References in IEEE Format
4. Students are expected to use open source tools for writing seminar report, citing the references and plagiarism detection. (Latex, Lex for report writing ; Mendeley, Zatero for collecting, organizing and citing the resources; DupliChecker , PaperRater, PlagiarismChecker and Viper for plagiarism detection)

Guidelines for Seminar Evaluation

1. A panel of examiners appointed by University will assess the seminar externally during the presentation.
2. Attendance for all seminars for all students is compulsory.
3. Criteria for evaluation
   i. Relevance of topic - 05 Marks
   ii. Relevance + depth of literature reviewed- 10 Marks
   iii. Seminar report (Technical Content) - 10 Marks
   iv. Seminar report (Language) - 05 Marks
   v. Presentation Slides - 05 Marks
   vi. Communication Skills - 05 Marks
   vii. Question and Answers - 10 Marks

Guidelines for Seminar Presentation

1) A panel of examiner will evaluate the viability of project scope and seminar delivery.
2) Oral examination in the form of presentation will be based on the project and seminar work completed by the candidates.
3) Seminar report must be presented during the oral examination.

References

1. Sharon J. Gerson, Steven M. Gerson, Technical Writing: Process and Product, Pearson Education Asia, ISBN :130981745, 4th Edition.
2. Andrea J. Rutherfoord, Basic Communication Skills for Technology, Pearson Education Asia, 2nd Edition.
3. Lesikar, Lesikar's Basic Business Communication, Tata McGraw, ISBN :256083274, 1st Edition.

314459 : Audit Course 4

In addition to credits course, it is recommended that there should be audit course (non-credit course) preferably in third year. Audit course is for the purposes of self-enrichment and academic exploration.Audit courses carry no academic credit. Though not mandatory, such a selection of the audit courses helps the learner to explore the subject of interest in greater details resulting in achieving the very objective of audit course's inclusion. Evaluation of audit course will be done at institute level. Method of conduction and method of assessment for audit courses is suggested.

Criteria:

The student registered for audit course shall be awarded the grade PP and shall be included such grade in the Semester grade report for that course, provided student has the minimum attendance as prescribed by the Savitribai Phule Pune University and satisfactory in-semester performance and secured a passing grade in that audit course. No grade points are associated with this 'PP' grade and performance in these courses is not accounted in the calculation of the performance indices SGPA and CGPA.

Guidelines for Conduction and Assessment(Any one or more of following but not limited to)

Lectures/ Guest Lectures
Visits (Social/Field) and reports
Demonstrations
Surveys
Mini Project
Hands on experience on Specific focused topic

Guidelines for Assessment (Any one or more of following but not limited to)

Written Test
Demonstrations/ Practical Test
Presentations
IPR/Publication
Report

Audit Course 4 Options

Course Code	Audit Course Title
AC 4- I	Intellectual Property Rights and Patenting
AC 4-II	Social Awareness and Governance Program
AC 4-III	Sustainable Energy System
AC 4-IV	Health & Fitness Management

Audit Course 4 - I : Intellectual Property Rights and Patenting

Prerequisites:

Concepts of Software Engineering

Course Objectives:

1. To gain the knowledge of the different types of Intellectual Property Rights (IPR).
2. To understand Trademark, Industrial Designs, Copyright and Trade Secret.
3. To learn about Patenting Systems in the World – USPTO, EPO.
4. To get Knowledge of Indian Patenting System – IPO.
5. To learn and understand different types of Contracts and Licensing and Open Source Software.

Course Outcomes:

1. To understand Intellectual Property Rights (IPR).
2. To explore applications of Trademark, Industrial Designs, Copyright and Trade Secret.
3. To understand function of USPTO, EPO.
4. To know the process of filing patent with IPO.
5. To understand the process of copyright and licensing.

UNIT I

An overview of the IPR Regime: Introduction, Intellectual Assets IA, The Intellectual Property System IPR, Types of IPR, Patents, Trademarks, Copyrights, Industrial Designs, Layout Designs of Integrated Circuits, Trade Secrets.

Patent: Definition of Patent, The Patent System, Requirement for getting a Patent, Inventions excluded from Patenting, Process and Product Patent, Acquiring a Patent, Method of Getting a Patent, Parts of an Patent Application, Patent Specification and Claims, Grant of Patents, Working of Patent and system, Voluntary Licensing and Compulsory Licensing, Licenses of Right.

UNIT II

Copyright: Copyright in Context, The terms of Copyright, Owning a Copyright, Rights granted by Copyright. Trademark: Trademarks Defined, The economic functions of Trademarks, Modern Trademarks Law. Trade Secrets: Trade Secrets defined The life and death of a Trade Secret, Trade Secret and Software Development, Trade Secrets and Business and Consultants.

UNIT III

Contracts and Licenses: Licenses and Firewalls, Why Contracts and Licenses matters, Contract Law Principles, Intellectual Property Contracts, Applying to License to Intellectual Property, Understanding Open Source, Credit unions and Open Source: An Analogy, The role of Open Source Licenses, The Open Source Definition, Different types of Open Source Licenses, Proprietary Commercial Licensing, Open Source Licensing, Choosing an Open Source License.

UNIT IV

Indian Patent Regime: IPO and Patent: Indian Patents Act 1970, Patents Amendment Act, Patent Offices in India, Procedures for Applying Patent Applications, Provisional Patent Application, Non-Provisional Patent Application, Patentability, Exclusions from Patentability, Acquisition of Patents, Preparation of Patent Application Specification, Patent Office Procedures

References:

1. Intellectual Property and Open Source – A Practical Guide to Protecting Code by Van Lindberg, O'REILLY Publication (www.oreilly.com) ISBN 13: 978-81-8404-563-5.
2. Open Source and Free Software Licensing by Andrew M. ST. Laurent, O'REILLY Publication

(www.oreilly.com) ISBN: 978-93-5213-280-5.
3. Intellectual Property Rights: Unleashing the Knowledge Economy by Prabuddha Ganguli, Tata McGraw-Hill Publishing Company, 2001, ISBN: 0074638602, 9780074638606.
4. IPO Manual of patent office practice and procedure - Intellectual Property Rights http://www.ipindia.nic.in/writereaddata/Portal/IPOGuidelinesManuals/1_28_1_manual-of-patent-office-practice_and-procedure.pdf.

Audit Course 4 - II : Social Awareness and Governance Program

Prerequisites:

Awareness about basic terms in Social Science and Governance

Course Objectives:

1. To Increase community awareness about social issues and to promote the practice of good governance in both private and public institutions, through policy advocacy and awareness creation in order to ensure proper utilization of public resources and good service delivery.
2. Increase community awareness on health, education, and human rights.
3. Transferring costs of social activities to other various segments of society.
4. To enhance youth participation in decision-making, democracy and economic development.

Course Outcomes:

1. Understand social issues and responsibilities as member of society.
2. Apply social values and ethics in decision making at social or organizational level
3. Promote obstacles in national integration and role of youth for National Integration
4. Demonstrate basic features of Indian Constitution.

UNIT I

Indian Society as Pluralistic, Fundamentals of unity in diversity, diversity and disparity in Indian society, women in mass media, disparities due to disability.

UNIT II

The Indian constitution as unifying factor, Introduction Making of Indian Constitution, Basic features of Indian Constitution, Strengths of Indian Constitution, and Fundamental Duties.

UNIT III

National Integration: Introduction, The Value of Tolerance, Minority Classes And Constitution, Pre-Requisites of National Integration, Obstacles To National Integration, Promotion of National Integration, Role of Youth In Promoting Communal Harmony.

UNIT IV

Socialization, Ethics, Values and Prejudices, Meaning of Socialization, Functions of Socialization, Agents of Socialization, Importance of Socialization, Role of Ethics In Individual Development, Role of Basic Human Values In Individual Development, Relative Value System.

Activities:

1. Conducting training/workshops/debates on HIV/AIDS prevention and stigma reduction.
2. Public shows on girls' education and empowerment.
3. Conducting campaigns on adult/disabled education.
4. To support the government to develop policy that encourages youth participation in decision-making through government agencies.

References:

1. Social Awareness and Personality Development by Devidas M. Muley , S Chand, ISBN: 812193074X.
2. Introduction to the Constitution of India, Bhagabati Prosad Banerjee, Durga Das Basu, Shakeel Ahmad Khan, V. R. Manohar, ISBN : 9788180385599.

Audit Course 4 – III : Sustainable Energy System

Prerequisites:

1. Awareness about energy consumption and energy utilization.
2. Awareness about effects of global warming.

Course Objectives:

1. To understand the impact of engineering solutions on a global, economic, environmental, and societal context.
2. To design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability.

Course Outcomes:

1. To demonstrate an overview of the main sources of renewable energy.
2. To understand benefits of renewable and sustainable energy systems.

UNIT I

Introduction and Energy Fundamentals, Sustainable Energy Systems: Issues for the 21st century, What are the critical challenges for a sustainable energy future? Sustainable energy systems: definitions, indicators, Physics of Energy: Laws of Thermodynamics Energy Forms and Conversion, First and Second Laws and Efficiencies Devices: Heat Engines, Refrigerators and Heat Pumps Instantaneous and Average Power.

UNIT II

Introduction to Renewable Energy, Wind Energy Wind Turbine Technologies Wind Resources and Modeling Energy Performance and Environmental Impacts Economics and Economic Development Impacts, Photovoltaic: PV and BIPV Technologies Solar Resources and Modeling Energy Performance and Environmental Impacts, Economics and Net Metering

UNIT III

Biomass: Electricity Biomass Technologies Introduction Biomass Productivity and Modeling Biopower: MSW, willows/switch grass/ poplar, wood waste, Biomass: Transport Fuels Biofuels , Bioethanol, Biodiesel, Algal, Jatropha Biofuels and Water Land Use Impacts, Food vs Fuel, Renewable Fuels Standards

UNIT IV

Building Energy Technologies and Policy, Smart buildings, Lighting and LEDs, Heating/cooling, technologies.

References :

1. Sustainable Energy Systems and Applications Textbook by İbrahim Dinçer, Calin Zamfirescu.
2. Fundamentals of Renewable Energy Systems, Book by D. Mukherjee.
3. “An introduction to global warming” John R. Barker and Marc H. Ross Am. J. Phys. 67(2): 1216-1226.

Audit Course 4 – IV : Health & Fitness Management

Prerequisites:

Awareness about healthy living.

Course Objectives:

1. To provide students a general concept of Health education and fitness.
2. To provide knowledge and understanding regarding health and nutrition.
3. To familiarize the students regarding safety education and health primitive measures for day to day life.
4. To promote and understanding of the value of physical and mental fitness for life skill development.

Course Outcomes:

1. Identify the health- and skill-related fitness components.
2. Understand the benefits of physical fitness, and the underlying principles, physiology, and practices for fitness development.
3. Apply of fitness management skills and strategies for the development of physical activity habits and personal fitness by the students.
4. Aware about healthy diet for physical and mental fitness of an individual.
5. Understand importance of mental fitness along with physical fitness by practicing yoga, meditation and relaxation techniques.

UNIT I

Importance of Health and Fitness, Physical fitness and mental fitness, Health and fitness issues in India, Government policies for Healthy Society, World Health Organization (WHO), and practicing good Habits for Healthy living.

UNIT II

Nutrition and Health : Concept of Food and Nutrition, Nutrients and Nutrient types, ,Balanced Diet, Vitamins – Malnutrition–Deficiency Diseases, Determining Caloric Intake and Expenditure, Obesity, Causes and Preventing Measures – Role of Diet.

UNIT III

Physical Exercise : Physical Activity and Health Benefits, Effect of Exercise on Body systems, Circulatory, Respiratory, Endocrine, Skeletal and Muscular, Role of Physical Education Programme on Community Health Promotion (Individual, Family and Society).

UNIT IV

Mental Health and Relaxation Techniques: Importance of mental health, Perspectives of mental health, Role of Emotional and Ethical Values in Mental Health, Preventing mental illness, Practicing Yoga and Meditation, Relaxation Techniques, Stress management Techniques.

References:

1. Fitness Management by Stephen J. Tharrett, James A. Peterson, Healthy Learning, ISBN: 9781606792155.
2. What to Eat by Marion Nestle, Macmillan Publication, ISBN 978-0865477384.
3. Light on Yog by B.K.S. Iyengar, Yehudi Menuhin, ISBN: 9780805210316.
4. Managing Your Mind: The Mental Fitness Guide by Gillian Butler, Tony Hope, ISBN: 9780195314533.

Faculty of Engineering

Syllabus

B.E. (Information Technology) 2012 Course

(With effect from Academic Year 2015 - 16)

SAVITRIBAI PHULE PUNE UNIVERSITY

THE SYLLABUS IS PREPARED BY:

B.O.S. in Information Technology, Savitribai Phule Pune University

PROGRAM EDUCATIONAL OBJECTIVES

The students of Information Technology course after passing out will

1. Graduates of the program will possess strong fundamental concepts in mathematics, science, engineering and Technology to address technological challenges.

2. Possess knowledge and skills in the field of Computer Science & Engineering and Information Technology for analyzing, designing and implementing complex engineering problems of any domain with innovative approaches.

3. Possess an attitude and aptitude for research, entrepreneurship and higher studies in the field of Computer Science & Engineering and Information Technology.

4. Have commitment to ethical practices, societal contributions through communities and life-long learning.

5. Possess better communication, presentation, time management and team work skills leading to responsible & competent professionals and will be able to address challenges in the field of IT at global level.

PROGRAM OUTCOMES

The students in the Information Technology course will attain:

1. an ability to apply knowledge of computing, mathematics including discrete mathematics as well as probability and statistics, science, and engineering and technology;

2. an ability to define a problem and provide a systematic solution with the help of conducting experiments, as well as analyzing and interpreting the data;

3. an ability to design, implement, and evaluate a software or a software/hardware system, component, or process to meet desired needs within realistic constraints;

4. an ability to identify, formulate, and provide systematic solutions to complex engineering problems;

5. an ability to use the techniques, skills, and modern engineering technologies tools, standard processes necessary for practice as a IT professional;

6. an ability to apply mathematical foundations, algorithmic principles, and computer science theory in the modeling and design of computer-based systems with necessary constraints and assumptions;

7. an ability to analyze the local and global impact of computing on individuals, organizations and society;

8. an ability to understand professional, ethical, legal, security and social issues and responsibilities;

9. an ability to function effectively as an individual or as a team member to accomplish a desired goal(s);

10. an ability to engage in life-long learning and continuing professional development to cope up with fast changes in the technologies/tools with the help of electives, professional organizations and extra-curricular activities;

11. an ability to communicate effectively in engineering community at large by means of effective presentations, report writing, paper publications, demonstrations;

12. an ability to understand engineering, management, financial aspects, performance, optimizations and time complexity necessary for professional practice;

13. an ability to apply design and development principles in the construction of software systems of varying complexity.

B.E. (Information Technology) 2012 Course to be implemented from June 2015

SEMESTER – I

Subject Code	Subject	Teaching Scheme			Examination Scheme					Total Marks
		Lecture	Practical	Tutorial	In-Semester Assessment Phase - I	TW	PR	OR	End Semester Examination Phase - II	
414453	Information and Cyber Security	3			30				70	**100**
414454	Software Modeling and Design	3			30				70	**100**
414455	Machine Learning	4			30				70	**100**
414456	Elective – I	3			30				70	**100**
414457	Elective – II	3			30				70	**100**
414458	Software Laboratory - III	--	4	--		50	--	50		**100**
414459	Software Laboratory - IV	--	4	--		--	50	50		**100**
414460	Project Phase I	--	--	2		50	--	--		**50**
Total		**16**	**8**	**2**	**150**	**100**	**50**	**100**	**350**	**750**

Software Laboratory – III: (Information and Cyber Security + Machine Learning)
Software Laboratory – IV: (Software Modeling and Design + Testing)

Elective – I	Elective – II
414456 A : Soft Computing	414457 A : Business Intelligence
414456 B : Usability Engineering	414457 B : Service Oriented Architecture
414456 C : Modern Compilers	414457 C : E&M Governance
414456 D : Parallel Algorithms and Design	414457 D : Geo Informatics Systems
414456 E : Cloud Computing	414457 E : Natural Language Processing

SEMESTER – II

Subject Code	Subject	Teaching Scheme			Examination Scheme					Total Marks
		Lecture	Practical	Tutorial	In-Semester Assessment Phase - I	TW	PR	OR	End Semester Examination Phase - II	
414461	Distributed System	3			30				70	**100**
414462	Advanced Databases	3			30				70	**100**
414463	Elective – III	3	2	--	30	25	--	25	70	**150**
414464	Elective – IV	3			30				70	**100**
414465	Software Laboratory - V	--	2	--		25	25	--		**50**
414466	Software Laboratory - VI	--	4	--		--	50	50		**100**
414467	Project Work	--	--	6		50	--	100		**150**
Total		**12**	**8**	**6**	**120**	**100**	**75**	**175**	**280**	**750**

Software Laboratory – V: (Distributed Systems)
Software Laboratory – VI: (Advanced Databases)

Elective – III	Elective – IV
414463 A :Mobile Computing	414464 A :Bio Informatics
414463 B :Advanced Graphics and Animation	414464 B :Real Time and Embedded Systems
414463 C :Information Storage and Retrieval	414464 C :Green IT - Principles and Practices
414463 D :IT Enabled Services	414464 D :Internet of Things
414463 E :Advanced Computer Networks	414464 E :Open Elective

SEMESTER - I

414453 : INFORMATION AND CYBER SECURITY

Teaching Scheme:	Examination Scheme:	
Lectures: 3 Hours/Week	In-Semester Assessment Phase I – 30 Marks	End-Semester Assessment Phase II – 70 Marks

Prerequisites: Data Communication and Computer Networks

Course Objectives :

1. Understand the essentials of information security.
2. Learn the algorithms for implementing security
3. To provide an understanding of principal concepts, major issues, technologies, and basic approaches in information security

Course Outcomes :

The learning outcomes are:

- Students shall be able to understand what are the common threats faced today
- What is the foundational theory behind information security
- What are the basic principles and techniques when designing a secure system
- How today's attacks and defenses work in practice
- How to assess threats for their significance and
- How to gauge the protections and limitations provided by today's technology

UNIT - I SECURITY FUNDAMENTALS **6 Hours**

Introduction, Terminology, Attacks, Security Goals : Authentication, Authorization, Cipher Techniques: Substitution and Transposition, One Time Pad, Modular Arithmetic, GCD, Euclid's Algorithms, Chinese Remainder Theorem, Discrete Logarithm, Fermat Theorem, Block Ciphers, Stream Ciphers. Secret Splitting and Sharing.

UNIT - II CRYPTOGRAPHY **6 Hours**

Symmetric Key Algorithms: DES, AES, BLOWFISH, Attacks on DES, Modes of Operations, Linear Cryptanalysis and Differential Cryptanalysis, Public Key Algorithms: RSA, Key Generation and Usage.

UNIT - III MESSAGE DIGEST AND KEY MANAGEMENT **6 Hours**

Hash Algorithms: SHA-1, MD5, Key Management: Introduction, Key Management: Generations, Distribution, Updation, Digital Certificate, Digital Signature, PKI. Diffie-Hellman Key Exchange. One Way Authentication, Mutual Authentication, Kerberos 5.0.

UNIT IV NETWORK SECURITY **6 Hours**

Layer Wise Security Concerns, IPSEC- Introduction, AH and ESP, Tunnel Mode, Transport Mode, Security Associations, SSL- Introduction, Handshake Protocol, Record Layer Protocol. IKE- Internet Key Exchange Protocol. Intrusion Detection Systems: Introduction, Anomaly Based, Signature Based, Host Based, Network Based Systems.

UNIT - V INTRODUCTION TO CYBER SECURITY **6 Hours**

Introduction, Definition and origin, Cybercrime and Information security, Classification of Cybercrimes, The legal perspectives- Indian perspective ,Global perspective, Categories of Cybercrime, Types of Attacks, a Social Engineering, Cyberstalking, Cloud Computing and Cybercrime

UNIT – VI TOOLS AND METHODS USED IN CYBERCRIME 6 Hours

Introduction, Proxy servers and Anonymizers, Phishing, Password Cracking, Key-loggers and Spywares, Types of Virus, Worms, Dos and DDoS ,SQL injection, Cybercrime and Legal perspectives, Cyber laws-Indian context, The Indian IT Act-Challenges, Amendments, Challenges to Indian Law and cybercrime Scenario in India, Indian IT Act and Digital Signatures.

Text Books

1. BruiceSchneier, "Applied Cryptography- Protocols, Algorithms and Source code in C", 2nd Edition, Wiely India Pvt Ltd, ISBN 978-81-265-1368-0
2. Nina Godbole, SunitBelapure, "Cyber Security- Understanding Cyber Crimes, Computer Forensics and Legal Perspectives", Wiely India Pvt.Ltd.,ISBN- 978-81-265-2179-1
3. Bernard Menezes, "Network Security and Cryptography", Cengage Learning, ISBN-978-81-315-1349-1

Reference Books

1. Nina Godbole, " Information Systems Security", Wiley India Pvt. Ltd, ISBN -978-81-265-1692-6
2. Willaim Stallings, "Computer Security : Principles and Practices", Pearson Ed. ISBN :978-81-317-3351-6
3. Mark Merkow, " Information Security-Principles and Practices", Pearson Ed. 978-81-317-1288-7
4. CK Shyamala et el., "Cryptography and Security", Wiley India Pvt. Ltd, ISBN 978-81-265-2285-9
5. Berouz Forouzan, "Cryptography and Network Security", 2 edition, TMH, ISBN :9780070702080

414454 : SOFTWARE MODELING AND DESIGN

Teaching Scheme:
Lectures: 3 Hours/Week

Examination Scheme:

In-Semester Assessment	End-Semester Assessment
Phase I – 30 Marks	Phase II – 70 Marks

Prerequisites : Problem Solving & Object Oriented Programming, Software Engineering

Course Objectives :

1. Based on user requirements, create a requirement model using UML class notations and use-cases.
2. Create an OO design of a system from the requirements model in terms of a high-level design description, and low-level models of structural organization and dynamic behavior using relevant UML diagrams.
3. Comprehend the importance of GOF design patterns by implementing few simple design patterns.
4. Validate software implementation for its correctness and quality using appropriate testing.

Course Outcomes :

Students will be able to

1. understand the usage of various UML diagrams to build a model
2. prepare an object oriented model in business domain of an application.
3. prepare an object oriented model in solution domain.
4. apply object oriented principles in the design of software system.
5. get started on study of GOF design patterns.
6. understand different types of software testing.

UNIT – I INTRODUCTION TO MODELING AND CLASS MODEL — 6 Hours

Modeling as a design technique, abstraction, three models, object and class concepts, links and association concepts, generalization and inheritance concepts, navigations in class models, advanced object and class concepts, association ends, n-ary association, aggregation, abstract classes, multiple inheritance, metadata, reification, constraints, derived data, packages.
UML diagrams: Object, class, package diagram.

UNIT – II STATE MODELING AND INTERACTION MODEL — 6 Hours

Events, states, transitions and conditions, state diagram, state diagram behavior, nested state diagram, nested states, signal generalization, concurrency, state model case study, relation of class and state model, Use case models, sequence models, activity models, use case relationships, procedural sequence model, and special constructs for activity models
State, activity, use case, sequence diagrams.

UNIT – III SYSTEM ANALYSIS — 6 Hours

Find classes, prepare data dictionary, find associations, find attributes of objects and links, organize and simplify classes using inheritance, verification of access paths, reconsider the level of abstraction, group classes into packages, determine system boundary, find actors, find use cases, find initial and final events, prepare normal scenarios, add variation and exception scenarios, find external events, prepare activity diagram for use cases.

UNIT – IV SYSTEM DESIGN **6 Hours**

Estimate system performance, make a reuse plan, organize the system into subsystem, identify concurrency inherent in the problem, allocate subsystems to hardware, manage data stores, handle global resources, choose a software control strategy, handle boundary conditions, set trade off priorities, select an architectural style, Component and deployment diagram.

UNIT – V DESIGN PATTERNS **6 Hours**

Types of design patterns, design pattern documentation, study of GOF design patterns namely strategy, observer, state, and adaptor.

UNIT - VI SOFTWARE TESTING **6 Hours**

Testing Terminologies: Verification and validation, Fault, error, bugs and failure, test case and test suite, white box testing and black box testing. V-test model: User Acceptance testing, integration testing, unit testing, and Introduction to test driven development.

Text Books

1. Michael R Blaha, James Rumbaugh, "Object Oriented Modeling and Design with UML", Second Edition, Pearson Education System.
2. Dennis, Wixom, Tegarden, "System Analysis and design - an Object oriented approach with UML", 5th Edition, Wiley publication.
3. M G Limaye, "Software Testing Principle, Techniques and Tools", TMH.

Reference Books

1. Grady Booch, "Object oriented analysis and design with application, third edition", Pearson Education.
2. Dan Pilone, " UML 2.0 in a Nutshell", O'Reilly.
3. Grady Booch, James Rumbaugh, Ivor Jacobson, "The Unified Modeling Language User Guide", Second Edition, Addison Wesley Object Technology Series.
4. Jim Arlow, "UML 2 and the Unified Process: Practical Object Oriented Analysis and design", Second Edition, , Addison Wesley Object Technology Series.
5. Erich Gamma and others, "Design Patterns: Reusable elements of object oriented software", Pearson Education Series.
6. Hasan Gomma, Software Modeling and Design, Cambridge University Press India.

414455 : MACHINE LEARNING

Teaching Scheme:	Examination Scheme:	
Lectures: 4 Hours/Week	In-Semester Assessment Phase I – 30 Marks	End-Semester Assessment Phase II – 70 Marks

Prerequisites : Linear Algebra and Calculus, Probability Basics

Course Objectives :

1. Understanding Human learning aspects.
2. Understanding primitives in learning process by computer.
3. Understanding nature of problems solved with Machine Learning.

Course Outcomes :

1. Students will be able to model the learning primitives.
2. Students will be able to build the learning model.
3. Student will be able to tackle real world problems in the domain of Data Mining, Information Retrieval, Computer vision, Linguistics and Bioinformatics.

UNIT – I INTRODUCTION TO MACHINE LEARNING 7 Hours

Why Machine learning, Examples of Machine Learning Problems, Structure of Learning, Learning versus Designing, Training versus Testing, Characteristics of Machine learning tasks, Predictive and descriptive tasks, Machine learning Models: Geometric Models, Logical Models, Probabilistic Models. Features: Feature types, Feature Construction and Transformation, Feature Selection.

UNIT – II CLASSIFICATION AND REGRESSION 8 Hours

Classification: Binary Classification- Assessing Classification performance, Class probability Estimation- Assessing class probability Estimates, Multiclass Classification.

Regression: Assessing performance of Regression- Error measures, Overfitting- Catalysts for Overfitting, Case study of Polynomial Regression.

Theory of Generalization: Effective number of hypothesis, Bounding the Growth function, VC Dimensions, Regularization theory.

UNIT – III LINEAR MODELS 7 Hours

Least Squares method, Multivariate Linear Regression, Regularized Regression, Using Least Square regression for Classification. Perceptron, Support Vector Machines, Soft Margin SVM, Obtaining probabilities from Linear classifiers, Kernel methods for non-Linearity.

UNIT – IV LOGIC BASED AND ALGEBRAIC MODELS 6 Hours

Distance Based Models: Neighbours and Examples, Nearest Neighbours Classification, Distance based clustering-K means Algorithm, Hierarchical clustering,

Rule Based Models: Rule learning for subgroup discovery, Association rule mining.

Tree Based Models: Decision Trees, Ranking and Probability estimation Trees, Regression trees, Clustering Trees.

UNIT – V PROBABILISTIC MODELS 6 Hours

Normal Distribution and Its Geometric Interpretations, Naïve Bayes Classifier, Discriminative learning with Maximum likelihood, Probabilistic Models with Hidden variables: Estimation-Maximization Methods, Gaussian Mixtures, and Compression based Models.

UNIT – VI TRENDS IN MACHINE LEARNING **8 Hours**

Model and Symbols- Bagging and Boosting, Multitask learning, Online learning and Sequence Prediction, Data Streams and Active Learning, Deep Learning, Reinforcement Learning.

Text Books

1. Peter Flach: Machine Learning: The Art and Science of Algorithms that Make Sense of Data, Cambridge University Press, Edition 2012.
2. Hastie, Tibshirani, Friedman: Introduction to Statistical Machine Learning with Applications in R, Springer, 2nd Edition-2012.

Reference Books

1. C. M. Bishop : Pattern Recognition and Machine Learning, Springer 1st Edition-2013.
2. Ethem Alpaydin : Introduction to Machine Learning, PHI 2nd Edition-2013.
3. Parag Kulkarni : Reinforcement and Systematic Machine Learning for Decision Making, Wiley-IEEE Press, Edition July 2012.

414456 A - ELECTIVE I : SOFT COMPUTING

Teaching Scheme:	Examination Scheme:	
Lectures: 3 Hours/Week	In-Semester Assessment Phase I – 30 Marks	End-Semester Assessment Phase II – 70 Marks

Prerequisites: Linear Algebra and Calculus 2. Probability Theory

Course Objectives :

1. Understanding differential behavior of Human and Intelligence Systems.
2. Understanding nature of problems solved with Soft Computing.
3. Understanding components of Soft Computing.

Course Outcomes :

1. Students will be inspired to solve complex real-world problems.
2. Students will correlate human-like processing in problem solving with current technologies in various domains like Bio Informatics, Multimedia Systems, Big Data Analytics, etc.
3. Student will be able to tackle problems of interdisciplinary nature.

UNIT – I INTRODUCTION TO INTELLIGENT SYSTEMS AND SOFT COMPUTING 5 Hours

Characteristic behavior of Intelligent systems, Knowledge based systems, Knowledge Representation and Processing, Soft Computing characteristics, Constitutes of Soft Computing-Fuzzy Logic and Computing, Neural Computing, Evolutionary Computing, Rough Sets, Probabilistic Reasoning and Machine Learning.

UNIT – II NEURO COMPUTING- SUPERVISED LEARNING 6 Hours

Biological background, Pattern recognition tasks, Features of artificial neural networks, Activation functions, Perceptron model, Perceptron for classification and its limitations, Architectures of multilayer feed-forward neural networks, Back-propagation learning algorithm, Limitations of MLP.

UNIT - III NEURO COMPUTING- UNSUPERVISED LEARNING 7Hours

Hebb's learning rule for competitive learning, Kohonen's self-organizing map and network topology, applications of SOM, Hopfield network and its topology, Boltzman Machines, Adaptive Resonance Theory.

UNIT - IV FUZZY LOGIC AND FUZZY SYSTEMS 7 Hours

Evolution of fuzzy logic, fuzzy sets, fuzzy logic operations, fuzzy relations, Fuzzy arithmetic and fuzzy measures. Fuzzy rules and reasoning, Fuzzy inference systems, Fuzzy modeling and decision making, Neuro-fuzzy modeling.

UNIT – V EVOLUTIONARY COMPUTING 6 Hours

Biological background and Overview of evolutionary computing, Genetic algorithm and search space, Operators in genetic algorithm- encoding, selection, crossover, and mutation, Classification of GA, Evolutionary Programming and Strategies.

UNIT - VI APPLICATIONS OF SOFT COMPUTING TECHNIQUES 5 Hours

Applications of fuzzy in pattern recognition-character recognition. Applications of evolutionary computing in Image processing and computer vision, Soft computing in mobile ad-hoc networks, soft computing in Information Retrieval and Semantic web, Soft Computing in Software Engineering.

Text Books

1. Fakhreddine O. Karray, Clarence De Silva, 'Soft Computing and Intelligent systems design' Pearson Education, ISBN 978-81-317-2324-1.
2. B. K. Tripathy, J. Anuradha, 'Soft Computing: advances and applications', Cengage learning, ISBN-13: 978-81-315-2619-4.

Reference Books

1. S. N. Sivanandam, S. N. Deepa, Principles of Soft Computing, Wiley publications, 2nd Edition.
2. J. S. R. Jang, C. T. Sun, E. Mizutani, 'Neuro-Fuzzy and Soft Computing- A computational approach to Learning and Machine Intelligence' PHI,
3. David E. Goldberg , Genetic Algorithms - Pearson Education, 2006
4. Satish Kumar, "Neural Networks - A Classroom Approach", Tata McGraw,Hill

414456 B - ELECTIVE I : USABILITY ENGINEERING

Teaching Scheme:
Lectures: 3 Hours/Week

Examination Scheme:

In-Semester Assessment	End-Semester Assessment
Phase I – 30 Marks	Phase II – 70 Marks

Prerequisites : Human Computer Interaction and Usability

Course Objectives :

1. To introduce the need for human-computer-interaction study or human-centered software design.
2. To explain usability engineering lifecycle for designing a user-friendly software.
3. To familiarize information, interaction and GUI design process for enhancing user-experience.
4. To develop usability evaluation skills for software testing.
5. To explain industry standards for designing and evaluating use-interfaces.
6. To make aware of the current trends in usability engineering.

Course Outcomes :

At the end of this course, student should be able to:

1. Justify the need to study human-computer-interaction or human-factors while designing software.
2. Discuss the process of designing user-friendly software based on usability engineering guidelines.
3. Apply interaction design and UI design process in enhancing user-experience of an application.
4. Conduct usability evaluation of user-interfaces or software applications.
5. Discuss industry standards for designing and evaluating user-interfaces.
6. Discuss current trends in usability engineering

UNIT – I HCI AND USABILITY — 3 Hours

What is HCI design? Disciplines contributing to HCI, Psychology of everyday things, Importance of human factors in design, Need Satisfaction curve of technology, Levels of human computer interaction
What is Usability? benefits and cost savings, usability slogans, attributes of system acceptability, definition of usability, usability trade-Offs , categories of users and individual user differences, generations of user interfaces, scenario-based usability engineering case study - A Virtual Science Fair.

UNIT – II THE USABILITY ENGINEERING LIFECYCLE — 9 Hours

User research and requirements analysis → know the user, user-profile questionnaire, field-study methods, contextual inquiry and analysis, hierarchical task analysis, ethnography, cultural probe, affinity diagramming, persona, scenarios of use, use cases.
Iterative Design → setting usability criteria or goals, participatory design (getting users involved), guidelines and heuristic evaluation, prototyping and scenarios , examples of problem scenarios, iterative design, interface evaluation, meta methods.
Usability Heuristics → simple and natural dialogue, speak the users' language, minimize user memory load, consistency, feedback, clearly marked exits, shortcuts, good error messages, prevent errors, help and documentation, heuristic evaluation.

UNIT – III INFORMATION DESIGN AND INTERACTION DESIGN — 6 Hours

Information design → Information architecture concepts, stages of action in human-computer interaction, perceiving information, interpreting information, making sense of information.
Interaction Design → selecting system goal, planning action sequence, executing action sequence, case

study of information and interaction design
User Interface Design → Goals of UID, User Interface Models , conceptual model and mock-ups of GUI, choosing prototyping alternatives - paper prototyping, rapid prototyping, storyboarding, wireframes, Cost/benefit of good interface design , Case Study.

UNIT – IV USABILITY EVALUATION 10 Hours

Developing usability specifications for evaluation - case study, criteria for user feedback techniques, formative and summative techniques of evaluation
Usability Inspections (testing without users) → heuristic evaluation, user-interface guideline reviews, cognitive walkthrough, model-based analysis
Usability Testing (testing with users) → developing usability or test specifications with case study , test goals and test plans , getting test users, choosing experimenters, ethical aspects of tests with human subjects, test tasks, stages of a test, performance measurement, thinking-aloud testing, usability laboratories, remote evaluation,
Methods beyond testing → observation, user satisfaction questionnaire (rating scale), interviews, system usability scale (SUS), focus groups, logging actual use, user feedback, choosing a methods.

UNIT – V USER-INTERFACE AND USABILITY STANDARDS 5 Hours

User benefits, vendor benefits, dangers of standards, principles of good UI design, national-international standards, internationalization - international GUI, guidelines for internationalization , localization and multilocale interfaces, UI standards - control standards, window standards, dialog box standards, message box standards, device interaction standards, feedback standards, developing style guides and toolkits , user documentation- manuals, tutorials, information in the interface.

UNIT – VI RECENT ADVANCES AND TRENDS 3 Hours

Theoretical solutions, technological solutions, CAUSE tools, emerging paradigms of user interaction-collaborative systems, ubiquitous computing , intelligent user-interfaces , simulation and virtual reality , case study , usability issues in organizations- case studies , organizational roles and structures , ethics of usability, web analytics.

Text Books

1. Nielsen, J. (1994), “Usability Engineering”, Elsevier.
2. Rosson, M. B., & Carroll, J. M. (2001), “ Usability Engineering: Scenario-Based development of human-computer interaction”, Elsevier.
3. Mayhew, D. (1999), “The Usability Engineering Lifecycle: A Practitioner's Handbook for user interface design”, Morgan Kaufmann

Reference Books

1. Cooper A. et. al. (2007), “ The Essentials of Interaction Design”, Wiley
2. Cooper, A. (1995),” The Essentials of User Interface Design”, IDG Books, New Delhi
3. Schneiderman, B. (2005), “ Designing the User Interface”, Pearson Education, New Delhi
4. Dix A. et. al.(1993), “ Human - Computer Interaction”, Prentice Hall, USA
5. Mandel, T. , “ Elements of User Interface Design”, John Wiley & Sons
6. Rogers et. al (2011), “ Interaction Design”, John Wiley & Sons
7. Norman, D. (1988), “The Design of Everyday Things”, Basic Books.
8. Donna Spencer<, “A Practical Guide to Information Architecture”
9. Galitz, W. (2002), “The Essential Guide To User Interface Design”, Wiley.

Web-links

1. http://www.usabilitybok.org/
2. http://www.usability.gov/
3. http://www.webmonkey.com/2010/02/information_architecture_tutorial/
4. http://www.measuringu.com/
5. http://user.medunigraz.at/andreas.holzinger/holzinger%20de/usability%20holzinger.html

414456 C - ELECTIVE I : MODERN COMPILERS

Teaching Scheme:	**Examination Scheme:**	
Lectures: 3 Hours/Week	In-Semester Assessment Phase I – 30 Marks	End-Semester Assessment Phase II – 70 Marks

Prerequisites: Compiler Construction, System Programming

Course Objectives :

1. To develop an awareness of the function and complexity of modern compilers.
2. To introduce the major concept areas of language translation and compiler design
3. To give students hands-on experience with crafting a simple compiler, working on a sizeable software engineering project, using modern software tools, and most importantly correlating theory.

Course Outcomes :

1. Understand the performance characteristics of modern processors
2. Be familiar with compiler architecture and implementation.
3. Be familiar with register allocation.
4. Be exposed to compiler optimization.

UNIT – I FUNDAMENTALS OF COMPILATION 6 Hours

Introduction: Modules and Interfaces, Tools and Software, Data Structure for Tree Language, Activation Record: Stack frames, Frames in the Tiger Compiler, Translation to Intermediate Code: Intermediate representation of trees, Translation into trees, Declaration

UNIT - II BASIC BLOCKS OF TRACES 6 Hours

Canonical Trees, Taming Conditional branches, Instruction Selection: Algorithm for Instructional Selection, CISC Machine, Instruction selection for Tiger Compiler, Liveness Analysis: solution of dataflow equations, Liveness in Tiger compiler

UNIT - III REGISTER ALLOCATION & GARBAGE COLLECTION 6 Hours

Coloring by simplification, Coalescing, precolored nodes, Graph Coloring implementation, Register allocation for trees, Garbage Collection: Mark and Sweep Collection, Reference Count, Copying Collection, Generational Collection, Incremental Collection, Baker’s Algorithm, Interface to the compiler

UNIT - IV FUNCTIONAL PROGRAMMING LANGUAGES 6 Hours

Canonical Trees, Taming Conditional branches, Instruction Selection: Algorithm for Instructional Selection, CISC Machine, Instruction selection for Tiger Compiler, Liveness Analysis: solution of dataflow equations, Liveness in Tiger compiler

UNIT - V INTER-PROCEDURAL ANALYSIS AND OPTIMIZATION 6 Hours

Inter-procedural Control flow analysis: The Call Graph, Inter-procedural Dataflow analysis, Inter-procedural Constant Propagation, Inter-procedural Alias Analysis, Inter-procedural optimization, Register allocation, Aggregation and Global References, Other issues in inter-procedural program management Optimizing for memory Hierarchy: Impact on Data of Instruction Cache, Instruction Cache optimization

UNIT - VI POLYMORPHIC TYPE & DATAFLOW ANALYSIS 6 Hours

Parametric Polymorphism, Type Inference, representation of polymorphic variables, Resolution of static overloading, Intermediate representation of flow analysis , various dataflow analysis, speeding up dataflow analysis, Alias Analysis, Introduction to cloud, Hybrid compiler, cloud based hybrid compiler, architecture of hybrid compiler.

Text Books

1. Advanced Compiler Design Implementation By Steven S. Muchnick ISBN1-55860-320-4 Morgan Kaoufmann Publisher

Reference Books

1. Modern Compiler Implementation in C By Andrew W. Appel, Maia Ginsburg ISBN 0-521-58390
2. Starting Out With Modern Compiler Design (W/Cd) By David Gaddis, Scott Jone
3. Modern Compiler Design By Galles Person Publication, ISBN 978-317-0941-2
4. Compilers: Principles, Techniques and Tools by A. V. Aho, R. Sethi, J. D. Ullman. Addison-Wesley, 1986.
5. Web-based C++ Compiler Aleksander Malinowski, Bogdan M.Wilamowski Bradley University, Peoria, IL / University of Wyoming,Laramie, WY.
6. Shuai Zhang Shufen Zhang Xuebin Chen XiuzhenHuo, Cloud Computing Research and Development Trend, Future Networks, 2010. ICFN '10. Second International Conference.

414456 D - ELECTIVE I : PARALLEL ALGORITHMS AND DESIGN

Teaching Scheme:	Examination Scheme:	
Lectures: 3 Hours/Week	In-Semester Assessment Phase I – 30 Marks	End-Semester Assessment Phase II – 70 Marks

Prerequisites : Discrete Structures,Design and Analysis of Algorithms

Course Objectives :

1. To study the parallel architecture of the processor.
2. To study various parallel algorithmic strategies and their comparison with traditional algorithmic strategies.
3. To study the analysis of parallel algorithms in terms of time and space complexity.
4. To classify the parallel algorithm in complexity class.
5. To understand the recent applications of Parallel algorithms.

Course Outcomes :

At the end of this course, students will be able to:

1. Explain key concepts in parallel computational models.
2. Describe parallel algorithms, architectures and applications.
3. Implement different parallel algorithms, techniques and architectures.
4. Explain graph algorithms.
5. Understand dynamic programming strategy and its applications.

UNIT – I INTRODUCTION — 8 Hours

Introduction and motivation: key concepts, performance metrics, scalability and overheads.
Sequential model, need of alternative model, parallel computational models such as PRAM, LMCC, Hypercube, Cube Connected Cycle, Butterfly, Perfect Shuffle Computers, Tree model, Pyramid model, Fully Connected model, PRAM-CREW, EREW models, simulation of one model from another one.

UNIT - II CLASSIFICATION OF ALGORITHMS — 8 Hours

Classification of algorithms, architectures and applications: searching, divide and conquer, data parallel. Static and dynamic, message passing and shared memory, systolic
Performance Measures of Parallel Algorithms, speed-up and efficiency of PA, Cost-optimality, an example of illustrate Cost-optimal algorithms- such as summation, Min/Max on various models.

UNIT - III PARALLEL SORTING NETWORKS — 8 Hours

Parallel Sorting Networks, Parallel Merging Algorithms on CREW/EREW/MCC/, Parallel Sorting Networks on CREW/EREW/MCC/, linear array Sorting and searching algorithms: merge sort, quicksort and bitonic sort, implementation on different architectures. Parallel depth-first and breadth-first search techniques.

UNIT - IV PARALLEL SEARCHING ALGORITHM — 6 Hours

Parallel Searching Algorithm, Kth element, Kth element in X+Y on PRAM, Parallel
Matrix Transportation and Multiplication Algorithm on PRAM, MCC, Vector-Matrix
Multiplication, Solution of Linear Equation, Root finding.
Matrix algorithms: striping and partitioning, matrix multiplication, linear equations, eigenvalues, dense and sparse techniques, finite element and conjugate gradient methods.

UNIT - V GRAPH ALGORITHMS **6 Hours**

Graph Algorithms - Connected Graphs, search and traversal, Combinatorial Algorithms- Permutation, Combinations, Derangements.
Optimization: graph problems, shortest path and spanning tree

UNIT - VI DYNAMIC PROGRAMMING **6 Hours**

Dynamic programming, knapsack problems, scheduling. Element methods.
Synthesis of parallel algorithms: algebraic methods, pipelines, homomorphism.

Text Books

1. Ananth Grama, Anshul Gupta, George Karypis, Vipin Kumar "Introduction to Parallel Computing", Second Edition, Addison Wesley, 2003. ISBN: 0-201-64865.
2. M.J. Quinn, "Designing Efficient Algorithms for Parallel Computer" by Mc Graw Hill.
3. S.G.Akl, "The Design and Analysis of Parallel Algorithms", PHI, 1989.

Reference Books

1. S.G. Akl, "Parallel Sorting Algorithm" by Academic Press
2. F.T.Leighton, "Introduction to Parallel Algorithms and Architectures: Arrays, Trees, Hypercubes", MK Publishers, San Mateo California, 1992.
3. Wilkinson, M.Allen,"Parallel Programming Techniques and Applications using networked workstations and parallel computers", Prentice Hall, 1999.
4. Michael J. Quinn, "Parallel Computer Theory and Practice", McGraw Hill, Second Edition, 1994.

414456 E - ELECTIVE I : CLOUD COMPUTING

Teaching Scheme:	Examination Scheme:	
Lectures: 3 Hours/Week	In-Semester Assessment Phase I – 30 Marks	End-Semester Assessment Phase II – 70 Marks

Prerequisites : Operating System, Computer Networks, Web Technologies

Course Objectives :

1. To know the emerging trends in Cloud Computing.
2. To have thorough knowledge of Virtualization Technologies and Cloud architecture.
3. To integrate security in cloud applications.
4. To have systematic knowledge of Ubiquitous Computing.

Course Outcomes :

1. Understand and Familiar with the basic concepts of cloud computing.
2. Understand how to build large scale distributed systems and cloud applications.
3. Comprehend the importance of cloud security.
4. Understand Ubiquitous Computing and applications.

UNIT – I INTRODUCTION TO CLOUD COMPUTING — 6 Hours

Defining Cloud computing, Essential characteristics of Cloud computing, Cloud deployment model, Cloud service models, Multitenancy, Cloud cube model, Cloud economics and benefits, Cloud types and service scalability over the cloud, challenges in cloud NIST guidelines.

UNIT - II VIRTUALIZATION, SERVER, STORAGE AND NETWORKING — 6 Hours

Virtualization concepts, types, Server virtualization, Storage virtualization, Storage services, Network virtualization, Service virtualization, Virtualization management, Virtualization technologies and architectures, Internals of virtual machine, Measurement andprofiling of virtualized applications. Hypervisors: KVM, Xen, HyperV Different hypervisors and features.

UNIT - III MONITORING AND MANAGEMENT — 6 Hours

An architecture for federated cloud computing, SLA management in cloud computing: Service provider's perspective, performance prediction for HPC on Clouds, Monitoring Tools.

UNIT - IV SECURITY — 6 Hours

Cloud Security risks, Security, Privacy, Trust, Operating system security, Security of virtualization, Security risks posed by shared images, Security risk posed by a management OS, Trusted virtual machine monitor.

UNIT - V CLOUD IMPLEMENTATION AND APPLICATIONS — 6 Hours

Cloud Platforms: Amazon EC2 and S3, Cloudstack, Intercloud, Google App Engine, Open Source cloud Eucalyptus, Open stack, Open Nebulla, etc., Applications.

UNIT - VI UBIQUITOUS COMPUTING — 6 Hours

Basics and Vision, Applications and Requirements, Smart Devices and Services, Human Computer Interaction, Tagging, Sensing and controlling, Context-Aware Systems, Ubiquitous Communication, Management of Smart Devices, Ubiquitous System Challenge and outlook.

Text Books

1. Barrie Sosinsky, " Cloud Computing Bible", Wiley
2. Gautham Shroff, "Enterprise Cloud Computing", Cambridge.
3. Stefan Poslad, "Ubiquitous Computing: Smart Devices, Environments and Interactions" by John Wiley & Sons, 2011.
4. A.Shrinivasan, J.Suresh, "Cloud Computing: A practical approach for learning and implementation", Pearson.

Reference Books

1. Rajkumar Buyya, J.Broberg, A. Goscinski, "Cloud Computing Principles and Paradigms", Wiley.
2. Ronald Krutz,"Cloud Security: Comprehensive guide to Secure Cloud Computing", Wiley Publishing.
3. Anthony T. Velte, "Cloud Computing: Practical Approach", McGraw Hill.
4. Tim Mather, "Cloud Security and Privacy", O'REILLY.

414457 A - ELECTIVE II : BUSINESS INTELLIGENCE

Teaching Scheme:	Examination Scheme:	
Lectures: 3 Hours/Week	In-Semester Assessment Phase I – 30 Marks	End-Semester Assessment Phase II – 70 Marks

Prerequisites: Database Management System.

Course Objectives :

1. This course focuses on how to design and build a Business Intelligence solution.
2. Students will also learn how to design and build a data warehouse within the context of student BI projects.
3. Students can develop their own projects within collaborative teams or be assigned an existing data source to develop a project.
4. To ensure success during the implementation phase, students will plan for and gather business requirements, as well as design the data warehouse in order to develop an effective BI plan.

Course Outcomes :

1. Design and implement OLTP, OLAP and Warehouse concepts.
2. Design and develop Data Warehouse using Various Schemas & Dimensional modelling.
3. Use the ETL concepts, tools and techniques to perform Extraction, Transformation, and Loading of data.
4. Report the usable data by using various reporting concepts, techniques/tools, and use charts, tables for reporting in BI.
5. Use Analytics concepts like data mining, Exploratory and statistical techniques for predictive analysis in Business Intelligence.
6. Demonstrate application of concepts in BI.

UNIT - I IMPORTANT CONCEPTS — 6 HOURS

Introduction to Data, Information, and Knowledge, Design and implementation aspect of OLTP, Introduction toBusiness Intelligence and Business Models, Design and implementation aspect of OLAP/Data Warehouse, BI Definitions & Concepts, Business Applications of BI, Role of DW in BI, BI system components, Components of Data Warehouse Architectures.

UNIT - II DIMENSIONAL MODELLING AND DW DESIGN — 6 Hours

Star schema, Snow flake schema, and Fact Constellation schema, Grain of dimensional model, transactions, Recurring Snapshots, Accumulating Snapshots, Dimensions (SCD types, conformed dimensions)Clickstream Source Data (Google Analytics as a Clickstream Data Source), Facts (additive, semi-additive, non-additive), Hierarchy in dimensions, parent child relationships, Many-Many Dimensional relationship, Multi Valued Dimensions and Dimension Attributes.

UNIT - III ETL — 6 Hours

Data Quality, Data profiling, Data enrichment, data duplication, ETL Architecture and what is ETL, Extraction concept and Change data capture, Transformation concept, lookups, time lag, formats, consistency, Loading concept, Initial and Incremental loading, late arriving facts, What is Staging, Data marts, Cubes, Scheduling and dependency matrix.

UNIT - IV REPORTING **6 Hours**

Metadata Layer, Presentation Layer, Data Layer, Use of different layers and overall Reporting architecture, Various report elements such as Charts, Tables, prompts Data aggregation: Table based, Materialized views, Query rewrite, OLAP, MOLAP, Dashboards, Ad-hoc reports, interactivity in analysis (drill down, drill up), Security: report level, data level (row, column),Scheduling.

UNIT - V ANALYTICS **6 Hours**

Analytics concepts and use in Business Intelligence, Exploratory and statistical techniques:- Cluster analysis, Data visualization, Predictive analysis :- Regression, Time series, Data Mining :- Hierarchical clustering, Decision tree Text analytics :- Text mining, In-Memory Analytics and In-DB Analytics, Case study: Google Analytics

UNIT - VI RECENT TRENDS **6 Hours**

Big data like HIVE, PIG and DW appliances like Netezza, Teradata, Smart Change data capture using log based techniques, Real time BI, Operational BI, Embedded BI, Agile BI, BI on cloud, BI applications (Case study on BI tools like: QlikView, Pentaho, Tableau, MyReport, Spotfire, OR any other BI tool).

Text Books

1. Reema Thareja, “Data Warehouse”, Publisher: Oxford University Press.
2. Jiawei Han, Micheline Kamber, Jian Pei “Data Mining: concepts and techniques”, 2nd Edition, Publisher: Elsevier/Morgan Kaufmann.
3. Ralph Kimball, Margy Ross, “The Data Warehouse Toolkit”, 3rd edition, Publisher: Wiley

Reference Books

1. William Inmon, “Building the Data Warehouse”, Wiley publication 4th edition.
2. Efrem G. Mallach, “**Decision Support And Data Warehouse Systems**”, 1st Edition Publisher: Tata McGraw-Hill Education,. ISBN-10: 0072899816.
3. Efraim Turban, Ramesh Sharda, Dursun Delen, David King, “**Business Intelligence**”, ISBN-10: 013610066X Publisher: Prentice Hall.ISBN-13: 9780136100669.
4. Dorian Pyle, “Business Modeling and Data Mining”, Elsevier Publication MK.

414457 B - ELECTIVE II : SERVICE ORIENTED ARCHITECTURE

Teaching Scheme:
Lectures: 3 Hours/Week

Examination Scheme:

In-Semester Assessment	End-Semester Assessment
Phase I – 30 Marks	Phase II – 70 Marks

Prerequisites: Web Engineering and Technology.

Course Objectives :

1. Understand the concepts of Service Oriented Architecture along with the evolution of SOA.
2. Be aware of the key issues facing many organizations, especially dealing with integration among systems and providing architectural abstractions to them.
3. Integrate SOA technologies with Web Services paradigms.
4. Know related technologies and implementation basics of SOA.

Course Outcomes :

1. Students will be able to know the importance of SOA.
2. Students will be able to know SOA primitives.
3. Students will be able to analyze quality web services.
4. Students will be able to design and develop web services.

UNIT - I INTRODUCTION TO SOA **6 Hours**

Fundamental SOA- Common Misperceptions about SOA- Common tangible benefits of SOA- Common pitfalls of adopting SOA. The Evolution of SOA:-from XML to Web services to SOA, Comparing SOA with N-tier architecture, The continuing evolution of SOA, The roots of SOA.

UNIT - II WEB SERVICES AND PRIMITIVE **6 Hours**

Web Services and Primitive SOA: The Web services framework- Services, Service descriptions, messaging with SOAP.

Web Services and Contemporary SOA: Message exchange patterns- Service activity coordination-Atomic transactions- Business activities-Orchestration-Choreography.

UNIT - III SERVICE ORIENTATION AND SECURITY **6 Hours**

Web Services and Contemporary SOA: Addressing- Reliable messaging- Correlation- Policies Metadata exchange- Security- Notification and eventing. SOA and Service-Orientation: Principles of Service-Orientation-Service-orientation. Anatomy of a service-oriented architecture- Common principle of service-orientation-Service Layers –Service orientation.

UNIT - IV BUILDING SOA **6 Hours**

SOA Delivery Strategies- SOA delivery lifecycle phases. Service-Oriented Analysis: Introduction to service-oriented analysis- Benefits of a business-centric SOA Deriving business services- Service-Oriented Analysis: Service modeling, Service modeling guidelines- Classifying service model logic-Contrasting service modeling approaches.

UNIT - V SERVICE-ORIENTED DESIGN **6 Hours**

Introduction to service-oriented design- WSDL-related XML Schema language basics- WSDL language basics- SOAP language basics- Service interface, design tools. SOA Composition Guidelines: Steps to composing SOA Considerations for choosing service layers and SOA standards, positioning of cores and SOA extensions.

UNIT - VI RECENT TRENDS IN SOA **6 Hours**

Overview-Service design of business service, application service, task centric service and guidelines. SOA Business Process Design: WS-BPEL language basics WS Coordination,QoS Compliance in SOA governance, Mapping of SOA and Cloud Computing, Case Study: Travel Insurance.

Text Books

1. Thomas Erl ," Service-Oriented Architecture: Concepts, Technology & Design", Pearson Education Pte Ltd 2008
2. Michael Rosen, Boris Lublin sky, Kevin T. Smith, Marc J. Balcer, "Applied SOA: Service Oriented Architecture and Design Strategies", Wiley, 2010.

Reference Books

1. Thomas Erl,"SOA Principles of Service Design"Pearson Exclusives 2007.
2. Tomas Erl and Grady Booch,"SOA Design Patterns"Prentice Hall 2008.111.
3. David S.Linthicum,"Cloud Computing and SOA Convergence in Your Enterprise",Pearson Addison-Wesley Information Technology Series.
4. Shankar Kambhampaty, "Service Oriented Architecture – for enterprise and cloud applications",Wiley Second Edition.
5. Douglas K. Barry, "Web Services, Service-Oriented Architectures, and Cloud Computing", Elsevier, 2003.
6. James Bean, "SOA and Web Services Interface Design: Principles, Techniques and Standards", Elsevier, 2010.

414457 C - ELECTIVE II : E & M GOVERNANCE

Teaching Scheme:	**Examination Scheme:**	
Lectures: 3 Hours/Week	In-Semester Assessment Phase I – 30 Marks	End-Semester Assessment Phase II – 70 Marks

Prerequisites : Information Technology Project Management

Course Objectives :

1. To understand What E-Commerce and M-Commerce is.
2. To study application of E-Commerce and M-Commerce.
3. To learn business models and governance structures in E & M Governance.
4. To study the effects of Information Technology on E & M Governance.
5. To learn mobile commerce technologies and to apply the same on E-Markets.

Course Outcomes :

At the end of this course, students will be able to:

1. Explain what E & M Governance is.
2. Understand the consequences of E-Commerce and M-Commerce.
3. Describe E-Procurements and E-Business Networks.
4. Define E-Commerce and M-Commerce services for consumers and businesses.
5. Understand E & M Governance standards and service development technology in M-Commerce.

UNIT - I INTRODUCTION TO E-BUSINESS — 6 Hours

e-Business: e-Business vs e-Commerce, Some critical factors, Characteristics of e-Business, Elements of an e-Business solution, e-Business roles and their challenges, e-Business requirements, Impacts of e-Business, Inhibitors of e-Business,

e-Business Strategy: Strategic positioning, Levels of e-Business strategy, The changing competitive agenda: business and technology drivers, The strategic planning process, Strategic alignment

The consequences of e-Business: theoretical foundations, Success factors for implementation of e-Business strategies

UNIT - II BUSINESS MODELS AND E-BUSINESS RELATIONSHIPS — 6 Hours

Pressures forcing business changes, Business models – definitions, Classifications of business models, Towards networked business models.

Modeling interdependent business activities: the value chain, Business processes and their management

Types and characteristics of e-Business relationships, Electronic links and the value chain.

UNIT - III GOVERNANCE STRUCTURES — 6 Hours

Markets versus hierarchies: theoretical contributions, The transaction cost perspective, Networks, A supply chain perspective: value-adding partnerships.

The effects of information technology on governance: e-Business Technological Infrastructure

Technical e-Business challenges, Basic infrastructure: client/server technology, Web technologies and applications, Collaborative technologies, The role of Enterprise Information Systems in e-Business

UNIT - IV E-MARKETS and E-PROCUREMENT 6 Hours

Electronic markets defined, The functions of electronic markets, electronic markets versus traditional markets? Effects of electronic markets, Electronic market success factors, e-Market technology solutions

E-procurement: The purchasing process, Developments in purchasing, IT and purchasing, e-Procurement.

E-Business Networks: Network organizations, Inter organizational information systems and network organizations, Supply chains and Integrated supply chains.

UNIT - V MOBILE COMMERCE OPPORTUNITIES 6 Hours

Mobile and Personal: The Emerging Mobile Lifestyle, Network Effects, Market Drivers, Beyond E-commerce.

Types of Mobile Commerce Services : Base Services Platform, Mobile Commerce Services for Consumers, Mobile Commerce Services for Businesses,

UNIT - VI MOBILE COMMERCE TECHNOLOGIES 6 Hours

Network Technologies, Mobile Devices, Service Development Technology, Mobile Commerce-Enabling Standards, Live Issues

Text Books

1. Michael P. Papazoglou, Pieter Ribbers, “e-Business: Organizational and Technical Foundations”, ISBN: 978-81-265-0796-2, Publisher: Wiley
2. Paul May , “Mobile Commerce: Opportunities, Applications, and Technologies of Wireless Business” ISBN: 978-0-521-79756-6, Cambridge University Press

Reference Books

1. Henry Chan, Raymond Lee, Tharam Dillon, Elizabeth Chang, E-Commerce: Fundamentals and Applications, ISBN: 978-0-471-49303-7, Publisher: Wiley
2. David Whiteley, E-Commerce: Strategy, Technologies and Applications, Tata McGraw Hill
3. Ravi Kalakota, Andrew Whinston, “ Frontiers of Electronic Commerce”, Addison Wesley Denial Amor “ The E Business revolution”, Addison Wesley
4. Sokol, “From EDI to Electronic Commerce: A Business Initiative”, TMH
5. Bajaj Nag, “E Commerce : The Cutting Edge of Business”, TMH
6. Bharat Bhasker, “Electronic Commerce Framework, Technologies and Applications”, ISBN-13: 978-1-25-902634-3, McGraw Hill Education.

414457 D - ELECTIVE II : GEO-INFORMATICS SYSTEMS

Teaching Scheme:	Examination Scheme:	
Lectures: 3 Hours/Week	In-Semester Assessment Phase I – 30 Marks	End-Semester Assessment Phase II – 70 Marks

Prerequisites: Database Management System, Computer Graphics.

Course Objectives :

1. To understand geographical Information system and its applications.
2. To understand sensing mechanism of different satellites.

Course Outcomes :

1. Students will understand basics of Remote Sensing & GIS.
2. Students will able to analyze GIS data and GIS applications.

UNIT – I INTRODUCTION TO GEO-INFORMATICS AND GIS — 6 Hours

Geo-Informatics: Introduction, Components of Geo-Informatics, Development and applications of remote sensing technology.

GIS: Definition, evolution, components, approaches, Geospatial data, GIS operations.

GIS architecture, models of GIS, framework for GIS, GIS categories, level / scales of measurement. types of map, spatial referencing system, map projections, grid systems, computer in map production.

UNIT – II FOUNDATIONS OF REMOTE SENSING — 6 Hours

Basic Principles of remote sensing, Electromagnetic remote sensing process, Microwave Remote Sensing: The radar Principle, factors affecting microwave measurements, radar wavebands, Side-Looking Airborne Radar (SLAR) Systems, Synthetic Aperture Radar (SAR), Interpreting SAR images, geometrical Remote Sensing platform and Sensors: Satellite system parameters, sensor parameters, imaging sensor systems, Earth resources satellite series. linkage of GIS to remote sensing

UNIT – III DIGITAL IMAGE PROCESSING FUNDAMENTALS — 6 Hours

Visual Image Interpretation: Types of pictorial data products, image interpretation strategy, image interpretation process, basic elements of image interpretation.

Basic character of digital images, preprocessing, registration, enhancement, spatial filtering, transformations, classification,

UNIT – IV SPATIAL DATA MANAGEMENT — 6 Hours

Existing GIS data, Metadata, conversion of existing data, creating new data, geometric transformations, Describing data quality and errors, Sources of errors in GIS, Finding and modeling errors in GIS, Managing GIS error, types of errors- RMS error, location error, topological error, spatial data accuracy. Attribute data in GIS, Spatial data processing.

UNIT – V DATA MODELING AND ANALYSIS — 6 Hours

Data Exploration, types of data queries, Vector data analysis- buffering, overlay, distance measurement, pattern analysis, Raster Data analysis- different types of operations, comparison of vector and raster based data analysis. Basic elements of GIS modeling- Binary models, Index models, Process models.

UNIT – VI APPLICATIONS AND DEVELOPMENT **6 Hours**

Urban and Municipal Applications- introduction and methodology.

GIS implementation and Project Management – Software Engineering. as applied to GIS, GIS project planning, System Analysis and user requirements studies, geospatial database design methodology Intelligent Transport Systems (ITS) -Components of ITS, Architecture and integration with GIS, Analysis and visualizations of traffic data in GIS, Integration of GPS and GIS.

Open source GIS.

Text Books

1. M. AnjiReddi, "Remote Sensing and Geographical Information Systems", B. S. Publications, Third Edition, 2006, Second reprint 2009
2. Kang-tsung Chang, "Introduction to Geographical Information Systems", Tata McGraw Hill, Fourth Edition, 2008

Reference Books

1. C.P.Lo, Albert K. W. Yeung, "Concept and techniques of Geographic Information Systems", PHI, Second Edition, 2007.
2. Lillesand, T. and Keifer R, ,1999: Remote sensing and Image Interpretation, Wiley, London
3. Peter A. Burrough, Rachael A. McDonnell" Principles of Geographical Information Systems", Oxford University Press.

414457 E - ELECTIVE II : NATURAL LANGUAGE PROCESSING

Teaching Scheme:	**Examination Scheme:**	
Lectures: 3 Hours/Week	In-Semester Assessment Phase I – 30 Marks	End-Semester Assessment Phase II – 70 Marks

Prerequisites : Basic understanding of probability theory, Theory of Computer Science, Systems Software

Course Objectives :

1. Understand the core concepts of Natural language processing and levels of language analysis.
2. Learning state of art NLP research areas such as parsing algorithms, ambiguity resolution and machine translation.

Course Outcomes :

1. Automatic processing and information extraction of human language using computer.
2. Learn applications of Natural Language Processing such as Information extraction, semantic web search, machine translation, text summarization, spam detection.

UNIT - I INTRODUCTION TO NATURAL LANGUAGE UNDERSTANDING 6 Hours

The Study of Language Applications of Natural LanguageUnderstanding Evaluating Language Understanding Systems The Different Levels of Language Analysis, Representations and Understanding The Organization of Natural Language Understanding Systems.

UNIT - II LINGUISTIC BACKGROUND: GRAMMARS AND PARSING 6 Hours

An Outline of English Syntax Words- The Elements of Simple Noun Phrases Verb Phrases and Simple Sentences Noun Phrases Revisited Adjective Phrases Adverbial Phrases, Grammars and Sentence Structure What Makes a Good Grammar A Top-Down Parser A Bottom-Up Chart Parser Top-Down Chart Parsing Finite State Models and Morphological Processing Grammars and Logic Programming Parsing tools such as Stanford Parser.

UNIT - III FEATURES AND AUGMENTED GRAMMARS 6 Hours

Feature Systems and Augmented Grammars Some Basic Feature Systemsfor English Morphological Analysis and the Lexicon A Simple Grammar Using Features Parsing with Features, Augmented Transition Networks Definite Clause Grammars Generalized Feature Systems and Unification Grammars.

UNIT - IV TOWARD EFFICIENT PARSING 6 Hours

Human Preferences in Parsing Encoding Uncertainty: Shift-Reduce Parsers Statistical Methods-Basic Probability Theory Estimating Probabilities Part-of-SpeechTagging Obtaining Lexical Probabilities Probabilistic Context-Free Grammars Best-First Parsing A Simple Context- Dependent Best-First Parser.

UNIT - V SEMANTIC INTERPRETATION AND AMBIGUITY RESOLUTION 6 Hours

Semantics and Logical Form Word Senses and Ambiguity The Basic Logical Form, Language Encoding Ambiguity in Logical Form Verbs and States in Logical Form Case Relations.Representation of meaning – model theoretic representation, description logic, Lexical Resources such as WordNet, Semantic web Ontologies.

UNIT - VI APPLICATIONS AND RECENT TRENDS IN NLP 6 Hours

Information Extraction, Question answering, Machine Translation, MT evaluation tools such as Bleu, (word error rate) WER etc. Automatic text summarization, Sentiment Speech Recognition, Semantic web search, Automatic text Clustering.

Text Books

1. James Allen, “Natural Language Understanding”, Pearson Publication, ISBN: 978-81-317-0895-8 2nd Edition
2. D. Jurafsky, J. H. Martin, “Speech and Language Processing”, Pearson Education, 2002.

Reference Books

1. Christopher D. Manning, HinrichSchutze, Foundations of Statistical Natural Language Processing, The MIT Press, Cambridge, Massachusetts, 1999.
2. Tanveer Siddiqui, US Tiwary, Natural Language Processing and Information Retrieval
3. Daniel M.Bikel, ImedZitouni, Multilingual Natural Language Processing Applications

414458 : SOFTWARE LABORATORY – III

Teaching Scheme:
Practical : 4 Hours/Week

Examination Scheme:
Term Work : 50 Marks
Oral : 50 Marks

Prerequisites: Knowledge of any Programming Language (Preferably Java).

Course Objectives :

1. To Understand the Security issues in networks and Applications software.
2. To understand the machine learning principles and analytics of learning algorithms.

Course Outcomes :

1. The students will be able to implement and port controlled and secured access to software systems and networks.
2. The students will be able to build learning software in various domains.

Contents

PART A : Cyber Laws and Information Security

Section A Programming

1. Write program in C++ or Java to implement RSA algorithm for key generation and cipher verification
2. Develop and program in C++ or Java based on number theory such as Chinese remainder or Extended Euclidean algorithm. (Or any other to illustrate number theory for security)
3. Write program in C++ or Java to implement Diffie Hellman key exchange algorithm.

Section B Cryptography Library (API)

1. Write a program in C++, C# or Java to implement RSA algorithm using Libraries (API).
2. Write a program in C++, C# or Java to implement SHA-1 algorithm using Libraries (API).

Section C Security Tools (Minimum one)

1. Configure and demonstrate use of IDS tool such as snort.
2. Configure and demonstrate use of vulnerability assessment tool such as NESSUS
3. Implement web security with Open SSL tool kit

Students should submit the term work in the form of a journal. Each assignment has to be well documented with problem definition, theory and code documentation. Staff in charge will assess the assignments continuously and grade or mark each assignment on completion date, declared for each assignment.

Note: Oral examination will be based on the term work submitted by the student and the associated theory of the subject.

Reference Books

1. William Stallings, “Computer Security: Principles and Practices”, Pearson Ed. ISBN: 978-81-317-3351-6.
2. Mark Merkow, “Information Security-Principles and Practices”, Pearson Ed. 978-81-317-1288-7.
3. CK Shyamalaet el., “Cryptography and Security”, Wiley India Pvt. Ltd, ISBN 978-81-265-2285-9.
4. BerouzForouzan, “Cryptography and Network Security”, 2 edition, TMH, ISBN: 9780070702080.

PART B : Machine Learning

GUIDELINES FOR STUDENTS AND TEACHERS:

Experiments should be performed with WEKA or R. Students are also encouraged to implement the experiments with **Java 1.6 and higher version (RJava Package).** Standard Data Sets available on line may be used. A few popular data sets are :

1) Olive Oil Data Set 2) Iris Data Set 3) UC Irvine ML Laboratory

#Create your own dataset from domain of your interest.

1) *Minimum five* experiments are to be performed by group of two students.
2) Assignment numbers 1, 2 and 3 are compulsory.
3) Any two assignments should be chosen from the remaining list.
4) Journal must be maintained and submitted by each student for all the four assignments.
5) Subject Teachers should encourage students to use the same DATA-SET (or subset of it as per the requirement) to perform all tasks.

REFERENCE : 1) Open source software-WEKA or R 2) JAVA 6.1 or more (for RJava Package)
Subject teachers are advised to frame proper assignment statements from the following list.

LIST OF ASSIGNMENTS:

1) **Study of platform for Implementation of Assignments**
   Download the open source software of your interest. Document the distinct features and functionality of the software platform. You may choose WEKA or R or Rjava.

2) **Supervised Learning - Regression**
   Generate a proper 2-D data set of N points. Split the data set into Training Data set and Test Data set.
   i) **Perform linear regression analysis with Least Squares Method.**
   ii) **Plot the graphs for Training MSE and Test MSE and comment on Curve Fitting and Generalization Error.**
   iii) **Verify the Effect of Data Set Size and Bias-Variance Tradeoff.**
   iv) **Apply Cross Validation and plot the graphs for errors.**
   v) **Apply Subset Selection Method and plot the graphs for errors.**
   vi) **Describe your findings in each case.**

3) Supervised Learning - Classification
Implement Naïve Bayes Classifier and K-Nearest Neighbor Classifier on Data set of your choice. Test and Compare for Accuracy and Precision.

4) Unsupervised Learning
Implement K-Means Clustering and Hierarchical clustering on proper data set of your choice. Compare their Convergence.

5) Dimensionality Reduction
Principal Component Analysis-Finding Principal Components, Variance and Standard Deviation calculations of principal components.

6) Supervised Learning and Kernel Methods
Design, Implement SVM for classification with proper data set of your choice. Comment on Design and Implementation for Linearly non separable Dataset.

Reference Books

1. Open source software-WEKA or R.
2. JAVA 6.1 or more (for RJava Package).
3. Dr. Mark Gardener, Beginning R The Statistical Programming Language, ISBN: 978-81-265-4120-1, Wiley India Pvt. Ltd.
4. Jason Bell, “Machine Learning for Big Data Hands-On for Developers and Technical Professionals”, ISBN: 978-81-265-5337-2-1, Wiley India Pvt. Ltd.

Term work:

Staff in-charge will suitably frame the above assignments and flexibility may be incorporated. Students will submit term work in the form of journal. Each assignment has to be well documented with problem definition, code documented with comments. Staff in-charge will assess the assignments continuously and grade or mark each assignment on completion date.

All the assignments should be conducted on Latest version of Open Source Operating Systems, tools and Multi-core CPU supporting Virtualization and Multi-Threading.

414459 : SOFTWARE LABORATORY – IV

Teaching Scheme:
Practical : 4 Hours/Week

Examination Scheme:
Practical : 50 Marks   Oral : 50 Marks

Prerequisites: Problem Solving and Object Oriented Paradigm, Software Engineering.

Course Objectives :

1. Prepare an analysis model of a system using UML 2 diagrams.
2. Implement an appropriate design pattern to solve a design problem.
3. Understand a test driven development approach for coding.
4. Understand Object Oriented Software Development life cycle activities.

Course Outcomes :

1. Students will be able to identify classes and collaboration from requirements.
2. Students will be able to prepare analysis and design model and implement.
3. Students will be able to use the test driven development approach in implementation.
4. Students will be able to experience Object Oriented Software Development life cycle activities.

Contents

The laboratory will be in form of assignments. Each assignment will have a laboratory pre work. Following are the guidelines to conduct the laboratories.

1. **Purpose: Understanding the implementation details of relationships among classes**
   Lab pre work: Prepare a class diagram from the given problem description using UML2.0 notations.
   Laboratory work: Implement the class diagram with a suitable object oriented language.
2. **Purpose: Implementation of a design model**
   Lab pre work: Prepare a design model from analysis model in the form of UML 2 class diagram.
   Laboratory work: Implement the design model with a suitable object oriented language
3. **Purpose: Implementation of a state model from the given description.**
   Lab pre work: Prepare a state model from the given problem description and draw a state diagram using UML2 notations
   Laboratory work: Implement the state model with a suitable object oriented language
4. **Purpose: Preparing an interaction model from the given details**
   Prepare a use case model, sequence model and activity model from the given description using UML 2 notations.
5. **Purpose: Implement a Strategy design pattern**
   Map the participants for the strategy design pattern from a given problem description and implement with a suitable object oriented language
6. **Purpose: Implement a State design pattern**
   Map the participants for the state design pattern from a given problem description and implement with a suitable object oriented language
7. **Purpose: Understand the concept of Test driven Development**
   Implement a design level class diagram (given as an input) with Test Driven Development approach.
8. **Objective: Understand and implement the Concept of a reusable component**
   Implement a reusable component in form of jar file (or in equivalent form for other OO languages). Use this component in a separate client implementation by importing the component as a jar file (or equivalent form for other OO language).

Reference Books

1. Software Architecture: Foundations, Theory and Practice by Richard N. Taylor, NenadMedvidovic, Eric M. Dashofy, Wiley India Pvt. Limited, 2010,
2. Software design: from programming to architecture, by Eric J. Braude, J. Wiley, 2004.
3. Pattern oriented software architecture: a pattern language for Distributed Computing, by By Fran Buschmann, Kelvin Henney, Douglas C Schmid, Wiley India Pvt. Limited volume-4.

All the assignments should be conducted on Latest version of Open Source Operating Systems, tools and Multi-core CPU supporting Virtualization and Multi-Threading.

414460 : PROJECT PHASE - I

Teaching Scheme:
Tutorial : 2 Hours/Week

Examination Scheme:
Term work : 50 Marks

Prerequisites: Project Based Seminar.

Course Objectives :

1. The practical implementation of theoretical knowledge gained during the study from FE to TE.
2. The student should be able implement their ideas/real time industrial problem/ current application of their engineering branch which they have studied in curriculum.
3. To build confidence in the student what he has learnt theoretically.
4. The dependent study of the state of the art topics in a broad area of his/her specialization.

Course Outcomes :

At the end of this course the student should be able to show preparedness to study independently in chosen domain of Information Technology and programming languages and apply to variety of real time problem scenarios.

Contents

Project Based Seminar (PBS) helped students to gather, organize, summarize and interpret technical literature with the purpose of formulating a project proposal in third year as part of course **314456 : Seminar& Technical Communication Laboratory.** They also submitted a technical report summarizing state-of-the-art on an identified topic.

B.E. Projects can be two types: Projects based on implementation of any application oriented problem, which will be more or less experimental in nature, and the others will be based on some innovative/ theoretical work.

In Project Phase-I the student will undertake same project over the academic year, which will involve the analysis, design of a system or sub system in the area identified earlier in the field of Information Technology and Computer Science and Engineering. In some cases; if earlier identified project is not feasible; a new topic must be formulated in consultation with the guide and project coordinator.

The project will be undertaken preferably by a group of **3-4 students** who will jointly work and implement the project. The group will select a project with approval from a committee formed by the department of senior faculty to check the feasibility and approve the topic.

Review Committee:

The Head of the department/Project coordinator shall constitute a review committee for project work for project group; project guide would be one member of that committee by default. There shall be at least two reviews in semester-I and semester-II by the review committee. The students or project group shall make presentation on the progress made by them before the committee. The record of the remarks/suggestions of the review committee should be properly maintained and should be made available at the time of examination.

Each student/group is required to give presentation as part of review for 10 to 15 minutes followed by a detailed discussion.

Semester - I

Review 1: Finalization of scope – the objectives and scope of the project should be finalized in second week of their academic semester. Should finalize list of required hardware, software or other equipment for executing the project, test environment/tools.

Review 2: Finalization of SRS – High level design, planning with CPM/PERT chart etc in the sixth week of their academic semester.

Semester – II

Review 3: Implementation Status and testing document.

Review 4 : Final Project Demonstration, Project Report and proper Result analysis

Guidelines for Students and Faculty:

Project Review Committee:

1. This committee will be responsible for evaluating the timely progress of the projects and communicating the progress report to the students.
2. As far as possible Students should finalize the same project title taken for Project Based Seminar (PBS).
3. Review committee should conduct “Feasibility Review” in first week after commencement of the term. Review committee should finalize the scope of the project.
4. If change in project topic is unavoidable then the students should complete the process of project approval by submitting synopsis along with the review of important papers. This new project topic should be approved by review committee.

Term Work:

1. The term work will consist of a report prepared by the student on the project allotted to them.
2. They should use appropriate tools for the preparation of the report like project planning, UML diagram, testing tools, referencing tools etc.

Report Structure

- Contents
- List of Abbreviations
- List of Figures
- List of Graphs
- List of Tables
    1. Introduction and aims/motivation and objectives
    2. Literature Survey
    3. Problem Statement
    4. Project Requirements
    5. System Analysis Proposed Architecture/ high level design of the project
    6. Verification Validation
    7. Project Plan
    8. Conclusion
- References
- Appendices
    A. Base Paper(s)

B. Plagiarism Report from any open source

Evaluation Guidelines:

A panel of examiner will evaluate the viability of project / project scope. The panel will also verify that all the suggestions/comments in the review document are taken care and accordingly allot the term work marks. Oral examination in the form of presentation will be based on the project work completed by the candidates. Preliminary report must also be presented during the oral examination.

SEMESTER - II

414461 : Distributed System

Teaching Scheme:
Lectures: 3 Hours/Week

Examination Scheme:

In-Semester Assessment	End-Semester Assessment
Phase I – 30 Marks	Phase II – 70 Marks

Prerequisites: Operating System, Computer Networks and Web Engineering & Technology.

Course Objectives :

1. To understand the fundamentals of distributed environment in complex application.
2. To get comprehensive knowledge of the architecture of distributed systems.
3. To make students aware about security issues and protection mechanism for distributed environment.

Course Outcomes :

1. Understand the principles and desired properties of distributed systems on which the internet and other distributed systems are based.
2. Understand and apply the basic theoretical concepts and algorithms of distributed systems in problem solving.
3. Recognize the inherent difficulties that arise due to distributed-ness of computing resources.
4. Identify the challenges in developing distributed applications.

UNIT - I INTRODUCTION 5 Hours

Introduction, Examples of distributed systems, Trends in distributed systems, Focus on Resource Sharing, Challenges.
System Models: Physical models, Architectural Models, Fundamental Models.
Case Study: The World Wide Web

UNIT - II COMMUNICATION 6 Hours

Inter-process Communication: Introduction, The API for the Internet Protocols, External Data Representation and Marshalling, Multicast Communication, Network Virtualization: Overlay Networks,
Case Study: MPI
Remote Invocation: Request-reply Protocols, Remote Procedure Call, Remote Method Invocation,
Case Study: Java RMI
Indirect Communication: Group Communication, Publish-subscribe Systems, Message Queues, Shared Memory approaches.

UNIT - III MIDDLEWARE 6 Hours

Distributed Objects and Components: Introduction, Distributed Objects, Case Study: CORBA. From Objects to Components,
Case Studies: Enterprise JavaBeans and Fractal.
Web Services: Introduction, Web Services, SERVICE Descriptions and IDL for Web Services, A directory service for use with web services, XML security, Coordination of web services, Applications of Web Services.
Peer-To-Peer Systems: Introduction, Peer-to-peer middleware, Routing overlays Application,
Case Study: Squirrel.

UNIT - IV DISTRIBUTED ALGORITHMS 6 Hours

Time and Global States: Introduction, Clocks, Events and Process States, Synchronizing Physical Clocks, Logical Time and Logical Clocks, Global States.

Coordination and Agreement: Introduction, Distributed mutual exclusion, Elections, Coordination and Agreement in Group Communication, Consensus.
Replication: Introduction, System Model and the role of Group Communication, Fault-tolerant Services.
Case Study: Coda.

UNIT – V DISTRIBUTED STORAGE AND MULTIMEDIA SYSTEMS 6 Hours

Distributed File Systems: Introduction, File Service Architecture, Sun Network File System, and HDFS.
Name Services: Introduction, Name Services and the Domain Name System, Directory Services.
Case Study: 1. The Global Name Service, 2. The X.500 Directory Service.
Distributed Multimedia Systems: Characteristics of Multimedia Data, Quality of Service Management, Resource management, Stream Adaptation.
Case Study: BitTorrent and End System Multicast.

UNIT - VI SECURITY IN DISTRIBUTED SYSTEMS 7 Hours

Introduction to Security: Security Threats, Policies, and Mechanisms, Design Issues, Cryptography.
Secure Channels: Authentication, Message Integrity and Confidentiality, Secure Group Communication,
Case Study: Kerberos.
Access Control: General Issues in Access Control, Firewalls, Secure Mobile Code, Denial of Service.
Security Management: Key Management, Secure Group Management, Authorization Management.
Emerging Trends In Distributed Systems: GRID COMPUTING, SOA, Cloud Computing.

Text Books

1. George Coulouris, Jean Dollimore, Tim Kindberg, & Gordon Blair, “Distributed Systems – Concept and Design”, 4th Edition, Publisher: Pearson.
2. Andrew S. Tanenbaum & Maarten van Steen”, Distributed Systems – Principles and Paradigms”, 2nd Edition, Publisher: PHI.
3. P. K. Sinha,”Distributed Operating Systems Concepts and Design”, Publisher: PHI.

Reference Books

1. Sunita Mahajan, Seema Shah, “Distributed Computing”, 2nd Edition, Publisher: Oxford University Press.
2. Advanced concepts in Operating Systems, Mukesh Singhal & N.G.Shivaratri, TMH.
3. Randay Chow, Theodore Johnson, “Distributed Operating System and Algorithm Analysis”, Publisher: Pearson (LPE).
4. Abhijit Belapurkar, Anirban Chakrabarti, Harigopal Ponnapalli, Niranjan Varadarajan, Srinivas Padmanabhuni, Srikanth Sunderrajan , " Distributed System Security: Issues, Processes and solutions", ISBN: 978-0-470-51988-2, Feb 2009, Publisher: Willey online Library.

414462 : Advanced Databases

Teaching Scheme:
Lectures: 3 Hours/Week

Examination Scheme:

In-Semester Assessment	End-Semester Assessment
Phase I – 30 Marks	Phase II – 70 Marks

Prerequisites: Database Management System.

Course Objectives :

1. To learn and understand Database Modeling, Database Architectures.
2. To learn and understand Object Oriented Databases.
3. To learn and understand web database language, XML, JDOQL.
4. To learn NoSQL Databases (Open source) and big data analytics.
5. To learn Web data and mining.
6. To learn current trends in databases.

Course Outcomes :

1. Understanding of Advances in Database Architectures for Big data.
2. Master the basics of web and object oriented database using XML and JDOQL.
3. Master the basic concepts of NoSQL Databases.
4. Understand how analytics and big data affect various functions now and in the future.
5. Appreciate the impact of analytics and big data on the information industry and the external ecosystem for analytical and data services.
6. Understanding of current trends in databases.

UNIT - I PARALLEL AND DISTRIBUTED DATABASES 6 Hours

Parallel Database: Introduction, Architectures, Interquery and Intraquery Parallelism, Parallelism on Multicore processor, Parallel Query Optimization,
Distributed Database: Introduction, Data Storage, Distributed Transactions, Commit Protocol, Concurrency control, Distributed Recovery.

UNIT - II OBJECT-BASED DATABASE AND XML 6 Hours

Overview, Complex databases, Structured data types, operations on structured and unstructured data. Encapsulation and ADTs. Inheritance, Objects, OIDs and Reference types, Database Design, ORDBMS Implementation challenges-Storage and Access methods, Query Optimization, ODMS-Object model. NOSQL object database-ObjectDB (JDO),JDO Data Model, XML Data Model ,DOM, XQuery, Efficient evaluation of XML Queries.

UNIT - III BIG DATABASES 8 Hours

Introduction to Big Data, NoSQL database system – Columnbased and key value based
Column based Database (Cassandra) : Architecture, Managing data, Data Caching, Tuning, Data backup, Cassandra Query Language, CQL Data Model, Indexing
Key Value based Database (DynamoDB) : Data Model, Operations, Data Access, Indexing.

UNIT - IV BIG DATA ANALYTICS 8 Hours

Introduction to data mining and analytics, Data Streams mining, Stream data management systems: Issues and solutions, Stream frequent pattern analysis, Stream classification, Stream cluster analysis, Graph based database, graph mining, Methods for Mining Frequent Sub graphs Mining Variant and Constrained Substructure Patterns, Social Network Analysis, Models of social network generation, mining on social network, Apache Flume NG - Microsoft StreamInsight as tools for Complex Event Processing (CEP) applications. Case Studies Big Data in E-Commerce and IT Energy Consumption, Social and Health Science.

UNIT - V MINING TEXT AND WEB 6 Hours

Text mining : Introduction, natural language processing and information extraction: An Introduction Text categorization methods

Web Mining : Introduction, Web Contents and Usage, Data Modeling for Web Usage Mining, Mining Web linkage structures, **Discovery and Analysis of Web Usage Patterns:** Session and Visitor Analysis, Analysis of Sequential and Navigational patterns

Recommender Systems and Collaborative Filtering: The Recommendation Problem, Content-Based Recommendation, Collaborative Filtering using K-Nearest Neighbor KNN and Association Rules, Matrix Factorization.

UNIT - VI CURRENT TRENDS IN ADVANCED DATABASES 6 Hours

Deductive Databases: Introduction, Semantics, Fix point operator, Safe data log programmers, Least Model, Least fixed point, Query Processing, Query Evaluation, Prototypes, and Deductive Vs RDBMS. Multimedia Database, Cloud Databases, Spatial Databases, Temporal Databases.

Text Books

1. Raghu Ramkrishanan, Johannes Gehrke 4th Edition "Database Management Systems"
2. Avi Silberschatz , Henry F. Korth , S. Sudarshan, "Database System Concepts, Sixth Edition", ISBN-13: 978-93-3290-138-4, MCGraw Hill

Reference Books

1. Shio Kumar Singh, Database Systems Concepts Design and Applications, ISBN- 978-81-317-6092-5, Pearson
2. Mario Piattini, Oscar Diaz "Advanced Database Technology and Design"- online book.
3. J. Han, M. Kamber Data mining: concepts and techniques. Morgan Kaufmann.
4. Bing Liu, Web Data Mining: Exploring Hyperlinks, Contents, and Usage Data, Springer.
5. Big Data Black Book, DT Editorial Services, Wiley-Dreamtech Press, ISBN-9789351197577, May 2015.
6. http://nosql-database.org/

414463 A - ELECTIVE III : MOBILE COMPUTING

Teaching Scheme:
Lectures: 3 Hours/Week
Practical: 2Hours /Week

Examination Scheme:

In-Semester Assessment	End-Semester Assessment
Phase I – 30 Marks	Phase II – 70 Marks
	Term work – 25 Marks
	Oral – 25 Marks

Prerequisites: Computer Networks.

Course Objectives :

1. To understand the fundamentals involved in technologies of Mobile computing.
2. To study GSM Architecture and Services.
3. To learn about different architectures of mobile application development.
4. To know recent and future trends in mobile computing.

Course Outcomes :

1. Students will gain knowledge of GSM architecture.
2. Students will be able to understand mobility management.
3. Students will be able to understand working of wireless architectures and their applications.
4. Students will be able to understand recent trends and emerging technologies.

UNIT - I INTRODUCTION — 6 Hours

Introduction – PCS Architecture, Cellular Telephony, Mobile Computing Architecture
Mobile devices: Device Overview, Input mechanism, Wireless communication, Mobile Device classification, Device Manufacturers
Mobile Generations: Devices and Applications for: 1G, 2G, 2.5G, 3G
Mobility Management :Handoff, Roaming Management, Roaming Management under SS7
Handoff Management :Handoff Detection, Strategies for Handoff Detection, Channel Assignment, Link Transfer Types, Hard Handoff, Soft Handoff

UNIT - II GSM AND MOBILITY MANAGEMENT — 6 Hours

GSM System Overview: GSM Architecture, Data Services, Unstructured Supplementary Service Data
Mobility Management : GSM Location Update, Mobility Databases, Failure Restoration, VLR Identification Algorithm, VLR Overflow Control

UNIT - III GSM SERVICES — 6Hours

GSM Service: SMS Architecture, SMS Protocol Hierarchy, Mobile-Originated Messaging, Mobile – Terminated Messaging
International Roaming for GSM: International GSM, Call Setup, Reducing the International Call Delivery Cost
Mobile Number Portability: Fixed Network Number Portability, Number Portability for Mobile Networks, Mobile Number Portability Mechanisms, Implementation Costs for Mobile Number
Mobile prepaid service: Wireless intelligent network approach, service node approach, hot billing approach, handset based approach

UNIT - IV GSM DATA LAYER **6 Hours**

General Packet Radio Service (GPRS): GPRS Functional Groups, GPRS Architecture GPRS Network Nodes, GPRS Interfaces, GPRS Procedures, GPRS Billing, Evolving from GSM to GPRS

Wireless Application Protocol (WAP): WAP Model, WAP Gateway, WAP Protocols WAP UAProf and Caching, Wireless Bearers for WAP, WAP Developer Toolkits, Mobile Station Application Execution Environment

Third-Generation Mobile Services: Paradigm Shifts in Third-Generation Systems W-CDMA and cdma2000, Improvements on Core Network, Quality of Service in 3G Wireless Operating System for 3G Handset

UNIT - V MOBILE APPLICATION ARCHITECTURES **6 Hours**

Choosing the right architecture: Application architecture, Device type, Enterprise connectivity, Enterprise data, Enterprise integration, User notification, security, battery life

Application Architectures: Wireless internet, Smart Client, messaging

Smart Client Overview: architecture

Smart Client Development process: Need analysis phase, design phase, implementation and testing phase, deployment phase

UNIT - VI RECENT AND FUTURE TRENDS **6Hours**

Android OS and its Architecture, Mobile Applications, User Interface design for mobile Applications, Managing Application Data, Performance, Scalability, Modifiability, Availability and Security of Mobile Applications, Testing Methodologies for Mobile Applications.

Future Mobile Generations: 4G, 5G

Note: Instructor should design at least 08 assignments of sufficient complexity on Mobile application Development (Unit VI) and 04 study assignments on Units I to V.

Text Books

1. Yi Bang Lin, “Wireless and Mobile Network Architectures”, Wiley Publications.
2. Martyn Mallick, “Mobile and Wireless design essentials”, Wiley Publications.

Reference Books

1. Johen Schiller, “Mobile communications”, Pearson Publications.
2. Asoke Talukder and Roopa Yavagal”, Mobile Computing Technology, Applications and Service Creation”, Second Edition, ISBN-13: 978-0-07-014457-6, Tata McGraw Hill.
3. Iti Shah Mishra, “Wireless Communication and Networks 3G and Beyond”, Second Edition, ISBN-13: 978-1-25-906273-5, McGraw Hill Education
4. Theodore S. Rappaport, “Wireless Communications principles and practice”, 2nd edition, Pearson Education, ISBN – 978-81-317-3186-4.
5. Ke-Lin Du & M.N. S. Swamy, “Wirless Communication Systems, From RF Subsystems to 4G Enabling Technologies, ISBN: 978-0-521-18736-7, Cambridge University Press,

414463 B - ELECTIVE III : ADVANCED GRAPHICS AND ANIMATION

Teaching Scheme:
Lectures: 3 Hours/Week
Practical: 2 Hours /Week

Examination Scheme:
In-Semester Assessment
Phase I – 30 Marks

End-Semester Assessment
Phase II – 70 Marks
Term work – 25 Marks
Oral – 25 Marks

Prerequisites :

1. Knowledge of C++ or linear algebra.
2. Computer Graphics, Multimedia Systems.
3. Strong software Engineering Skills.

Course Objectives :

1. Provide solid grounding in three dimensional modeling mechanisms.
2. Introduce students to techniques in virtual reality, solid modeling and animation
3. To gain first-hand experience for accurate modeling, rendering, and simulation, and the necessary data structures and algorithms.
4. To develop programming skills in 3D computer graphics.
5. Become acquainted with some advanced topics in computer graphics.

Course Outcomes :

At the end of this course students should be able to

1. Learn recent methods in rendering, modeling, and animation.
2. Understand the current models for the interaction of light and materials
3. Understand some areas of current computer graphics research.
4. Learn and use the production pipeline to create your own animation

UNIT – I 3D MODELING AND 3D OBJECT REPRESENTATION — 3 Hours

Brief Review of 3D modeling and 3D object Representation 3D display methods, Polygon surfaces, polygon meshes, Curved lines and surfaces, Quadratic surfaces, Spline representation and specification B-Spline curves and surfaces.

UNIT - II SOLID MODELING — 9 Hours

Representing solids, Primitive instancing, sweep representations, Boundary representations, spatial-partitioning representations, constructive solid geometry, user interfaces for solid modeling, comparison of representations.

UNIT - III RENDERING — 6 Hours

Introduction, Basics of illumination and shading models, Transparency,
Shadows and textures, Ray tracing from the light source, cone, beam and pencil tracing. Point based rendering, Mesh Simplification, Spatial partitioning, Solid Modeling,

UNIT – IV OpenGL — 10 Hours

OpenGL over windows, SDK, Extensions, GLUT, GLU, OpenGL primitives,
Programming language: Blending, 3D Viewing (camera analogy), Lighting model, Culling, Fog, Texture mapping.
OpenGL over Linux, pBuffer rendering, Shadowing Techniques, a few examples and demos of OpenGL programs.

UNIT - V ANIMATION **5 Hours**

Introduction, Devices for producing animation , Conventional and Computer assisted animation, Animation languages, Basic rules of animation, Methods of controlling animation, frame-by-frame animation techniques, real-time animation techniques , Programming aspects in creating simple animation

UNIT – VI VIRTUAL REALITY **3 Hours**

Basics, Devices for Virtual Reality, Virtual Reality Languages, Virtual Reality Design, Omegalib And Applications

Text Books

1. Donald Hearn & M. Pauline Baker, "Computer Graphics C version", 2nd Ed, Pearson
2. Education.
3. David F. Rogers, "Procedural Elements for Computer Graphics", 2nd Ed - Tata McGraw Hill Edition.
4. "OpenGL Programming Guide: The Official Guide to Learning OpenGL", Mason Woo, Jackie, Tom Davis, Version 2.1, 6th Edition, Pearson Education, ISBN 978-81-317-2184-1.

Reference Books

1. M.N. Sinha, A.D. Udai, "Computer Graphics",Tata McGraw Hill Edition.
2. Foley, Dam, Feiner, Hughes,"Computer Graphics Principles & Practice", 2nd Ed, Pearson Education.
3. Hill, Kelly, "Computer Graphics using OpenGL", 3rd Ed, Eastern Economy Edition.
4. "Advanced Animation and Rendering Techniques: Theory and Practice", Alan H. Watt and Mark Watt, Addison-Wesley, ACM Press, ISBN: 0201544121

Web-links

http://nptel.ac.in/syllabus/106106090/
http://studentnet.cs.manchester.ac.uk/ugt/COMP37111/syllabus
http://www.sci.tamucc.edu/~sking/Courses/COSC5328/syllabus.php

List of Practical

The lab course will be evaluated on the basis of five assignments framed by the faculty that primarily involve programming systems for rendering, simulation and animation concepts. These assignments need to be done individually by the students. Faculty can choose from the list below or frame new assignments based on the theory contents.

1. Implement an OpenGL program to draw different 2D shapes.
2. Implement an OpenGL program to draw 2 overlapped shapes and use alpha blending.
3. Implement an OpenGL program to draw 3D cube and apply transformations.
4. Implement an OpenGL program to draw 12 spheres and apply different light effects.
5. Implement an OpenGL program to draw scene and apply fog effect.
6. Implement an OpenGL program to draw 3D cube and apply different textures on different faces.
7. Program describing certain animation techniques like Basic Key-framing , Rigid Body Dynamics, Motion Capture (Can be implemented in the language / API of your choice)
8. Assignments based on virtual reality
9. Draw histogram of 256-color BMP image.

414463 C - ELECTIVE III : INFORMATION STORAGE AND RETRIEVAL

Teaching Scheme:
Lectures: 3 Hours/Week
Practical: 2 Hours /Week

Examination Scheme:
In-Semester Assessment
Phase I – 30 Marks

End-Semester Assessment
Phase II – 70 Marks
Term work – 25 Marks
Oral – 25 Marks

Prerequisites: Data Structures and Files, Database management systems.

Course Objectives :

1. To understand information retrieval process.
2. To understand concepts of clustering and how it is related to Information retrieval.
3. To deal Storage, Organization & Access to Information Items.
4. To evaluate the performance of IR system.
5. TO understand information sharing on semantic web.
6. To understand the various applications of Information Retrieval giving emphasis to multimedia and distributed IR, web Search.

Course Outcomes :

1. Student should be able to understand the concept of Information retrieval.
2. Student should be able to deal with storage and retrieval process of text and multimedia data.
3. Student should be able to evaluate performance of any information retrieval system.
4. Student should be able to understand importance of recommender system.
5. Student should be able to understand concept of multimedia and distributed information retrieval.

UNIT - I INTRODUCTION 8 Hours

Basic Concepts of IR, Data Retrieval & Information Retrieval, IR system block diagram. **Automatic Text Analysis**: Luhn's ideas, Conflation Algorithm, Indexing and Index Term Weighing, Probabilistic Indexing, Automatic Classification. Measures of Association, Different Matching Coefficient, Classification Methods, Cluster Hypothesis, Clustering Algorithms, Single Pass Algorithm, Single Link Algorithm, Rocchio's Algorithm.

UNIT - II STORAGE AND SEARCHING TECHNIQUES 6 Hours

Storage: Inverted file, Suffix trees & suffix arrays, Signature Files, Scatter storage or hash addressing, Clustered files.
IR Models: Basic concepts, Boolean Model, Vector Model
Searching strategies: Boolean Search, Serial search, cluster based retrieval, Query languages, Types of queries, Patterns matching, structural queries.

UNIT - III RETRIEVAL PERFORMANCE EVALUATION AND ONTOLOGY 6 Hours

Performance evaluation: Precision and recall, alternative measures
Ontology: Ontology based information sharing, Ontology languages for semantic web, Ontology creation.

UNIT - IV DISTRIBUTED AND MULTIMEDIA IR 6 Hours

Distributed IR: Introduction, Collection Partitioning, Source Selection, Query Processing, web issues.
MULTIMEDIA IR: Introduction, Data Modeling, Query languages, Generic multimedia indexing approach, One dimensional time series, two dimensional color images, Automatic feature extraction.

UNIT - V WEB SEARCHING 6 Hours

Searching the Web: Challenges, Characterizing the Web, Search Engines, Browsing, Mata-searchers, Web crawlers, Meta-crawler, Web data mining, Finding needle in the Haystack, Searching using Hyperlinks, Page ranking algorithms.

UNIT - VI RECOMMENDER SYSTEMS 6 Hours

Collaborative Filtering and Content Based Recommendation of Documents and Products, **Information Extraction and Integration**: Extracting Data from Text. Semantic Web, Collecting and Integrating Specialized Information on the web.

Text Books

1. Yates & Neto, "Modern Information Retrieval", Pearson Education, ISBN 81-297-0274-6.
2. C.J. Rijsbergen, "Information Retrieval", (www.dcs.gla.ac.uk).
3. Heiner Stuckenschmidt, Frank van Harmelen, "Information Sharing on th Semantic Web", Springer International Edition, ISBN 3-540-20594-2.

Reference Books

1. Christopher D. Manning, PrabhakarRaghavan and HinrichSchutze"Introduction to Information Retrieval", Cambridge University Press, ISBN 978-0-521-86571-5
2. Mark leven, "Introduction to search engines and web navigation", John Wiley and sons Inc., ISBN 9780-170-52684-2.
3. V. S. Subrahamanian, Satish K. Tripathi "Multimedia information System", Kulwer Academic Publisher.
4. ChabaneDjeraba,"Multimedia mining A highway to intelligent multimedia documents", Kulwer Academic Publisher, ISBN 1-4020-7247-3.
5. Ricci, F, Rokach, L. Shapira, B.Kantor, "Recommender Systems Handbook", First Edition, 2011.
6. Stefan Buttcher, Charles L. A. Clarke, Gordon V. Cormack, Information Retrieval Implementing and Evaluating Search Engines, The MIT Press, Cambridge, Massachusetts London, England, 2010.

List of Practical Assignments

Faculty member should frame 7-8 assignments of sufficient complexity and maintain a record of continuous assessment and should be produced at the time of practical/oral examination

414463 D - ELECTIVE III : IT ENABLED SERVICES

Teaching Scheme:	Examination Scheme:	
Lectures: 3 Hours/Week Practical: 2 Hours /Week	In-Semester Assessment Phase I – 30 Marks	End-Semester Assessment Phase II – 70 Marks

Prerequisites: Information Technology and Project Management, Web Engineering and Technology.

Course Objectives :

1. To understand importance of IT enabled services.
2. To encourage the use of Information Technology so as to enable students to improve their skills, knowledge and job prospects and enable them to obtain employment in sunrise industries.
3. To develop the ability to integrate various resources for optimization in the industry as well as for strategic utilization of IT enabled services and functions.

Course Outcomes :

1. Students will be able to understand the process of IT Industry
2. Students will be able to understand Indian laws of IT industry
3. Student will be able to study current trends and services in IT industry
4. Student will be able to understand programming concept of IT Web services.

UNIT - I BUSINESS STRATEGY: CHALLENGES AND OPPORTUNITIES FOR IT — 6 Hours

Business Strategy: Challenges and Opportunities in the Globalized, Interconnected, Convergent World, Establish Principles before Practice, IT Strategy, Application Strategy, Technology Strategy for IT, IT Management Strategy, Developing IT Strategy for Competitive Advantage, Stages of IT Strategy Development and Implementation, Challenges of IT and Business Strategy Alignment, Inhibitors of Business and IT Strategy Alignment, Three-D Framework for Business and IT Strategy Alignment.

Unit – II STRATEGIC IT PLANNING — 6 Hours

Business Implications for IT Strategic and Planning, Strategic IT Planning Motivations, SITP Process: Prevalent Planning Approaches, Difficulties in Developing and Executing SITP, Best Practices for Achieving Good SITP, SITP Approaches-Prevalent Researches.

UNIT - III ENTERPRISE IT ARCHITECTURE — 6 Hours

Defining EITA, Contents of a Typical Enterprise IT Architecture, Standard for Enterprise IT Architecture, Technology Management strategy Framework, Prevalent Technology Reference Architectures Framework and Standards, Program Management, Benefits of PMO, Desired Qualities of a Program Office Manager, Maturity of PMO, Implementation of PMO Strategy, Measuring PMO Performance, Success Factors for PMO, Project Scope Management, PMO Dashboard and Reporting.

UNIT - IV IT SERVICE MANAGEMENT STRATEGY — 6 Hours

Information Technology Infrastructure Library (ITIL), ITIL Overview, ITIL Service Support Processes, Incident Management, Problem Management, Service Delivery, Service Level Management, Financial Management, Capacity Management, IT Service Continuity Management (ITSCM), Availability Management, Imperatives for Outsourcing, IT Management Layers, Variants of Outsourcing, Business Process Outsourcing, In sourcing.

UNIT – V IT ENABLED WEB SERVICES **6 Hours**

Overview of basic features of PHP: arrays, functions and state management, working with PHP forms, More advanced PHP, OOP's concept in PHP, Portable database supported with different, exception handling, concepts of UDDI, WSDL, SOAP.

UNIT – VI CURRENT TRENDS IN ITES **6 Hours**

Current Employment in the IT and ITES industry: Newly emerging area and requirement of IT enabled service sector. Industry Oriented Human Resource Requirement: Outlook of the IT and ITES Industry. Barriers to Trade in ITES Role of International Bodies (WTO & UNCTAD) in facilitating Trade in ITEST/ITES, experiences and Case studies of ITES-call centers, ERP, google.

Text Books:

1. Sanjiva Shankar Dubey, " IT strategy and Management", PHI.
2. K.Venkatesh, " Marketing of Information Technology",TMH.
3. Steve Suehring, Timconverse, Joyoe Park , "PHP 6 and MySQL Bible", Willey.

Reference Books:

1. Shiro Uesugi, "IT Enabled Services", Springer; 2013 edition, 2013.
2. Sanjiva Shankar Dubey, "IT Services Business Management: Concepts, Processes and Practices", PHI, 2012.
3. Nikhil Treebhoohu, "Promoting IT Enabled Services", Addison-Wesley, 2013.

List of Practical Assignments

1. Create a Dynamic Calendar using PHP functions which allows the user to move the calendar forward or backward by a month at a time using simple XHTML form submit button.
2. Write a program to implement error handling in PHP.
3. Write a program to implement file handling in PHP including different file functions such as fwrite(), fgetss(), fpassthru(), file() etc.
4. Explore and implement WSDL document structure.
5. Write a program to implement WSDL in PHP using request and response operations and its types.
6. Write a program to implement a SOAP web service in PHP using request and response operations.
7. Write a program in Object Oriented PHP such that it will create the number of pages for a web site that will look and behave in same way and those pages should be able to modify to suit the different parts of the site.
8. Study a case study of Internet Banking web site or Indian Call Center for understanding the Architecture, Strategic IT Planning, Business Strategies – Challenges and Opportunities.
9. Study assignment on Information Technology Infrastructure Library (ITIL).

Note:

All the assignments should be conducted on Latest version of Open Source Operating Systems, tools and Multi-core CPU supporting Virtualization and Multi-Threading.

Subject teacher may frame new assignments which will have equivalent the difficulty level.

Text Books:

1. IT strategy and Management by Sanjiva Shankar Dubey, PHI
2. PHP 6 and MySQL Bible,Steve Suehring, Timconverse, Joyoe Park, Willey.
3. PHP and MySQL Web Development by Luke Welling and Laura Thomson, SAMs Publishing.

414463 E - ELECTIVE III : ADVANCED COMPUTER NETWORKS

Teaching Scheme:
Lectures: 3 Hours/Week
Practical: 2 Hours /Week

Examination Scheme:

In-Semester Assessment	End-Semester Assessment
Phase I – 30 Marks	Phase II – 70 Marks
	Term work – 25 Marks
	Oral – 25 Marks

Prerequisites: Fundamentals of Computer Network, Computer Network, Web Technologies.

Course Objectives :

1. To learn fundamental of computer network principles, services and architectures of various networks.
2. To introduce a set of advanced technologies in networking.
3. To learn advanced routing protocols and router architecture.
4. To gain knowledge of QoS and congestion control in end-to-end data transfer.
5. To introduce with a set of advanced Wireless Network standards and research in network.

Course Outcomes :

After successful completion of this course students will be able to:

1. Apply basic principles in designing modern computer networks.
2. Use functionality of high speed networks in development of advanced network applications.
3. Use advanced routing architecture and protocols in networking.
4. Apply performance measures for routing in computer networks.
5. Use advanced wireless standards in designing wireless networks.

UNIT - I FOUNDATION OF COMPUTER NETWORK — 6 Hours

Application, Requirements, Network Architecture, ISO-OSI, TCP-IP, Implementing Network Software, Performance, Perspective on Connecting, Encoding, Framing, Error Detection, Reliable Transmission, Ethernet and Multiple Access Network, Wireless: 802.11a/b, 802.15.1 to 802.15.4, 802.16 (c-d), Cell Phone Technologies, Ad-hoc Networking: Model of operation, DoD Perspective, Internetworking: Switching and Bridging, Basic Internetworking, Routing, Implementation and Performance.

UNIT - II HIGH SPEED NETWORKS AND ADVANCED TECHNOLOGIES — 6 Hours

Frame Relay, ATM: Features, Addressing, Signaling, and Routing, ATM Header Structure, ATM Adaptation Layer, Management and Control, Internetworking with ATM, ISDN: Overview, Interface and function, ISDN layers, ISDN services, BISDN: Need, Functional Architecture, Optical Network: links, WDM system, Optical LANs, Optical paths and networks.

UNIT - III ADVANCED INTERNETWORKING — 6 Hours

Routing Areas, Inter-domain Routing (BGP Version 4), IPv6, Multicast Addresses and Routing Mechanism (DVMRP, PIM, MSDP), Integrated IS-IS, Interior Gateway Routing Protocol (IGRP), Enhanced Interior Gateway Routing Protocol (EIGRP), Routing Among Mobile Devices Mobile IP, Virtual Private Network, VoIP Basics, Router Architectures: Shared CPU Architectures, Shared Forwarding Engine Architectures, Shared Nothing Architectures, Clustered Architectures.

UNIT - IV CONGESTION CONTROL, RESOURCE ALLOCATION AND END-TO-END DATA — 6 Hours

Issues in resource allocation, Queuing Disciplines: First-In, First-Out Queueing, Priority Queueing , Round-Robin and Fair Queueing, Weighted Round-Robin and Weighted Fair Queueing, Deficit Round-Robin Queueing, Modified Deficit Round-Robin Queueing, TCP Congestion Control: Additive

Increase/Multiplicative Increase, Slow Start, Fast Retransmit and Fast Recovery, Congestion Avoidance Mechanisms: DECbit, RED, Source Based Congestion Avoidance, Traffic Policing, Quality of Service: Application Requirements, RSVP, EE, AF. Data Presentation Formatting: Taxonomy, XDR, ASN, NDB, Markup Languages, and Multimedia Data: Lossless Compression Techniques, Images Representation and Compression, Video Compression, Transmitting MPEG over Network, Audio Compression.

UNIT - V QUALITY OF SERVICE ROUTING 6 Hours

QoS attributes, Routing Protocol for QoS Routing, Traffic Engineering, Traffic Engineering Extension to Routing Protocols, Multiprotocol Lable Switching (MPLS), Generalized MPLS, MPLS Virtual Private Networks, and Traffic Engineering of IP/MPLS Networks, VPN Traffic Engineering, and Routing/Traffic Engineering for Voice over MPLS.

UNIT - VI ADVANCED WIRELESS NETWORK STANDARDS 6 Hours

Advanced Wireless LAN Standards: 802.11g, 802.11n, 802.11ac-ax, Difference in between different 802.11 standards, WPAN: High Rate WPAN, Low Rate WPAN, IEEE 802.15.5, IEEE 802.15.6, IEEE 802.15.7, WiMAX: 802.16e to 802.16. 1a, Difference in between different 802.16 standards, Quality of Service in Wireless Networks, Research Trends in Wireless Networks.

Text Books

1. Larry L. Peterson, Bruce S. ,"Computer Networks: A Systems Approach", 4th edition, Davie Publisher: Elsevier/Morgan Kaufmann, ISBN: 13:978-0-12-370548-8; 10:0-12-370548-7.
2. Jean Walrand and Pravin Varniya,"High Performance Communication Networks" second edition Publisher: Morgan Kaufmann Publisher Elsevier ISBN: 1-5580- 574-6 Indian ISBN: 81-8147-652-2.
3. Deepankar Medhi, Karthikeyan Ramasamy, "Network Routing Algorithms, Protocols, and Architectures", Publisher: Morgan Kaufmann Publisher Elsevier ISBN 13: 978-0-12-088588-6.
4. William Stallings, "Wireless Communications & Networks", 3rd Edition, Prentice Hall, ISBN-10: 0131918354.

Reference Books

1. Douglas E. Comer,"Internetworking with TCP/IP Vol -I", 5thEdition Publisher: Prentice Hall.
2. Andrew S. Tanenbaum, "Computer Networks", PHI, Fifth Edition, ISBN: 978-0132-126953.
3. C. Siva Ram Murthy and B. S. Manoj, "Ad Hoc Wireless Networks: Architectures and Protocols" Prentice Hall, 2004

414464 A - ELECTIVE IV : BIO INFORMATICS

Teaching Scheme:
Lectures: 3 Hours/Week

Examination Scheme:

In-Semester Assessment	End-Semester Assessment
Phase I – 30 Marks	Phase II – 70 Marks

Prerequisites : Design and Analysis of Algorithms, Basic Concepts of Data Mining and Machine Learning.

Course Objectives :

1. To introduce students with Synthesis of DNA and RNA, major databases and applications in Bioinformatics along with classification schema.
2. Study of various data visualization and statistical techniques to discover new patterns in protein structure, through Clustering and Classification.
3. Study of various Data Mining and Pattern Matching techniques for knowledge discovery in Bioinformatics Databases through sequence alignment algorithms.
4. Analysis of various simulation tools in Bioinformatics for similarity search and study of prediction algorithms.
5. Study of Protein Structure Modeling and Simulation, drug discovery process.
6. To introduce students with the overview of Systems Biology and Human Disease.

Course Outcomes :

After successful completion of this course student will able to:

1. Understand basic DNA and RNA structure, features and classification schema for databases, applications in Bioinformatics.
2. Use various statistical concepts and visualization tools to discover new patterns in Protein Structures and analyze randomness in data.
3. Explore the various Bioinformatics Databases for knowledge discovery given by Data Mining and Pattern Matching techniques through study of various sequence alignment algorithms.
4. Offer appropriate solutions for similarity search through similarity search and prediction algorithms.
5. Understand modeling and simulation in bioinformatics with the help of simulation and statistical protocols, basic drug discovery process.
6. Gain awareness in field of Systems Biology and Human Disease.

UNIT - I INTRODUCTION **6 Hours**

Introduction, Historical overview, Information Theory and Central Dogma of Molecular Biology, Bioinformatics Applications, Features and Classification Schema of Biological Databases, Protein Structure Classification Databases

UNIT - II DATA VISUALIZATION AND STATISTICS **6 Hours**

Sequence Visualization, Structure visualization, Rendering Tools, Statistical Concepts, Micro arrays, Imperfect Data, Quantifying Randomness, Data Analysis, Tool selection for Statistical Analysis, Statistics of Alignment, Clustering and Classification

UNIT - III DATA MINING AND PATTERN MATCHING **6 Hours**

Methods & Technology Overview, Infrastructure, Pattern Recognition & Discovery, Text Mining & Tools, Sequence alignment-Concept of alignment, Scoring matrices, PAM, BLOSUM, Alignment of pairs of sequences, Alignment algorithms

UNITIV BIOINFORMATICS TOOLS AND ALGORITHMS 6 Hours

Introduction, Heuristic Methods for Sequence Alignment, Working with FASTA, Working with BLAST, FASTA & BLAST Algorithms & Comparison, Introduction to Phylogenetic, Prediction algorithms for Genes and Phylogenetic

UNIT - V PROTEIN STRUCTURE MODELING, SIMULATION AND DRUG DESIGN 6 Hours

Methods for Protein Modeling, Homology or Comparative modeling, Model refinement and Evaluation, Tools for Modeling and Simulation, Drug Discovery Process, Structural Bioinformatics in Drug Discovery, Simulation and Statistical Protocols of Markov Chain and Hidden Markov Model

UNIT - VI RECENT AND FUTURE TRENDS IN BIOINFORMATICS 6 Hours

Systems Biology in Human Health and Disease and Future of Medicine

Text Books

1. S.C.Rastogi, N.Mendiratta, P.Rastogi 'Bioinformatics-Methods & Application Genomics, Proteomics and Drug Discovery', Third Edition, Prentice Hall of India.
2. Bryan Bergeron, 'Bioinformatics Computing', Pearson Education.
3. Zhumur Ghosh, BibekanandMallick, 'Bioinformatics Principles and Applications', Oxford University Press 2008.

Reference Books

1. Orpita Bosu, Simminder Kaur Thukral 'Bioinformatics: Databases, Tools and Algorithms', Oxford press.
2. David W. Mount,'Bioinformatics: Sequence and Genome Analysis.
3. Matej, Oresic, 'A Systems Biology to Study Metabolic Syndrome', Chapter 2, Systems Biology in Human Health and Disease, Springer International Publishing, Switzerland, 2014.
4. http://www.ncbi.nlm.nih.gov/pubmed/21928407.
5. http://www.ias.ac.in/pubs/splpubs/pjubileebook/379.pdf.
3. https://www.systemsbiology.org/sites/default/files/Hood_P4.pdf.

414464 B - ELECTIVE IV : REAL TIME AND EMBEDDED SYSTEMS

Teaching Scheme:	**Examination Scheme:**	
Lectures: 3 Hours/Week	In-Semester Assessment Phase I – 30 Marks	End-Semester Assessment Phase II – 70 Marks

Prerequisites : Processor Architecture and Interfacing

Course Objectives :

1. Understanding embedded system, processor & distributed embedded systems architecture.
2. Understanding Real Time system, Real time task scheduling & Real time operating system.

Course Outcomes :

1. Students should be able to design distributed embedded system for specific example.
2. Students should be able to schedule real time tasks as per the specific requirement.

UNIT - I EMBEDDED ARCHITECTURE — 6 Hours

Embedded Computers, Characteristics of Embedded Computing Applications, Challenges in Embedded Computing system design, Categories of Embedded System, Embedded system design process-Requirements, Specification, Architectural Design, Designing Hardware and Software Components, System Integration, Formalism for System Design-Structural Description, Behavioural Description, Design Example: Model Train Controller

UNIT – II EMBEDDED PROCESSOR AND COMPUTING PLATFORM — 6 Hours

ARM processor-processor and memory organization, Data operations, Flow of Control, SHARC processor-Memory organization, Data operations, Flow of Control, parallelism with instructions, CPU Bus configuration, ARM Bus, SHARC Bus, Memory devices, Input/output devices, Component interfacing, designing with microprocessor development and debugging, Design Example : Alarm Clock.

UNIT - III NETWORKS — 6 Hours

Distributed Embedded Architecture-Hardware and Software Architectures, Networks for embedded systems-I2C, CAN Bus, SHARC link ports, Ethernet, Myrinet, Internet, Network-Based design-Communication Analysis, system performance Analysis, Hardware platform design, Allocation and scheduling, Design Example: Elevator Controller.

UNIT - IV INTRODUCTION TO REAL-TIME SYSTEMS — 6 Hours

Characteristics of Real – Time Systems, Classification of Real – Time Systems, Types of Real-Time tasks – Timing constraints –Real-Time Scheduling: Basic concepts and classification of Algorithms – Clock-Driven Scheduling – Event-Driven Scheduling – Hybrid schedulers – EDF Scheduling – RM Scheduling and its Issues.

UNIT – V RESOURCE SHARING AND DEPENDENCIES AMONG REAL-TIME TASKS — 6 Hours

Resource sharing in Real Time tasks, Priority Inversion, Priority Inheritance Protocol, Highest Locker Protocol, Priority Ceiling Protocol, Handling Task dependencies – Scheduling Real-Time Tasks in Multiprocessor and Distributed Systems – Resource Reclaiming in Multiprocessor RealTime Systems – Fault-Tolerant Task Scheduling in Multiprocessor Real-Time Systems.

UNIT - VI REAL-TIME OPERATING SYSTEM (RTOS) — 6 Hours

Features of RTOS, Commercial Real-Time Operating Systems, Real-Time Databases, Applications, Design issues, Characteristics of Temporal Data, Concurrency control, Commercial Real-Time

Databases.

Text Books

1. Frank Vahid, Tony Givargis Embedded system design: a unified hardware/ software introduction. Wiley publication.
2. C. Siva Ram Murthy and G. Manimaran, “Resource Management in Real-Time Systems and Networks”, Prentice-Hall of India, 2005.

Reference Books

1. Raj Kamal, Embedded systems: Architecture, Programming and design; Tata McGraw Hill
2. Wayne Wolf, Computers as Components: Principles of Embedded Computing System Design, Morgan Kaufman Publishers, 2001.
3. Jane.W.S. Liu Real-Time systems, Pearson Education Asia, 2000.
4. Rajib Mall, “Real-Time Systems Theory and Practice”, Pearson Education, India, 2007.
5. C.M. Krishna, Kang G. Shin, “Real-Time Systems”, ISBN-13: 978-0-07-070115-1, MC GrawHill Education

414464 C - ELECTIVE IV : GREEN IT – PRINCIPLES AND PRACTICES

Teaching Scheme:	Examination Scheme:	
Lectures: 3 Hours/Week	In-Semester Assessment Phase I – 30 Marks	End-Semester Assessment Phase II – 70 Marks

Prerequisites : The course assume no prior knowledge in this area

Course Objectives :

1. To understand what Green IT is and How it can help improve environmental Sustainability
2. To understand the principles and practices of Green IT.
3. To understand how Green IT is adopted or deployed in enterprises.

Course Outcomes :

1. Students will be able to create awareness among stakeholders and promote green agenda and green initiatives in their working environments leading to green movement.
2. This green movement will create new career opportunities for IT professionals, auditors and others with special skills such as energy efficiency, ethical IT assets disposal, carbon footprint estimation, reporting and development of green products, applications and services.

UNIT – I INTRODUCTION — 6 Hours

Environmental Impacts of IT, Holistic Approach to Greening IT, Green IT Standards and Eco-Labelling, Enterprise Green IT Strategy , Green IT: Burden or Opportunity?

Hardware: Life Cycle of a Device or Hardware, Reuse, Recycle and Dispose.

Software: Introduction, Energy-Saving Software Techniques, Evaluating and Measuring Software Impact to Platform Power.

UNIT - II SOFTWARE DEVELOPMENT AND DATA CENTERS — 6 Hours

Sustainable Software, Software Sustainability Attributes, Software Sustainability Metrics, Sustainable Software Methodology, Data Centres and Associated Energy Challenges, Data Centre IT Infrastructure, Data Centre Facility Infrastructure: Implications for Energy Efficiency, IT Infrastructure Management, Green Data Centre Metrics.

UNIT - III DATA STORAGE AND COMMUNICATION — 6 Hours

Storage Media Power Characteristics, Energy Management Techniques for Hard Disks, System-Level Energy Management, Objectives of Green Network Protocols, Green Network Protocols and Standards.

UNIT - IV INFORMATION SYSTEMS, GREEN IT STRATEGY AND METRICS — 6 Hours

Approaching Green IT Strategies, Business Drivers of Green IT Strategy, Business Dimensions for Green IT Transformation, Multilevel Sustainable Information, Sustainability Hierarchy Models, Product Level Information, Individual Level Information, Functional Level Information, Organizational Level Information, Regional/City Level Information, Measuring the Maturity of Sustainable ICT.

UNIT - V GREEN IT SERVICES AND ROLES — 6 Hours

Factors Driving the Development of Sustainable IT, Sustainable IT Services (SITS), SITS Strategic Framework, Sustainable IT Roadmap, Organizational and Enterprise Greening, Information Systems in Greening Enterprises, Greening the Enterprise: IT Usage and Hardware, Inter-organizational Enterprise Activities and Green Issues, Enablers and Making the Case for IT and the Green Enterprise.

UNIT – VI MANAGING AND REGULATING GREEN IT **6 Hours**

Strategizing Green Initiatives, Implementation of Green IT, Information Assurance, Communication and Social Media, The Regulatory Environment and IT Manufacturers, Nonregulatory Government Initiatives, Industry Associations and Standards Bodies, Green Building Standards, Green Data Centres, Social Movements and Greenpeace.

Text Book

1. San Murugesan, G. R. Gangadharan: Harnessing Green IT,WILEY 1st Edition-2013

414464 D - ELECTIVE IV : INTERNET OF THINGS

Teaching Scheme:	**Examination Scheme:**	
Lectures: 3 Hours/Week	In-Semester Assessment Phase I – 30 Marks	End-Semester Assessment Phase II – 70 Marks

Prerequisites : Fundamentals of Computer Network, Computer Network

Course Objectives :

1. To understand what Internet of Things is.
2. To get basic knowledge of RFID Technology, Sensor Technology and Satellite Technology.
3. To make students aware of resource management and security issues in Internet of Things.

Course Outcomes :

At the end of this course, students will be able to:

1. Explain what Internet of Thins is.
2. Describe key technologies in Internet of Things.
3. Understand wireless sensor network architecture and its framework along with WSN applications.
4. Explain resource management in the Internet of Things.
5. Understand business models for the Internet of Things.

UNIT - I INTRODUCTION **6 Hours**

What is the Internet of Things? : History of IoT, About IoT, Overview and Motivations, Examples of Applications, Internet of Things Definitions and Frameworks : IoT Definitions, IoT Architecture, General Observations, ITU-T Views, Working Definition, IoT Frameworks, Basic Nodal Capabilities

UNIT - II FUNDAMENTAL IoT MECHANISMS AND KEY TECHNOLOGIES **6 Hours**

Identification of IoT Objects and Services, Structural Aspects of the IoT, Environment Characteristics, Traffic Characteristics, Scalability, Interoperability, Security and Privacy, Open Architecture, Key IoT Technologies, Device Intelligence, Communication Capabilities, Mobility Support, Device Power, Sensor Technology, RFID Technology, Satellite Technology,

UNIT - III RADIO FREQUENCY IDENTIFICATION TECHNOLOGY **6 Hours**

RFID: Introduction, Principle of RFID, Components of an RFID system, Issues

EPCGlobal Architecture Framework: EPCIS & ONS, Design issues, Technological challenges, Security challenges, IP for IoT, Web of Things.

Wireless Sensor Networks: History and context, WSN Architecture, the node, Connecting nodes, Networking Nodes, Securing Communication

WSN specific IoT applications, challenges: Security, QoS, Configuration, Various integration approaches, Data link layer protocols, routing protocols and infrastructure establishment.

UNIT - IV RESOURCE MANAGEMENT IN THE INTERNET OF THINGS **6 Hours**

Clustering, Software Agents, Clustering Principles in an Internet of ThingsArchitecture, Design Guidelines, and Software Agents for Object Representation, Data Synchronization.

Identity portrayal, Identity management, various identity management models: Local, Network, Federated and global web identity, user-centric identity management, device centric identity management and hybrid-identity management, Identity and trust.

UNIT - V INTERNET OF THINGS PRIVACY, SECURITY AND GOVERNANCE 6 Hours

Vulnerabilities of IoT, Security requirements, Threat analysis, Use cases and misuse cases, IoT security tomography and layered attacker model, Identity establishment, Access control, Message integrity, Non-repudiation and availability, Security model for IoT.

UNIT - VI BUSINESS MODELS FOR THE INTERNET OF THINGS 6 Hours

Business Models and Business Model Innovation, Value Creation in the Internet of Things, Business Model Scenarios for the Internet of Things.

Internet of Things Application : Smart Metering Advanced Metering Infrastructure, e-Health Body Area Networks, City Automation, Automotive Applications, Home Automation, Smart Cards,

Text Books

1. Daniel Minoli, "Building the Internet of Things with IPv6 and MIPv6: The Evolving World of M2M Communications", ISBN: 978-1-118-47347-4, Willy Publications
2. Bernd Scholz-Reiter, Florian Michahelles, "Architecting the Internet of Things", ISBN 978-3-642-19156-5 e-ISBN 978-3-642-19157-2, Springer
3. Parikshit N. Mahalle& Poonam N. Railkar, "Identity Management for Internet of Things", River Publishers, ISBN: 978-87-93102-90-3 (Hard Copy), 978-87-93102-91-0 (ebook).

Reference Books

1. Hakima Chaouchi, " The Internet of Things Connecting Objects to the Web" ISBN : 978-1-84821-140-7, Willy Publications
2. Olivier Hersent, David Boswarthick, Omar Elloumi, The Internet of Things: Key Applications and Protocols, ISBN: 978-1-119-99435-0, 2nd Edition, Willy Publications
3. Daniel Kellmereit, Daniel Obodovski, "The Silent Intelligence: The Internet of Things",. Publisher: Lightning Source Inc; 1 edition (15 April 2014). ISBN-10: 0989973700, ISBN-13: 978-0989973700.
4. Fang Zhaho, Leonidas Guibas, "Wireless Sensor Network: An information processing approach", Elsevier, ISBN: 978-81-8147-642-5.

414464 E - ELECTIVE IV : OPEN ELECTIVE

In this subject, a student can opt for a subject from other branch of engineering (preferably *Computer Engineering* and *Electronics & Telecommunication*). An institution may design the syllabus of a subject in consultation with a software company/industry. This syllabus will be approved by the University authorities and then students can opt for the same as an open elective.

414465 : SOFTWARE LABORATORY – V

Teaching Scheme:
Practical : 2 Hours/Week

Examination Scheme:
Term Work : 25 Marks
Practical : 25 Marks

Prerequisites: Operating System, Computer Networks and Web Engineering and Technology.

Course Objectives :

1. To understand the fundamentals of distributed environment in complex application.
2. To get comprehensive knowledge of the architecture of distributed systems.
3. To make students aware about security issues and protection mechanism for distributed environment.

Course Outcomes :

After completion of the subject, the students will be able to:

1. Understand the principles on which the internet and other distributed systems are based.
2. Understand and apply the basic theoretical concepts and algorithms of distributed systems in problem solving.

Contents

1. Design a distributed application using RMI for remote computation where client submits two strings to the server and server returns the concatenation of the given strings.
2. Design a distributed application using RPC for remote computation where client submits an integer value to the server and server calculates factorial and returns the result to the client program.
3. Design a distributed application using Message Passing Interface (MPI) for remote computation where client submits a string to the server and server returns the reverse of it to the client.
4. Design a distributed application which consist of a server and client using threads.
5. Design a distributed application which consists of an agent program that program travels in the network and performs a given task on the targeted machine. You may assign any task to the agent e.g. to carry out the existing file opening and reading number of vowels present in that file.
6. Design a distributed application using MapReduce which processes a log file of a system. List out the users who have logged for maximum period on the system. Use simple log file from the Internet and process it using a pseudo distribution mode on Hadoop platform.
7. Design and develop a distributed application to find the coolest/hottest year from the available weather data. Use weather data from the Internet and process it using MapReduce.
8. Design and develop a distributed Hotel booking application using Java RMI.

   A distributed hotel booking system consists of the hotel server and the client machines. The server manages hotel rooms booking information. A customer can invoke the following operations at his machine

   i) Book the room for the specific guest
   ii) Cancel the booking of a guest

1. Enquire the check in date for the specified customer/guest.

Term work:

Staff in-charge will suitably frame the above assignments and flexibility may be incorporated. Students will submit term work in the form of journal. Each assignment has to be well documented with problem definition, code documented with comments. Staff in-charge will assess the assignments continuously and grade or mark each assignment on completion date.

All the assignments should be conducted on Latest version of Open Source Operating Systems, tools and Multi-core CPU supporting Virtualization and Multi-Threading.

Reference Books

1. George Coulouris, Jean Dollimore, Tim Kindberg, & Gordon Blair, "Distributed Systems – Concept and Design", 5th Edition, Publisher: Pearson, ISBN – 978-13-214301-1.
2. Randay Chow, Theodore Johnson, "Distributed Operating System and Algorithm Analysis", Publisher: Pearson (LPE). ISBN – 978-81-317-2859-8.

414466 : SOFTWARE LABORATORY – VI

Teaching Scheme:
Practical : 4 Hours/Week

Examination Scheme:
Practical : 50 Marks Oral : 50 Marks

Prerequisites : Database Management System

Course Objectives :

1. To learn and understand Database Modeling, Architectures.
2. To learn and understand Advanced Database Programming Frameworks.
3. To learn and understand web database language, XML, JDOQL.
4. To learn NoSQL Databases (Open source) such as Hive/ Hbase/ Cassendra/DynamoDB.

Course Outcomes :

1. Understanding of Advanced Database Programming Languages.
2. Master the basics of web and object oriented database languages and construct queries using XML and JDOQL.
3. Master the basic concepts of NoSQL Databases.
4. Understand how analytics and big data affect various functions now and in the future.
5. Appreciate the impact of analytics and big data on the information industry and the external ecosystem for analytical and data services.

Contents

1. Study and Configure Hadoop for Big Data
2. Study of NoSQL Databases such as Hive/Hbase/Cassendra/DynamoDB
3. Design Data Model using NoSQL Databases such as Hive/Hbase/Cassendra/DynamoDB
4. Implement any one Partitioning technique in Parallel Databases
5. Implement Two Phase commit protocol in Distributed Databases
6. Design Persistent Objects using JDO and implement min 10 queries on objects using JDOQL in ObjectDB NOSQL DATABASE
7. Create XML, XML schemas , DTD for any database application and implement min 10 queries using XQuery FLOWR expression and XPath
8. Design database schemas and implement min 10 queries using Hive/ Hbase/ Cassendra column based databases
9. Design database schemas and implement min 10 queries using DynamoDBkeyValue based databases
10. Implement Web Page ranking algorithm
11. Implement any one machine learning algorithm for classification / clustering task in BIG data Analytics
12. Design and Implement social web mining application using NoSQL databases, machine learning algorithm, Hadoop and Java/.Net

Instructor should maintain progress report of mini project throughout the semester from project group and assign marks as a part of the term work

Instructor should frame Practical Assignments based on above mentioned list of assignments. Submission of each Practical Assignment should be in the form of handwritten write-ups/ printout of

source code and output. Instructor should assign an assignment no. 12 to a group of 3 - 4 students Practical Examination will be based on the all topics covered and questions will be asked to judge understanding of practical performed at the time of practical examination
Group of students should submit the Report for assignment no. 12 which will be consist of Title of the Project, Abstract, Introduction, scope, Requirements, Data Modeling , Database design, Algorithms, Graphical User Interface, Source Code, Testing document, Conclusion.

All the assignments should be conducted on Latest version of Open Source Operating Systems, tools and Multi-core CPU supporting Virtualization and Multi-Threading.

Reference Books

1. http://nosql-database.org/
2. Hadoop, O'Reilly Publications.
3. Silberschatz A., Korth H., Sudarshan S., "Database System Concepts", 6thEdition, McGraw Hill Publishers, ISBN 0-07-120413-X.
4. http://www.objectdb.com/database/jdo
5. Data Mining: Concepts and Techniques by Jiawei Han, MichelineKamber, Jian Pei, Elsevier.

414467 : PROJECT WORK

Teaching Scheme:
Tutorial : 6 Hours/Week

Examination Scheme:
Term work : 50 Marks Oral : 100 Marks

Prerequisites :BE-Project Phase I – Semester I, Project Based Seminar

Course Objectives :

1. To expose students to product development cycle using industrial experience, use of state of art technologies.
2. To encourage and expose students for participation in National/International paper presentation activities and funding agency for sponsored projects.
3. Exposure to Learning and knowledge access techniques using Conferences, Journal papers and anticipation in research activities.

Contents

Reviews3: Based on Implementation (50% implementation expected)

Reviews4: Complete Project and Testing

Project Exhibition: All TE students must see all the projects in the exhibition

The group will submit at the end of semester II.

a) The Workable project.
b) Project report (in Latex/Lyx/latest Word) in the form of bound journal complete in all respect – 1 copy for the Institute, 1 copy for guide and 1 copy of each student in the group for certification.

The project report contains the details.

1. Problem definition
2. Requirement specification
3. System design details (UML diagrams)
4. System implementation – code documentation – dataflow diagrams/ algorithm, protocols used.
5. Test result and procedure – test report as per ATP.
6. Conclusions.
7. Appendix
    a. Tools used
    b. References
    c. Papers published/certificates

Plagiarism Report of paper and project report from any open source tool

One paper should be published in reputed International conference/International journal

Department of

First Year B.Tech.

F.Y.B.Tech Course Book

(2016 Pattern)

(With effect from June 2016)

Department of
First Year B.Tech.

Under Graduate (UG) Course Book

F.Y. B.Tech. (Common)

Semester I /II

INDEX

About First Year Department

- Department provides a common platform to all branches students by imparting fundamental knowledge
- Involvement of Experts from IITs, NITs, Govt. Colleges, Reputed Industries, Alumni and Students in development of curriculum
- Choice Based Credit System (CBCS)
- General Proficiency - Foreign Language (German, French, Japanese and Spanish)
- Remedial Teaching
- Sponsorship for Publications and IPR
- Research Mentorship
- Industry Internship
- Provision of Credit Transfer Scheme (CTS)
- Peer Teaching Scheme
- Teacher Guardian Scheme (TGS)
- Various Clubs and Hobby Modules
- Emphasis on English Communication
- Activity based learning

INSTITUTE VISION AND MISSION

VISION

To achieve excellent standards of quality education by keeping pace with rapidly changing technologies and to create technical manpower of global standards with capabilities of accepting new challenges.

MISSION

Our efforts are dedicated to impart quality and value based education to raise satisfaction level of all stake holders. Our strength is directed to create competent professionals. Our endeavor is to provide all possible support to promote research and development activities.

DEPARTMENT VISION AND MISSION

DEPARTMENT VISION

To achieve excellent standard of quality education through effective teaching and learning process and to create technical manpower with capabilities of global standards.

DEPARTMENT MISSION

To impart quality and value education by providing high standard technical knowledge to create competent professionals.
To inculcate research amongst students and faculties.

Program outcomes

Engineering Graduate will be able to:

PO1	**Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO2	**Identify**, formulate, review research literature, and analyse complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences
PO3	**Design/development of solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
PO4	**Conduct investigations of complex problems**: Use research-based knowledge and research methods including design of experiments, analysis, and interpretation of data, and synthesis of the information to provide valid conclusions.
PO5	**Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.
PO6	**The engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
PO7	**Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and a need for sustainable development.
PO8	**Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO9	**Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO10	**Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions
PO11	**Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
PO12	**Life-long learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

First Year B.Tech Structure & Evaluation Scheme

Semester - I														
S N	Subject Code	Subject Name	Teaching				Credits	Evaluation Scheme (Marks)						ESE Duration (Hrs)
								Theory			Practical		Total	
			Lect.	Tut.	Pract.	Total		TAE	CAE	ESE	Cont. Assessment	Ext		
1	BEML101	Engineering Mathematics-I	3	1	–	4	4	20	20	60	–	–	100	3
2	BPHL102 BPHP102 / BCHL103 BCHP103	Engineering Physics/Engineering Chemistry	4	1	2	7	6	20	20	60	25	25	150	3
3	BITL104 BITP104 / BECL105 BECP105	Programming in C / Basic Electronics Engineering	2	–	2	4	3	10	10	30	25	25	100	2
4	BEEL106 BEEP106 / BCEL107 BCEP107	Basic Electrical Engineering /Engineering Mechanics	3	1	2	6	5	20	20	60	25	25	150	3
5	BMEL108 BMEP108/ BHUL113, BMEP111, BFYP112	Basic Mechanical and Engineering Graphics/ Communication Skills, Workshop, Mini modeling	2	–	2	4	3	20	20	60	25	25	150	3
6	BHUP109 / BIDL101	Environmental Studies and Professional Ethics / Bio System in Engineering	2	–	–	2	Audit Course	–	–	–	–	–	–	–
Total			16	3	8	27	21	90	90	270	100	100	650	14

First Year B.Tech Structure & Evaluation Scheme

Semester - II															
S N	Subject Code	Subject Name	Teaching				Credits	Evaluation Scheme (Marks)						ESE Duration (Hrs)
			Lect.	Tut.	Pract.	Total		Theory			Practical		Total	
								TAE	CAE	ESE	Cont. Assessment	Ext		
1	BEML110	Engineering Mathematics-II	3	1	_	4	4	20	20	60	_	_	100	3
2	BPHL102 BPHP102 /BCHL103 BCHP103	Engineering Physics/ Engineering Chemistry	4	1	2	7	6	20	20	60	25	25	150	3
3	BITL104 BITP104 /BECL105 BECP105	Programming in C / Basic Electronics Engineering	2	_	2	4	3	10	10	30	25	25	100	2
4	BEEL106 BEEP106 /BCEL107 BCEP107	Basic Electrical Engineering / Engineering Mechanics	3	1	2	6	5	20	20	60	25	25	150	3
5	BMEP111	Workshop	_	_	2	2	1	_	_	_	50	_	50	_
6	BFYP112	Mini Modeling	_	_	2	2	1	_	_	_	50	_	50	_
7	BMEL108 BMEP108 /BHUL113 & BMEP111	Basic Mechanical and Engineering Graphics/ Communication Skills	2	_	_	2	2	10	10	30	_	_	50	2
8	BHUP109 / BIDL101	Environmental Studies and Professional Ethics / Bio System in Engineering	2	_	_	2	Audit Course	_	_	_	_	_	_	_
Total			16	3	10	29	22	80	80	240	175	75	650	13

Department of First Year B.Tech.

Detailed Syllabus

F. Y. B. Tech

Semester I/II

BEML101: Engineering Mathematics - I

Teaching Scheme	Examination Scheme (Theory)	Examination Scheme(Lab)
Lectures: 3 Hrs/Week	**Teachers Assessment Exam:** 20 Marks	**Internal(TW):** ---
Tutorials: 1 Hr/Week	**Class Assessment Exam:** 20 Marks	**External(PR) :**Nil
	End Semester Exam: 60 Marks	**External(OR) :** Nil
Credit	**4**	**-----**

Prerequisite: 12th Science Basics

Course Objective : After completing this course student will able

1. To understand system of linear equations arising in all engineering fields using matrix methods where knowledge of Eigen values and Eigen vectors are essential.
2. To introduce Successive Differentiation and its application in the field of Engineering.
3. To understand concept of convergence of sequences and series with applications to modeling of realistic problems
4. To understand concept of sphere, Cone and Cylinder that arise in vector calculus, electro-magnetic field theory, CAD-CAM, computer graphics etc.

Course Outcome:

1. It will be possible to express the physical problems in to mathematical formulation and to find the proper solutions and apply concepts of matrices and its application for solving engineering problems.
2. Able to find solution of linear algebraic equations with consistency and inconsistency.
3. Able to find the limits and continuity of functions of multiple variables and finding nth derivative by various methods.
4. Able to find the convergence, divergence and range of convergence of various series.
5. Able to find Reduction formulae of various functions and its applications.
6. Able to calculate Cartesian, spherical, polar co-ordinate system as well as equation of sphere, cone, cylinder with guiding curve.

Course Contents **Hrs**

Unit – I : Matrices 6

Basics of Matrix, Rank of Matrix, Reduction methods Normal form, Row Echelon form and PAQ form, System of Linear algebraic equations , homogeneous and Non-homogeneous equations with consistency and inconsistency.

Unit – II : Linear Algebra 6

Linear dependence and independence of vectors, Linear and Orthogonal Transformation, Eigen values, Eigen vectors (Symmetric and Non Symmetric Matrices), Cayley-Hamilton theorem.

Unit –III: Differential Calculus and Expansion of Functions 8

Successive Differentiation, Finding Nth Derivative by standard function, trigonometrical transformation, Partial fraction method. Leibnitz's Theorem. Indeterminate Forms, L' Hospital's Rule, Taylor's Series and Maclaurine's series with standard expansion, differentiation and Integration, use of substitution.

Unit – IV : Infinite Series 6

Infinite Sequences, Infinite Series, Alternating Series, Tests for Convergence by Cauchy's nth root test, p test, comparison test, D'Alemberts Ratio test, Raabe's test, Leibnitz test, Absolute and Conditional Convergence, Range of Convergence.

Unit – V : Integral Calculus 8

Reduction Formulae, Beta and Gamma functions, Differentiation Under Integral Sign, Error Functions.

Unit – VI : Solid Geometry 8

Cartesian, Spherical, Polar and Cylindrical Co-ordinate Systems. Sphere, Cone and Cylinder

Tutorials

1. Basics & Problem solving of rank, LD & LI, Normal form.
2. Problem solving of Eigen values, Eigen vectors, Cayley-Hamilton theorem.
3. Leibnitz Theorem, Indeterminate forms.
4. Infinite Series, Taylor's & Maclaurine's Series.
5. Examples on Reduction Formulae, Beta & Gamma functions.
6. Examples on Right Circular Cone & Cylinder.

Text Books:

1. "Higher Engineering Mathematics", B.S. Grewal, Khanna Publishers.
2. Applied Mathematics (Volumes I and II) by P. N. Wartikar & J. N. Wartikar (Pune Vidyarthi Griha Prakashan, Pune)
3. Higher Engineering Mathematics by B.V. Ramana (Tata McGraw-Hill).

Reference Books:

1. Advanced Engineering Mathematics, 7e, by Peter V. O'Neil (Thomson Learning).
2. *Advance Engineering Mathematics* Erawin Kreyszig, Wiley India Pvt. Ltd New Delhi.
3. Advanced Engineering Mathematics, 2e, by M. D. Greenberg (Pearson Education).

Web Links:

- **Matrices:**
  https://www.youtube.com/watch?v=mYVbYBZZdW0
  https://www.youtube.com/watch?v=hbk01uhgsos
- ***Eigen value & Eigen Vectors***
  https://www.youtube.com/watch?v=XM4GU8hPoZs
  https://www.youtube.com/watch?v=P2pL5VThrzQ
- **Successive differentiation**
  https://www.youtube.com/watch?v=zWURS768QrA
- ***Leibnitz thm:***
  https://www.youtube.com/watch?v=67uJGwsZz-Q
- **Indeterminate forms:**
  https://www.youtube.com/watch?v=PNTnmH6jsRI
- **Infinite Series**
  http://ocw.mit.edu/courses/mathematics/18-01-single-variable-calculus-fall-2006/video- lectures/lecture-37-infinite-series/
  https://www.youtube.com/watch?v=qNZxf0j41tw
- **Gamma function:**
  www.youtube.com/watch?v=Vc8dIykQRhy
  www.youtube.com/watch?v=SYfLj-koGJO
- **DUIS:**
  www.youtube.com/watch?v=NpXWv2jR4nC

BEML110: Engineering Mathematics – II

Teaching Scheme	**Examination Scheme (Theory)**	**Examination Scheme(Lab)**
Lectures: 3 Hrs/Week	**Teachers Assessment Exam:** 20 Marks	**Internal(TW):** Nil
Tutorials: 1 Hr/Week	**Class Assessment Exam:** 20 Marks	**External(PR) :**Nil
	End Semester Exam: 60 Marks	**External(OR) :** Nil
Credit	**4**	**-------**

Course Objective : After completing this course student will able

1. To analyze and solve first order differential equations

2. To aware of the applications of first order differential equations and modeling of various physical systems such as Newton's Law of cooling and simple electrical circuits.
3. To design and analysis of continuous and discrete system where the knowledge of Fourier series and Harmonic analysis required.
4. To understand multiple integration.
5. To understand concept of Partial Differential Equation in Engineering Applications such as Electric circuit, Heat transfer etc.
6. To understand Stationary Values of functions (Maxima and Minima), arising in optimization problems.

Course Outcome:

1. To compute solutions for first order ordinary differential equations using different analytic techniques and able to model and solve various simple real world phenomenon governed by ordinary differential equations of first order.
2. Able to understand application of differential equation.
3. Able to trace the curve and use multiple integral to formulate various engineering problems and find its area and volume.
4. Students are able to find maxima & minima, critical points, points of inflection, Errors and Approximations.
5. It will help to develop analytical skills to provide solution to the simple engineering problems.
6. Apply the fundamentals of mathematics in various branches of engineering.

Course Contents	Hrs
Unit – I :Differential Equations	6
Definition, Order and Degree of DE, Formation of DE. Solutions of Variable separable, Homogeneous DE, Exact DE (without Integrating Factor method), Linear DE and reducible to these types.	
Unit – II :Applications of Differential Equations	6
Applications of DE to orthogonal trajectories, Rate of decay of radioactive materials, Newton's Law of Cooling, Kirchhoff's Law of Electrical Circuits, Simple harmonic motion, One–Dimensional Conduction of Heat.	
Unit – III : Fourier series	8
Definition, Dirichlet's conditions, Full Range Fourier Series, Half Range Fourier Series, Harmonic Analysis and Applications to Problems in Engineering.	
Unit – IV : Multiple Integral & Applications	8

Basics of Curve Tracing, Double Integration, triple integration, Applications to Area , Volume.

Unit – V : Partial Differential Equation 8

Partial derivatives of composite function, variable to be treated as constants, Euler's theorem on homogeneous functions of two & three variables, Implicit functions, Total Derivatives.

Unit – VI : Application of Partial Differential Equation 6

Jacobians and their applications, Errors and Approximations, Maxima and Minima of Functions of two variables, Lagrange's Method of undetermined multipliers.

Tutorials

1. Basics & Problem solving of Differential Equations.
2. Problem solving of Newton's Law of Cooling, Electrical Circuits, Conduction of Heat.
3. Examples on Fourier series.
4. Examples on Multiple Integral & Applications
5. Examples on Partial differential equations.
6. Examples on Error & Approximations, Maxima & Minima.

Text Books:

1) Higher Engineering Mathematics by B. S. Grewal (Khanna Publication, Delhi).
2) Higher Engineering Mathematics by B.V. Ramana (Tata McGraw-Hill).
3) Applied Mathematics (Volumes I and II) by P. N. Wartikar & J. N. Wartikar (Pune Vidyarthi Griha Prakashan, Pune)

Reference Books:

1) Advanced Engineering Mathematics by Erwin Kreyszig, Volume I & II (Wiley Eastern Ltd)
2) Advanced Engineering Mathematics, 7e, by Peter V. O'Neil (Thomson Learning).
3) Advanced Engineering Mathematics, Wylie C.R. & Barrett L.C. (McGraw-Hill, Inc.)

Weblink:

- **Ordinary Differential Equations:**
  www.youtube.com/watch?v=P7gVp333B6M
- **Linear Differential Equations:**
  www.youtube.com/watch?v=1FnBPmEWpus
- **Fourier series:**

www.youtube.com/watch?v=3bXH7AkIV6C

www.imperial.ac.uk/worksspace/mathematics/Public

- **Multiple Integral:**

  http://freevideolectures.com/Course/2267/Mathematics-I/28#

  http://www.learnerstv.com/video/Free-video-Lecture-1823-Maths.htm

- **Partial Differential Equations:**

  http://nptel.ac.in/courses/111103021/

  https://www.youtube.com/watch?v=PTvvoVLzVCE

BPHL102: Engineering Physics

Teaching Scheme	**Examination Scheme (Theory)**	**Examination Scheme(Lab)**
Lectures: 4 Hrs/Week	**Teachers Assessment Exam:** 20 Marks	**Internal(TW):** 25 Marks
Tutorials: 1 Hr/Week	**Class Assessment Exam:** 20 Marks	**External(PR) :** 25 Marks
Practical: 2 Hrs/Week	**End Semester Exam:** 60 Marks	**External(OR) :** Nil
Credit	**5**	**1**

Prerequisite : Class XII Knowledge on the course

Course Objective:

1. To understand fundamental principles of Engineering physics specifically concern to electron optics and quantum physics and their engineering applications.
2. To use various techniques for measurement, calculation, control and analysis of engineering problems based on the principles of Electron Optics, Ultrasonic, Acoustics, Laser, Band theory of solids, Quantum Mechanics, Superconductivity, and Nanophysics
3. To provides the basic ideas and gives the solution for developing mathematical and analytical abilities with higher precision.

Course Outcome: At the end of the course student will be able to

1. Solve the problems related to the applications of uniform & non uniform electric and magnetic fields and its use related devices for engineering applications.
2. Understand the nature and characterization of acoustics and its applications.
3. Demonstrate the knowledge of semiconductors and their applications.
4. Apply the concepts of light in optical fibers, light wave communication systems, and holography and for sensing physical parameters
5. Apply knowledge of physics in mechanics, wave properties, properties of matter and to solve simple qualitative and quantitative problems

6. Apply the concepts of physics in various branches of engineering

Course Contents	Hrs
Unit – I : Electron Ballistics	
Motion of charges in uniform electric and magnetic fields; Electron optics: Bethe's law; Electrostatic and magneto static focusing; Devices: CRT, CRO and Cyclotron	8
Unit – II : Ultrasonics & Acoustics of Building	
Ultrasonics: Introduction, Production of ultrasonics waves, Magnetostriction and Piezo electric method, Detection of ultrasonics waves, Applications Acoustics of Building: Basic requirement of acoustically good hall, Reverberation, Sabine formula for reverberation, factors affecting the architectural acoustics and their remedy.	8
Unit – III : Lasers and Holography	
Introduction, Absorption and Emission of Radiation, Characteristics of Laser light, Pumping Scheme, Population Inversion, metastable state, Types of Laser i) two level – semiconductor laser, ii)three level l – Ruby laser, iii)four level – He:Ne laser Applications of Lasers – Holography, Recording and Reconstruction of Image, Applications of Holography, Optical Fiber communication system	8
Unit – IV : Band Theory of Solids	
Introduction, Distinction between Insulators, Semiconductors and Conductors, Intrinsic Semiconductor, Extrinsic Semiconductor, Hall Effect, Fermi Distribution Function, Fermi level in Intrinsic and Extrinsic Semiconductors, band structure of PN junction diode under i) zero bias, ii) forward bias, iii) reverse bias, Working of transistor (NPN only) on the basis of band diagram, photovoltaic effect, working of solar cell on the basis of band diagram and its applications.	9
Unit – V : Quantum Mechanics	
Introduction, Wave particle duality, de Broglie waves, Phase and Group velocities, Heisenberg Uncertainty Principle, Wave function and its Physical Significance, Time Independent and Time dependent Schrodinger Equation, Applications of Schrodinger Equation (infinite potential well – with derivation of energy and wave function), Tunneling through potential barrier, Applications of Tunnel Effect.	9
Unit – VI : Advanced Trends in Physics	6

BPHL102: Engineering Physics

Part A: List of Practical (Any Six)

1. Application of Velocity filter using CRT: To determine e/m by Thomson's method.
2. Study of Lissajou's Figure using CRO
3. Ultrasonic interferometer for the determination of compressibility of liquid
4. Determination of band gap of a given semiconductor
5. Characteristics of Solar cell and Calculation of fill factor
6. Determination of thickness of wire using LASER.
7. Determination wavelength of Laser using Diffraction Grating.
8. Determination of electrical resistivity of semiconductor by using four probe method.

Part B:Mini Project Modeling

Every Students has to performed mini project in a group based on curriculum courses

Instructions to Student:

1. Maximum Three Students are permissible in each group
2. Project must be based on the contents of syllabus of subject.
3. Project report has to be prepared and attach in practical file individually.

Text Books:

1. Engineering Physics, Hitendra K. Malik & A. K. Singh, Tata McGraw Hill, New Delhi, 2010
2. Engineering Physics, Avadhanulu, Kshirsagar, S. Chand Publications
3. Engineering Physics, Guar, Gupta, Dhanpat Rai and Sons Publications

Reference Books:

1. Fundamentals of Physics, Resnick and Halliday, John Wiley and Sons.
2. Lectures on Physics, Volume 1, 2 and 3 by Richard P. Feynman, Narosa Publisers /
3. Pearson Education.
4. Laser and Non-Linear Optics, B. B. Laud (Oscar publication)

Web Links:

1. https://www.youtube.com/watch?v=Lcy3f3QkTIw (Electron Ballistics)
2. http://www.nptel.ac.in/courses/122107035/6 (Acoustics)
3. https://www.youtube.com/watch?v=HFvPzXr7rxU (Nanophysics)
4. https://www.youtube.com/watch?v=knVD1AfiozA (Fermi energy & Fermi level)
5. https://www.youtube.com/watch?v=T8WCr5axQXM (Energy Bands)
6. https://www.youtube.com/watch?v=GglT1RoBPzg (Superconductivity)

BCHP103: Engineering Chemistry

Teaching Scheme:	Examination Scheme (Theory)	Examination Scheme(Lab)
Lectures: 4Hrs/Week	**Teachers Assessment Exam:** 20 Marks	**Internal(TW):** 25 Marks
Tutorials:1 Hr/Week	**Class Assessment Exam :** 20 Marks	**External(PR) :**25 Marks
Practical: 2Hrs/Week	**End Semester Exam:** 60 Marks	**External(OR) :**Nil
Credit	**5**	**1**

Prerequisite : 12th Standard Curriculum

Course Objective:

1. Technology involved in improving quality of water for its industrial use.
2. The basic concept of Electro analytical techniques that facilitate rapid and reliable measurements.
3. Chemical structure of Polymers and its effect on various properties when used as engineering materials.
4. Study of Fossil fuel and derived fuels with its properties and applications.
5. The principles of chemical and electrochemical reactions causing corrosion and methods used for minimizing.
6. An insight in to Nano materials and advance materials aspect of modern chemistry.

Course Outcome:

1. To apply the knowledge of basic science in engineering and technology and also understand the concept of applied chemistry and analyze it with experiments.
2. The broad education necessary to understand the impact of engineering solutions in global, economic and in environmental context.
3. An ability to design and conduct experiments as well as to organize, analyze and interpret data.
4. An ability to use the techniques, skills and modern engineering tools necessary for engineering practice.
5. To apply the knowledge of advance engineering materials for varied engineering applications.
6. The significance of teaching the aforementioned course is realized in both research, and development of innovative technologies by the student's successful participation in various basic level research oriented programs, and competitions, both at the national and international levels..

Course Contents	Hrs
Unit – I : Water technology and Green chemistry	8

Impurities in water. Hardness of water &its determination by EDTA method. Alkalinity of water and its determination and Numerical on alkalinity and hardness. Ill effects of hard water in boilers. Boiler feed water treatment -1) Internal treatment-calgon and phosphate conditioning, 2) External treatment- a) Zeolite process & its numerical b) Ion exchange method. Desalination of brackish water/Purification of water by Reverse osmosis and Electro dialysis.

Green Chemistry: Introduction, Twelve Principles of green Chemistry Major uses- traditional and green path ways of synthesis of adipic acid, indigo dye.

Unit – II : Electro analytical techniques

Type of reference electrode (calomel electrode), indicator electrode (glass electrode), Ion selective electrode, Half-cell reaction and complete cell reaction.

Conductometery: Introduction, Kohlrausch's law, Conductivity cell, Measurement of conductance, applications-Counductometric titrations, Acid-Base Titrations, precipitation titration, Potentiometry: Introduction, Potentiometric titrations-differential plots. Applications- 8
redox titrations Fe^{2+}/Ce^{4+}titration. UV/Visible spectroscopy: Beer lambert's law, chromophore and auxochrome, types of electronic transitions. Instrumentation and principle- block diagram of single and double beam spectrophotometer. Applications of uv-visible spectroscopy.

Unit – III : Synthetic Organic Polymers

Introduction, functionality of monomer, polymerization-Free radical mechanism & step growth polymerization, Tm and Tg, Thermoplastic and Thermosetting polymers. Compounding of plastics. Preparation, properties & engineering applications of: Polyethylene (LDPE & HDPE) and Bakelite. Elastomers- Natural rubber-processing & vulcanization by sulphur. Synthetic rubbers-SBR. Specialty polymers: Engineering 8
thermoplastics- Polycarbonate, Biodegradable polymers- Poly (hydroxyl butarate-hydroxyvalanate), Conducting polymers- Polyacetylene, Liquid Crystal polymer-Kevlar.

Unit – IV : Fuel & Combustion

Fossil Fuels: Definition, Calorific values, Determination- Bomb calorimeter, Numerical Boy's gas calorimeter, Numerical Solid fuel-coal-Proximate analysis, Ultimate analysis & Numerical. Liquid fuels-Petroleum-composition and refining. Octane number of petrol, 8
Cetane number of diesel, Power alcohol, Biodiesel. Gaseous fuel-Composition, properties and applications of NG, CNG & LPG, Combustion- Chemical reactions, Calculations for air required. Numerical.

Fuel cell: Introduction, applications.

Unit – V: Corrosion science

Introduction. Types of corrosion- Dry corrosion- mechanism, Pilling-bed worth rule. Wet corrosion- mechanism. Factors influencing corrosion- Nature of metal, Nature of environment, Catholic and anodic protection, Use of corrosion Inhibitors Protective coatings: surface preparation 8

a) Metallic coatings:, Electroplating & Electro less plating.

b) Non-metallic coatings: chemical conversion coatings

Unit –VI : Advances in Engineering Chemistry

Nanomaterial: Graphite, Carbon nanotube (CNT) & Fullerenes- Structure, Properties, Applications, Lubricants: Introduction, classification of lubricants, (Liquid, semi– solid (Grease). Biomaterial: classification, Properties, Examples. Biosensor- Introduction, Classification, Applications. Smart Material: Introduction, Shape Memory Alloy and its Example, Advantages, Disadvantages, Applications. 8

BCHP103: Engineering Chemistry

Part A:List of Practical(Any Six)	**Hrs.**
1.Determination of hardness of water by EDTA method.	02
2.Determination of alkalinity of water.	0 2
3.To determine maximum wavelength of absorption of $CuSO_4$ / FeSO4, verify Beer's law and find unknown concentration in given sample	02
4.Titrationofmixture of weak acidands trong acid with strong base using conductometer.	02
5. Preparation of Urea-formaldehyde resin and its characterization.	02
6.Determination of molecular weight/radius of macromolecule polystyrene/polyvinylalcohol	02
7.Proximate analysis of coal	
8. Preparation of nickel coating on copper metal using electroplating & electro less plating	02
9.TO calculate the electrochemical equivalent of copper by electrolysis of copper sulphate solution using copper electrode.	02
10.Determination of acid value of given lubricating oil.	02

Part B:Mini Project Modeling

Every Students has to performed mini project in a group based on curriculum courses 02

Instructions to Student:

1. Maximum Three Students are permissible in each group
2. Project must be based on the contents of syllabus.
3. Project report has to be prepared and attach in practical file individually.

Text Books:

1. Engineering chemistry by O.G. Palana, Tata Mcgraw Hill Eduction Pvt. Ltd.
2. Engineering chemistry by Dr. S.S. Dara Dr. S.S.Umare, S. Chand & company ltd.

Reference Books:

1. Engineering chemistry by Wiley India Pvt. Ltd. First edition
2. Inorganic chemistry, 5e, by Shriver and Atkins, Oxford university press.
3. Shashi Chawala Text book of Engineering Chemistry Sudharani (Dhanpat Rai Publishing Company)

Laboratory Manual:

1. Vogels text book of Quantitative Chemical analysis ,6e,by Mendham, R.C.denney, J.D. Barnes, M.J. K. Thomas, Pearson Education Ltd.
2. Applied Chemistry Theory and Practice ,2e, by O. P. Virmani and A.K. Narula , New age International (P) Ltd.
3. Laboratory manual Engineering Chemistry by Dr. Sudharani (Dhanpat Rai Publishing Company.)

Web Links:

1. www.nptel.ac.in/course/105/04/02-water technology
2. www.nptel.ac.in/syllabus/syllabus.php?subjectId=103/08/00 -electro analytical technique
3. www.nptel.ac.in/courses/113/05028 -polymer
4. www.nptel.ac.in/courses/103/05/10/-fuel & combustion
5. www.nptel.ac.in/courses/113108051/ corrosion science
6. http://nptel.ac.in/course.php?disciplineId=102 – advance materials

BITL104: Programming in C

Teaching Scheme	Examination Scheme (Theory)	Examination Scheme(Lab)
Lectures:	**Teachers Assessment Exam:** 10 Marks	**Internal (TW) :** 25
2Hrs/Week	**Class Assessment Exam:** 10 Marks	**External (PR) :** 25
Practical: 2Hr/Week	**End Semester Exam:** 30 Marks	**External (OR)** : Nil
Credit	**2**	**1**

Prerequisite :

1. Basic Knowledge of Computer

Course Objective:

1. To make students aware of basics about computers, hardware, software & Operating system.
2. To understand the role of constants, variables, identifiers, operators, type conversion and other building blocks of C Language.
3. To understand the Use of conditional expressions and looping statements to solve problems associated with conditions and repetitions.
4. To understand concept of array and passing array through function
5. To understand the concept of structure and union
6. To develop programming skill in a student to write programs in C language.

Course Outcome:

1. Students are able to understand basic concepts of programming.
2. Students are able to understand the basic terminology used in 'C' programming.
3. Students are able to design programs involving decision structures and loops.
4. Students are able to use different data types in a computer program.
5. Students are able to apply functions and array in program.
6. Students are able to write, compile and debug programs in C language.

Course Contents	**Hrs.**
Unit – I :Basics of Programming	4

Basics of programming: approaches to Problem solving, concept of algorithm and flow charts with e.g., types of computer languages: Machine language, assembly language and high level language, concept of assembler, compiler, loader and linker.

Unit – II : C Programming fundamentals	4

Types of programming language , Introduction to C language, tokens, character set, constants, variables, data types, keywords, expressions, operators in C and its types, standard input-output statements in C, structure of C-program.

Unit –III Conditional Program Execution	4

Conditional Program Execution: Applying if and switch statements, nesting if and else, restrictions on switch values, use of break and default with switch, Uses of while, do and for loops, multiple loop variables, assignment operators, using break and continue.

Unit – IV : Introduction to function and Arrays	4

Standard library functions and user defined functions, function declaration, function definition

and function call - call by value and call by reference, return statement, recursion, **Introduction to array**, One and Two Dimensional Arrays, Initialization, Operations on one & two dimensional arrays.

Unit –V Introduction to String 4

Definition of string, Declaration of string, Reading, Writing, String handling operations using and without using library functions, Examples of stings.

Unit – VI : Structure 4

Introduction to Structure definition. Initializing, Assigning values, passing of structure as arguments, Unions, Programming Examples. **Standard C preprocessors,** defining and calling macros, Storage Classes with types.

Practical/Assignments		**Hrs.**
1.	Study of Operating Systems – Window & Linux with their Commands	2
2.	Write programs to implement simple/basic concepts of C.	2
3.	Write programs to implement decision making and control statements in C – if-else, nested if else, if-else-if and switch-case statement.	2
4.	Write programs to implement loops in C – while, do-while.	2
5.	Write programs to implement for loop in C.	2
6.	Write programs to implement string operations in C – strlen(), strcpy(), strcat(), strrev() etc.	2
7.	Write programs to implement string operations in C without using library functions.	2
8.	Write programs to implement functions in C.	2
9.	Write programs to implement of concept call by value & call by reference in C.	2
10.	Write programs to implement of Array concept (One dimensional)	2
11.	Write programs to implement of Array concept (Two dimensional)	2
12.	Write programs to implement structures in C.	2
13.	Write a programs to implement union in C.	2

Text Books:

1. E.Balagurusamy, “Programming in ANSI C” , Tata McGraw Hill
2. B.W. Kernighan, D.M. Ritchie, “The C Programming Language”, Prentice Hall of India.
3. Yeshwant Kanetkar, “Let Us C”, BPB Publication.

Reference Books:

1. R.G. Dromey, “How to Solve It By Computer”, Pearson Education
2. K. R. Venugopal, Sudeep R. Prasad, “Programming with C”, Tata McGraw Hill.
3. E.Balagurusamy,“Fundamentals of Computers”, Tata McGraw Hill

Web Links

1. www.w3schools.com
2. www.cprogromming.com
3. www.eskimo.com/~scs/cclass /notes/top.html
4. www.cprogrammingexpert.com/

BECL105: Basic Electronics Engineering

Teaching Scheme:	**Examination Scheme (Theory)**	**Examination Scheme (Laboratory)**
Lectures:2Hrs/Week	**Teachers Assessment Examination:** 10 Marks	**Internal(TW):** 25 Marks
Practical: 2 Hrs/Week	**Class Assessment Examination :** 10 Marks	**External(PR) :** 25Marks
	End Semester Examination: 30 Marks	**External(OR) :**Nil
Credit	**2**	**1**

Prerequisite : 12^{th} Physics

Course Objective:

1. To give the basic knowledge of basic components & circuit.
2. To study logic gates and their usages in digital circuits
3. To expose the student to working of power electronic devices and transducers
4. To introduce basic aspect of electronic communication system

Course Outcome ; After completion of this course student will be able to

1. Student can acquire the basic knowledge of electronic components and circuits.
2. To gain the concepts of Semiconductor physics
3. Students will be able to effectively employ basic knowledge for new application
4. To design and analyze basic electronic circuits
5. Students will be able to effectively employ technology for their use.
6. To measure the performance parameters of electronic circuits

Course Contents	**Hrs**
Unit – I : Diode Circuits	
Half wave rectifier, Full wave rectifier, D.C Regulated Power supply, Diode application: clipper, Clamper. LED Diodes and Photodiode.	4
Unit – II : BJT circuits	
BJT structure and its operation with normal biasing, DC operating point, DC load line	6

analysis in various operating region of BJT. Transistor as an amplifier in CE mode and as a switch.

Unit – III : Linear Integrated Circuit

Introduction to Op-Amp, Op-amp input modes and parameters, Op-Amp with negative 6
feedback: summing amplifier, integrator, and differentiator, IC555 as a astable multivibrator.

Unit – IV: Basic Digital Electronics

Introduction to logic gates with their truth table, Boolean algebra, D Morgan's Law, 6
Simplification of logical expressions, Sum of product & product of sum, Implementation of SOP (using 3 variable)on Karnaugh map and solving technique. Implementation of expression with basic gates.

Unit – V : Digital Electronics Fundamental

Number system: Binary, Gray, octal, Hex, Half adder, Full Adder, Mux, Demux, Flip-flop, 4
Registers, Mod Counter, Sequential and combinational circuits.

Unit – VI : Power devices and Transducers

SCR, DIAC, Triac, Transducer like Thermocouple, RTD, thermister, load cell and its 6
application like Digital thermometer, weighing machine.

BECP105: Basic Electronics Engineering

Part A :List of Practical(Any Ten)

1. Study of different electronics components.
2. Study of different electronics measuring devices.
3. Study of regulated DC power supply.
4. Study of V-I characteristics of Diode.
5. Study of Clipper circuits.
6. Study of Clamper circuits.
7. Study of single stage BJT common emitter amplifier circuit.
8. Study of Op-Amp circuits as i) Adder ii) Integrator
9. Study of i) MUX ii) Demux
10. Study of IC555 as a timer
11. Study of Half Adder
12. Study of Full Adder
13. Verify the truth tables of different digital ICs like: AND, OR, NAND, NOR.
14. Study of design of AND,OR by universal gate

Engineering Management Law Schools Other Courses
NAGPUR PUNE JALGAON AMRAVATI AHMEDNAGAR CHHINDWARA
RAISONI GROUP OF INSTITUTIONS

15. Study of synchronous counter.
16. Study of asynchronous counter.
17. Study of V-I characteristics of SCR.
18. To design electronic circuit for given application
19. Use of PCB for making circuits.
20. Study of function generator to generate various signals like sinusoidal, triangular, ramp observe the waveform on CRO.

Part B-Mini Project Modeling

Every Students has to performed mini project in a group based on curriculum courses

Instructions to Student:

1)Maximum Three Students are permissible in each group

2) Project must be based on the contents of syllabus.

3) Project report has to be prepared and attach in practical file individuallyProject report has to be prepared and attach in practical file individually.

Text Books:

1. Electronic Devices & circuits – Floyd (Pearson Education India)
2. Modern digital Electronics- R.P. Jain(TMH Publication)
3. Electronics Instrumentation- H.S. Kalsi(Tata McGraw Hill)
4. Communication Electronics principle & Application-Frenzel ((Tata McGraw Hill)
5. Electronic Devices & circuits – salivahanan Tata McGraw Hill

Reference Books:

1. Jacob Miliman, C CHalkias, Chetan Parikh- Integrated Electronics.(Tata McGraw Hill)
2. Debashish De, Kamakhya Prasad Ghatak- Basic Electronics(Pearson Education)
3. J R Cogdell- foundation of Electronics(Pearson Education)

Web Links:

Unit I : PN junction diode & Rectifier

1. http://www.electronics-tutorials.ws/diode/diode_1.html
2. http://www.allaboutcircuits.com/textbook/semiconductors/chpt-3/introduction-to-diodes-and-rectifiers/

Clipper & Clamper

http://www.daenotes.com/electronics/devices-circuits/clipper-clamper

Unit II: BJT

1. Applicationhttp://www.electronics-tutorials.ws/transistor/tran_1.html
2. BJT CE Amplifier:http://www.electronics-tutorials.ws/amplifier/amp_2.html
3. BJT as a switch:http://www.electronics-tutorials.ws/transistor/tran_4.html

Unit III: Linear Integrated Circuit

1. Op amp Application:http://www.electronics-tutorials.ws/opamp/opamp_7.html
2. http://www.electronics-tutorials.ws/opamp/opamp_4.html

IC 555:

3. https://electrosome.com/astable-multivibrator-555-timer/

Unit IV: Basic Digital Electronic

http://www.electronics-tutorials.ws/counter/count_3.html

1. **Unit V:: Digital Electronics Fundamental**
2. Half & Full adderhttp://www.circuitstoday.com/half-adder-and-full-adder
3. http://www.radio-electronics.com/info/data/semicond/thyristor/structure-fabrication.php

Unit VI: Power Devices and Transducers

http://www.radio-electronics.com/info/cellulartelecomms/cellular_concepts/mobile-basics-

Transducers:http://www.electronics-tutorials.ws/io/io_1.html

BEEL106: Basic Electrical Engineering

Teaching Scheme	Examination Scheme (Theory)	Examination Scheme(Lab)
Lectures: 3 Hrs/Week	**Teachers Assessment Exam:** 20 Marks	**Continuous**
Tutorials: 1 Hr/Week	**Class Assessment Exam:** 20 Marks	**Assessment:** 25 Marks
Practical: 2 Hrs/Week	**End Semester Exam:** 60 Marks	**External(PR) :** 25 Marks
Credit	**4**	**1**

Course Objective:

1. To expose the undergraduate first-year engineering students to the fundamental laws of electricity and their applications in day-to-day life.
2. To lay a course foundation for the students who would be trained in the related core subjects like electrical, electronics, instrumentation and control, tele-communications etc.
3. Demonstrate the awareness on social issues like conservation of electrical energy, electrical safety etc.
4. Develop abilities to analyze circuits quantitatively.

Course Outcome:

1. Apply basic electric circuit laws to solve electric circuit problems and design basic D.C. electric circuit using circuit analysis techniques.
2. Apply basic A.C. electric circuit laws in solving A.C. circuit problems and able to perform A.C. power calculation.
3. Learner should understand and grasp the analytical treatment of electrical quantities with the help of phasor-algebra.
4. To understand the difference between DC and AC Systems and between Single-phase and three phase utility AC Source.
5. To understand functioning of basic electrical circuits, useful in domestic and industrial power supplies.
6. To train the learner in adequate experimentation related to high power electricity and in measurements of electrical quantities such as voltage, current and power

Course Contents	Hrs
Unit – I : D.C. Circuits	
Ohm's law, Simplification of networks using series - parallel combinations, Current and Voltage sources, Kirchhoff's laws, Superposition theorem, Thevenin's theorem, Maximum Power Transfer theorem.	07
Unit – II : Single Phase A.C. Circuits	
Concept of AC quantities, Concepts of cycle, Period, Frequency, Generation of alternating voltage and currents, RMS and Average value, Form factor, Crest factor, Phase and Phasor diagrams, AC through Pure resistance, Inductance &Capacitance, R-L , R-C and R-L-C series circuits, Power and Power factors.	07
Unit – III :Three Phase A.C. Circuits	
Three Phase Circuits:- Concept of three phase supply, Phase sequence, Concepts of line, Phase, Neutral etc., Power relations in a Three phase balanced Star and Delta connections, Three phase phasor diagrams.	06
Unit – IV : Fundamentals of Transformer	
Construction, Working Principle, EMF equation, Rating of transformer, Transformer on no load and on Full load, Transformer losses, Calculation of Efficiency and Regulation.	06
Unit – V : Work , Power and Energy	
Energy conversions from one form to another such as Electrical, Thermal and Mechanical, and Numerical problems based on different energy conversions in real life cases.	04

Unit – VI : Electrical Machines

Fundamentals of DC and AC Machines, DC Series and Shunt Motor, AC Single Phase Induction Motor, Stepper Motor, Servo Motor. 06

BEEP106: Basic Electrical Engineering

Part A:List of Practical/Assignments (Any Six)

1. Study of :
   a) Different wiring components, switches, holders, cables, tube circuit, CFL, Megger.
   b) Energy conservation and safety precautions.
2. Study of :
   a) Control of lamp from two switches.
   b) Study of staircase wiring.
3. Verification of Kirchhoff's laws.
4. Verification of Superposition theorem.
5. Verification of Thevenin's theorem.
6. Study of R. L. C. series circuits.
7. Verification of current relations in three phase balanced star and delta connected loads.
8. Single phase transformer:
   a) Voltage and Current ratio
   b) Efficiency and regulation by direct loading method.
9. Load test on DC series motor.

Part B-Mini Project Modeling

Every Student has to perform mini project in a group based on curriculum courses.

Instructions to Student:

1) Maximum Three Students are permissible in each group
2) Project must be based on the contents of syllabus of subject.
3) Project report has to be prepared and attach in practical file individually .

Text Books:

1. **Electrical Technology** Volume-I–B.L. Theraja, S.Chand and Company Ltd.,New Delhi.
2. **Basic Electrical Engineering**, V. K. Mehta , S. Chand and Company Ltd., New Delhi.
3. **Theory and problems of Basic Electrical Engineering**- I. J. Nagrath and Kothari, Prentice-Hall of India Pvt. Ltd.

Reference Books:

1. **Electrical Technology**- Edward Hughes, Seventh Edition, Pearson Education
2. **Elements of Electrical Technology**- H. Cotton, C.B.S. Publications
3. **Electric Machines** by AshfaqHussain - Dhanpatrai

Web Links:

Unit1: correlation on effect of temperature:

1. http://arxiv.org/ftp/arxiv/papers/0903/0903.1334.pdf

Unit-2: Single phase AC Circuit:

2. http://elearning.vtu.ac.in/13/ENotes/BEE/BasicElectricalNotes.pdf

Unit-3: Three Phase AC Circuit:

3. http://www.allaboutcircuits.com/textbook/alternating-current/chpt-10/three-phase-y-delta-configurations/

Unit4: Core construction of Transformer:

4. wapyoutub.com/download/video/How...**Transformer**.../vh_aCAHThTQ

Problems on Transformer:

5. https://www.youtube.com/watch?v=zg0piCo5ZTA
6. https://www.youtube.com/watch?v=9TTxUY0vNb8

Unit-5: Work , Power , Energy:

7. http://www.efm.leeds.ac.uk/CIVE/CIVE1140/
8. docs/mechanics_sec03_full_notes02.pdf

Unit-6: Electrical Machines:

9. https://www.rockwellautomation.com/resources/downloads/rockwellautomation/che/pdf/
10. Application_basics_operation_three_phase_induction_motors.pdf
11. http://www.solarbotics.net/library/pdflib/pdf/motorbas.pdf
12. http://www.baldor.com/Shared/manuals/1205-394.pdf

http://uotechnology.edu.iq/dep-ee/lectures/3rd/Communication/machine/PART%203.pdf

BCEL107: Engineering Mechanics

Teaching Scheme:	**Examination Scheme (Theory)**	**Examination Scheme(Lab)**
	Teachers Assessment Exam: 20 Marks	**Internal(TW):** 25 Marks
Lectures: 3 Hrs/Week	**Class Assessment Exam:** 20 Marks	**External(PR)** : 25 Marks
Tutorials: 1 Hrs/Week	**End Semester Exam:** 60 Marks	**External(OR)** :- Nil
Practical: 2 Hrs/Week		
Credit	**4**	**1**

Prerequisite: Knowledge of basic physics and geometry of XIIth standard

Course Objective:

1. Basic concepts of Mechanics for Static and Dynamics have to be implanted into the student.
2. To describe and be able to predict the conditions of rest or motion of the bodies under the action of forces
3. To understand the basic concepts of forces moments, couples in two dimensional force syst

Course Outcomes: After Completion of this course student will be able to

1. Understand the principle of work and energy
2. Comprehend the effect of friction on equilibrium.
3. Understand the laws of motion, the kinematics of motion and the interrelationship.

Course Content	Hrs
Unit – I : Coplanar Force System	
1.1 System of Coplanar forces:- Resultant of Concurrent forces, Parallel forces, Non Concurrent Non Parallel system of forces, Moment of force about a point, Couples, Lami's Theorem, Varignon's Theorem. Distributed Forces in plane, Resultant of general force system	6
1.2 Center of Gravity and Centroid for plane Laminas	
Unit – II :Equilibrium of Force System	
2.1 Equilibrium of system of coplanar forces:- Condition of equilibrium for concurrent forces, parallel forces and Non concurrent Non Parallel general forces and Couples.	6
2.2 Analysis of plane trusses by using Method of joints and Method of sections.	
Unit – III : Analysis of Beams, Frames & Cables	
3.1 Beams: Types of beams, Types of supports, Types of loading.	6
3.2 Frames : Analysis of Trusses &Frames	
Unit – IV : Friction	
4.1 Friction: Dry Friction, Laws of friction, angle of friction & resultant reaction, wedge friction, ladder friction, belt friction.	6
4.2 Kinematics- Basic concepts, equation of motion for constant acceleration and motion under gravity. Variable acceleration and motion curves.	
Unit – V : Dynamics	
A] Kinematics of Particle: - Velocity & acceleration in terms of rectangular co-ordinate system, Rectilinear motion, Motion along plane curved path, Tangential & Normal component of acceleration, Motion curves (a-t, v-t, s-t curves), Projectile motion.	6

Engineering Management Law Schools Other Courses
NAGPUR PUNE JALGAON AMRAVATI AHMEDNAGAR CHHINDWARA
RAISONI GROUP OF INSTITUTIONS

B] Kinetics of a Particle: Force and Acceleration:-Introduction to basic concepts, Newton's Second law of motion. D'Alemberts Principle.

Unit – VI : Principle of Work Energy & Impulse Momentum

A] Work energy principle for particle: Work, Power, Energy, conservative forces & Potential Energy, Conservation of Energy, Work energy principle for motion of particle. 6

B] Impulse momentum principle for particle: Linear Impulse & Momentum, Conservation of momentum, Direct central impact & coefficient of restitution, Impulse momentum principle

Assignments :

Analytical solution of at least four problems / question on each unit based on above syllabus

BCEP107: Engineering Mechanics

Part A :List of Experiments (Any Six)

1. Study of law of parallelogram of forces
2. To Determine the Reaction at The Supports of Simply Supported Beam
3. To determine coefficient of Friction using Belt Friction
4. Verification of law of polygon of forces by graphical method.
5. Study of Lami's Theorem
6. To Determine the Moment of Inertia of Fly-Wheel.
7. To study kinematics of curvilinear motion of a particle
8. To find coefficient of restitution

Text Books:

1. F. L. Singer, Engineering Mechanics, Third Edition, Harper Publication, 2012
2. Engineering Mechanics – Statics and Dynamics by A Nelson, Tata McGraw Hill Education private Ltd, New Delhi 2009.

Reference Books:

1. Vector Mechanics for Engineers, Tata McGraw Hill Company Beer & Johnston, 2012, 9th Edition.
2. Engineering Mechanics, Pearson Education Asia Pvt. Ltd., Iriving K. Shames, 2009, 4th Edition.
3. Engineering Mechanics, Prentice Hall, R.C.Hibbler, 2003, Tenth Edition
4. Engineering Mechanics, DhanpatRai Publishing Company, S. Ramamrutham, 2009, 9th Edition.
5. Engineering Mechanics, DhanpatRai Publishing Company, R. K. Rajput, 2011, 3rd Edition
6. Engineering Mechanics, S. Chand Publication , R.S. Khurmi& Gupta,30july 2015.

Web Links:

Unit I : Resultant of concurrent force System

1. http://www.ae.msstate.edu/vlsm/forcesys/concurrent_force_systems/resultant.html
2. http://www.brainchamp.net/parallelogram-law-of-coplanar-concurrent-forces/
3. http://www.slideshare.net/guestb54490/concurrent-forces

Lamis theorem

1. http://me-mechanicalengineering.com/lamis-theorem/
2. http://www.tutorvista.com/content/physics/physics-iii/motion-laws/lamis-theorem.php
3. http://encyclopedia2.thefreedictionary.com/Lami's+theorem

Varignos theorem

1. nptel.ac.in/courses/Webcourse-contents/IIT-%20Guwahati/.../lec1.htm
2. me-mechanicalengineering.com/varignons-theorem
3. fsinet.fsid.cvut.cz/en/u2052/node40.htm

Moment & couple

1. www.mathalino.com/reviewer/engineering-**mechanics**/**moment**-force
2. web.mit.edu/4.441/1_lectures/1_lecture5/1_lecture5.html
3. physicsnet.co.uk/a-level-physics-as-a2/mechanics/moments/

Unit II : Analysis of structure (join method & section method)

1. www.mathalino.com › Engineering Mechanics › Analysis of Structures
2. www.thelearningpoint.net/home/...**mechanics/analysis-of-structure**
3. www.ce.memphis.edu/3121/notes/notes_03b.pd
4. https://en.wikipedia.org/wiki/**Structural_analysis**

Unit III : Beam & types of beam & FBD

1. https://en.wikipedia.org/wiki/**Beam**_(structure)
2. www.ecourses.ou.edu/cgi-bin/ebook.cgi?topic=me&chap_sec
3. https://www.quora.com/What-are-the-**types-of-beams**

Unit IV : Friction

1. study.com/academy/.../what-is-friction-definition-formula-forces.html
2. www.physicsclassroom.com › Physics Tutorial › Newton's Laws

Unit V : Dynamics

1. http://www.real-world-physics-problems.com/curvilinear-motion.html
2. http://nptel.ac.in/courses/122103010/md07_experiment/module2/lectures/lect4/slides/slide1.htm
3. www.iitg.ac.in/kd/Lecture%20Notes/ME101-Lecture27-KD.pdf
4. study.com/academy/lesson/projectile-motion-definition-and-examples.html
5. https://www.khanacademy.org/...newtons-laws/newtons-laws.../ne...
6. www.crackthehack.com/bnd/epress/2012/.../d-alemberts-principle-and-its-applications...

Unit VI : Principle of Work-Energy & Impulse

1. https://www.khanacademy.org/.../work...energy/work...energy.../...
2. www.spumone.org/courses/dynamics-notes/impulse_momentum/
3. https://www.coursera.org/.../module-12-define-coefficient-of-restitution-solve-an-imp...

BMEL108 : Basic Mechanical & Engineering Graphics

Teaching Scheme:	**Examination Scheme (Theory)**	**Examination Scheme(Lab)**
Lectures: 2 Hrs/Week	**Teachers Assessment Exam:** 20 Marks	**Internal(TW):** 25 Marks
Practical: 2 Hrs/Week	**Class Assessment Exam:**20 Marks	**External(PR) :** 25Marks
	End Semester Exam: 60 Marks	**External (OR) : Nil**
Credit	**2**	**1**

Prerequisite:

1. XIIth Physics and its principles.
2. Basic Geometry and concepts.

Course Objective:

1. To describe the scope of mechanical engineering in multidisciplinary industries.
2. To understand and identify common machine elements with their functions and power transmission devices.
3. To learn conventional machine tools , manufacturing processes and understand the design in mechanical engineering.
4. To develop imagination power of student of physical objects to be represented on paper for engineering communication in technical field.
5. To develop the manual drawing skill, drawing interpretation skill.
6. To develop the physical realization of the dimension of the objects.

Course Outcomes:

1. The students will understand the mechanical engineering in general; they will get information of power transmission shafts, keys, coupling, bush, ball bearing, friction clutches, and brakes.
2. The Students will get information of Individual & group drives, gear train, gear drive etc.
3. The Student will get information of basic Manufacturing processes as well as working principle and types of operations with block diagram of Lathe Machine, Drilling Machine, Grinding Machine.
4. The student will get idea of first & third angle method of projection, projection of lines which are inclined to both planes i.e. H.P & V.P. by first angle method of projection.

5. The student will able to draw Engineering Curves, Projection of Solids, Section of Solids and Development of Solids on sheets with their imagination power; they acquire knowledge of method of drawings adapted all over the world and able to read sheets in engineering field, their dimensioning.
6. The students will get idea of Auto-CAD software which is user friendly to draw 2D and 3D object with uniform dimensioning.

Course Contents	Hrs
Unit – I : Basic Mechanical Devices	
A] Machine Elements : Power transmission shafts, coupling, bush and ball bearing and friction clutches, brakes (Types & application only) **B] Drives :** Individual and group drives, belt drive, chain drive, rope drive, gear drive and Spur Gear Drive arrangement with gear train (Types & application only)	4
Unit – II: Manufacturing Processes & Machine Tools	
A] Manufacturing Processes Basic Manufacturing Processes overviews, Sheet metal forming processes : drawing and bending, Sheet metal Cutting processes : Blanking, Piercing ,Metal Joining Processes : Welding , Soldering , Brazing methods and application **B] Machine Tools& Operations:** Basic Elements, Working Principle, Types of Operations with Block Diagram**:** Lathe Machine, Drilling Machine.	6
Unit – III : Projection of Lines, Projection of Solids, Development of Solid & Orthographic Projection	
A] Introduction to lines and **Engineering Curves** -Ellipse, Parabola, Hyperbola by Focus Directrix and Rectangle Method **B]** Introduction to projection of solids and section of solids and Development of Solid(Prism and Pyramid Maximum with six sides) **C] Orthographic projections** of given pictorial view by First Angle Method of Projections.	8
Unit – IV : Isometric Projection & Auto-CAD	
A] Introduction to Isometric View with the example of Cube Isometric axes, scale, Isometric Projection and Isometric Views. Drawing isometric views of simple solids and objects dimensioning-only Length, width and height of Isometric views. **B] Introduction to AutoCAD**, Commands, AutoCAD drawing of simple 2D objects	6

BMEP 108: Elements of Mechanical & Engineering Graphics

Part A- List of Practical/Assignments (Any Eight Out of which 9 & 10 compulsory)	Hrs.
1. Study of power transmitting Elements – Gears, Couplings, Bearings	2
2. Study of Automobile Clutches.	1
3. Study of Mechanical Brakes.	1
4. Study, demonstration & working of Lathe Machine	2
5. Study ,demonstration & working of Drilling Machine	2
6. Four problems on Projection of lines	4
7. Two problems on Projection of Solids	4
8. Four problems on Engineering Curves and Development of Lateral Surfaces.	4
9. AutoCAD Drawing- 2 Problem on orthographic	4
10. AutoCAD Drawing- 2 Problem on Isometric Projection	4

Part B-Mini Project Modeling

Every Students has to performed mini project in a group based on curriculum courses

Instructions to Student:

1. Maximum Three Students are permissible in each group
2. Project must be based on the contents of syllabus.
3. Project report has to be prepared and attach in practical file individually.

Text Books:

1. N. D. Bhatt & V. M. Panchal, Engineering Drawing, Plane and Solid Geometry, Charotor Publication House, Anand, Gujrat, India.
2. Dhananjay A. Jolhe, Engineering Drawing with an Introduction to Auto CAD, Tata Mcgraw- hill Publishing Co. Ltd., New Delhi, India.
3. G. Shanmugam S. Ravindran " Basic Mechanical Engineering",Tata McGraw- Hill Publisher Co. Ltd.
4. R. K. Purohit " Foundation of Mechanical Engineering" , Scientific Publishers.

Reference Books :

1. K. Venugopal, Engineering Drawing and Graphics, New Age Publication.
2. N. B. Shaha and B. C. Rana, Engineering Drawing, Pearson Education.
3. C. Jensen, J. D. Helsel and D. R. Short, "Engineering Drawing and Design", Tata McGraw-Hill Education Pvt. Ltd., New Delhi, 2012
4. Surinder kumar , " Basics of Mechanical Engineering". Ane Books Pvt. Ltd., New Delhi, 2011
5. T. J. Parbhu , V. Jaiganesh and S. Jebaraj, " Basic Mechanical Engineering" , Scitech Publications (India) Pvt. Ltd. Chennai, 2010.

Weblinks :

Unit – I

- https://www.google.co.in/webhp?sourceid=chrome-instant&ion=1&espv=2&ie=UTF-8#q=machine+Elements+Shaft+%2C+keys%2C+Coupling
- http://www.codecogs.com/library/engineering/theory_of_machines/belt-and-rope-drives-brakes.php

Unit – II

- https://en.wikipedia.org/wiki/List_of_manufacturing_processes
- http://www.egr.msu.edu/~pkwon/me478/operations.pdf

Unit – III

- http://nptel.ac.in/courses/112103019/20
- http://www.iitg.ernet.in/rkbc/ME111/Lecture4%20Engineering%20Curves%20and%20Theory%20of%20projections.pdf
- http://nptel.ac.in/courses/112103019/29
- http://www.iitg.ernet.in/rkbc/ME111/Lecture11%20Sections%20of%20solids.pdf
- http://www.engineeringessentials.com/ege/ortho/ortho_page2.htm

Unit – IV

- http://home.iitk.ac.in/~cvrm/TA101_L12_IsometricProjections_Basics.pdf
- http://cms.cerritos.edu/uploads/engt/autocad%20basics.pdf

BHUL109: Environmental Studies and Professional Ethics

Teaching Scheme:	**Examination Scheme (Theory)**	**Examination Scheme (Lab)**
Lectures: 2 Hrs/Week	**Teachers Assessment Exam:** Nil	**Internal(TW):** Nil
Tutorial: Nil	**Class Assessment Exam:** Nil	**External(PR) :**Nil
	End Semester Exam: Nil	**External(OR) :** Nil
Credit	**Audit Course**	

Course Objective: After completing the course students wil be able to

1. Understand fundamental concepts of Environmental systems
2. Understand fundamental concepts from the social sciences and humanities underlying environmental thought and governance.

Course Outcome: At the end of the course the student shall be able to:

1. Understand the concepts and methods and their applications in environmental problem-solving.
2. To get knowledge about impact of different types of pollutions.
3. To get knowledge about effect of water pollution on health and different energy recourses.
4. Demonstrate self confidence and self esteem.
5. Present appropriate etiquettes, style, manners and graceful personality.

Course Contents	Hrs
Unit – I : Environmental Science, Climate Change and need of public awareness	
Definition, scope importance and objectives, guiding principle of Environmental studies, climate change and Need for public awareness. Concept of ecosystem biotic & abiotic components, types of ecosystems. Explain different ecosystems- forest, grassland, desert, aquatic.	4
Unit – II : Pollution and Waste Management	
Air Pollution & Automobile Pollution: Definition, Effects – Global Warming, Acid rain & Ozone layer depletion, Animal husbandry, controlling measures. **Solid Waste Management** - E-Waste Management & Biomedical Waste Management - Sources, Characteristics & Disposal methods.	4
Unit – III : Natural Resources, Material Cycles and Energy	
Natural Resources - Water resources – Availability & Quality aspects, Water borne diseases &water induced diseases, Fluoride problem in drinking water. **Wealth Material Cycles –** Phosphorous Cycle, Carbon Cycle, Nitrogen Cycle & Sulphur Cycle. **Energy** – Different types of energy, Conventional sources & Non-Conventional sources of energy. with examples such as Solar energy and Hydro electric energy.	4
UNIT-IV: Ethics, Value System & Value Education	
Ethics: Behavioral Values, Code of Conduct in College Premises, Addiction, Patriotism – Building respect for the Country, National Anthem and National Flag, Ragging, Respect for Individuals & Environment, Peer – Pressure & Support, Moral Uprightness, Importance of Altruism, Living by the Rules. **Value System & Value Education:** Understanding how value system affects behavior and perception, Difference between Values, Moral & Ethics, Concept of Equality, Acceptance, Humility. Importance of Value education for College Student, Understanding the meaning of Vishwas : Differentiating between intention and competence, How to resolve ethical dilemma, “Right” and “Wrong” Action	4
UNIT-V: Copyrights, Corruption & Integrity and Goal Setting ,Self Improvement and Self Analysis	8
Introduction, Moral Obligations, Copyright Infringement, Patent Law, Case Study Analysis **Goal Setting:** - The importance and benefits of proper goal setting is explained to the students. The following topics are covered: S.M.A.R.T. Goals, Principles of Goal Setting, Steps for Goal	

- Setting Activity. Grooming & Body Language: The students are trained on various aspects of self-grooming and body-language.
- Attitude Development: Types of Attitude, How society affects attitude, Importance of right attitude, Activity.
- Vocabulary Building, Public Speaking & Extempore: Vocabulary Building, Crosswords, Word & Meaning, Spellings, Conversation Practice, Extempore Practice, Intonation, Speech Anxiety.

Self Analysis:

- Self Awareness& Mindfulness: Being Self Aware, Self Awareness in relationships, SWOT, Developing Self Awareness, Self Mastery, JoHari Window.

Mini Project Modeling

Every Students has to performed mini project or a survey report in a group based on following topics.

1.Air pollution

2.Noice pollution

3. water treatment

4.Sewage treatment

5.Human Rights ACTs.(right to equality, education, own a private land, other constitutional rights)

6.Recent studies on minimization of solid waste.(electronic waste, biomedical waste, plastic waste etc)

7. Latest existing status regarding rural development. (sanitary, agricultural, lifestyle, use of technical knowledge for improving different perspects of life, health awareness of both humans and animals)

8. Green building

9. Effects of Global warming

10. Impacts of climate change

Instructions to Students

1. Maximum Three Students are permissible in each group
2. Project must be based on the contents of syllabus.
3. Project report has to be prepared and attach in practical file individually.

Reference Books:

1. A textbook of Environment and Ecology – by Shashi Chawla
2. Textbook for Enviornmental Studies for Undergraduate Courses of all Branches of Higher Education by eran barucha.
3. Solid waste management- by chandrappa, Ramesh, Brown and Jeff.
4. A Textbook of Environmental Chemistry & Pollution Control: S SDara, S. Chand & Company, New

Delhi (2002).

5. “Essentials of Ecology & Environment Science” by Rana. S.V.S.; EPI Publications.
6. Gleick, H.P.1993. Water in crisis, Pacifics Institute for Studies in Dev., Environment & Security. Stockholm Env. Institute. Oxford Univ. Press.473p
7. Robert Schuller, Success Never Ends, Failure is Never Final, Revised Edition, Paperback, 1990 Page 14 of 323
8. Allen Pease, Body Language b, First Edition, Paperback, 2005

BMEP111: Workshop

Teaching Scheme:	Examination Scheme: (Theory)	Examination Scheme:(Lab)
Lectures: Nil	**Teachers Assessment Exam:** Nil	**Continuous Assessment:**
Practical: 2Hr/Week	**Class Assessment Exam:** Nil	50 Marks
Tutorial: Nil	**End Semester Exam:** Nil	
Credit	_	**1**

Course Objective:

1. To introduce to names, uses and setting of hand tools for Fitting, Carpentry and Welding used in mechanical engineering workshop.
2. To introduce students to components and PCB making so as to be able to do work related to Mini-Model making in Electronics workshop.

Course Outcome: At the end of this course student are able to

1. Understand and demonstrate workshop safety regulations.
2. Use tools and processes in fitting, carpentry and welding operations.
3. Demonstrate knowledge of component identification and PCB making.

Course Contents	**Hrs**
Unit – I : Utility Tools	
Carpentry – 1 Job	
Introduction to wood working, kinds of woods, hand tools and machines. Types of joints, wood turning. Pattern making, types of patterns, contraction, draft and machining allowances. Term work to include one job involving joint and woodturning.	4
Fitting – 1 Job	
Types of fits, concepts of interchangeability, datum selection, location layout, marking, cutting, shearing, chipping, sizing of metals, drilling and tapping.	4

Term work to include one job involving fitting to size, male-female fitting with drilling and tapping. 4

Sheet Metal Practice – 1 Job

Introduction to primary technology processes involving bending, punching and drawing various sheet metal joints, development of joints.

Term work to include a utility job in sheet metal.

Joining – 1 Job

Includes making temporary and permanent joints between similar and dissimilar material by processes of chemical bonding, mechanical fasteners and fusion technologies. 4

Term work includes one job involving various joining processes like riveting. Joining of plastics, welding, brazing etc.

Unit – II : Demonstrations (Any Four)

Assembly and Inspection

Assembly and Disassembly of some products, tools etc. Videos of advancement in manufacturing technology. Inspection of various components using different measuring instruments. Introduction to measuring equipment used in Quality Control.

Safety in Workshop

Fire hazards, electric short circuit- causes and remedies. Machine protection, Human protection, Accident prevention methods, developing ability to observe safe working habits.

Forging

Hot working, cold working processes, forging materials, hand tools and appliances, hand forging, power forging. 2

Moulding

Principles of moulding, methods, core & core boxes, preparation of foundry sand, casting, plastic moulding.

Plumbing

Types of pipe joints, threading dies, Pipe fitting.

PCB Making

Layout drawing, positive and negative film marking, PCB etching and drilling.

Machine Tools

Turing, Milling, Grinding, Planning – Machines, Tools and Accessories.

Note: All demonstrations to be engaged by teaching faculty and corresponding teaching load be shown in the time table for respective teaching faculty.

Submissions :

Two jobs as mentioned above.

Brief write-up with illustration / sketches on the demonstration (not more than 3 pages for each demonstration.)

Text Books:

Chaudhary, Hazra, "Elements of Workshop Technology,: Volume I & II Media Promoters and Publishers, Mumbai.

Course in Workshop Technology Volume-I, B. S. Raghuwanshi, Laxmi Publication-Revised Edition

BFYP112: MINI MODELING

Teaching Scheme	Examination Scheme: (Theory)	Examination Scheme: (Laboratory)
Lectures: Nil	**Teachers Assessment Examination:** Nil	**Continuous Assessment:** 50 Marks
Practicals: 2 Hrs./Week	**Class Assessment Examination:** Nil	
Tutorials: Nil	**End Semester Examination :**Nil	
Credit	----	1

Prerequisite: 12th Science Basics

Course Objective : After completing this course student will able

1. To understand different phase of model development.
2. To learn various techniques of model development.

Course Outcome: student shall be able to:

1. Developing the skills of planning and designing to develop a working Mini Model.
2. Implement knowledge of concepts learnt and workshop practices to prepare a model.
3. Use innovative ideas and convert these into physical models.

Sr. No	Themes for Mini Modeling (value addition Venture)
1	Mechatronics
2	Modeling a) AutoCAD/Autodesk b) Nx4/Ansys/CATIA/Uni Graphics c) Metro Rail/Automobiles

3 Transducers and sensors
   a) Simulink
   b) Lab view
4 Energy conversion and conservation
5 Renewable energy sources
6 Energy Audit
7 Alternate fuels
8 Environmental issues related projects
9 Environmental Audit
10 Designing application based projects PCB Fabrication
11 Agriculture Based Projects
12 Design of web page
13 Bio-Engineering

BHUL113 : Communication Skill

Teaching Scheme:	**Examination Scheme (Theory)**	**Examination Scheme (Lab)**
Lectures: 2Hr/Week	**Teachers Assessment Exam:**10 Marks	**Internal(TW):** Nil
Tutorials: Nil	**Class Assessment Exam:**10 Marks	**External(PR) :**Nil
	End Semester Exam: 30 Marks	**External(OR) :** Nil
Credit	**2**	–

Course Objective:

1. To develop an understanding in the students regarding communication skills
2. To develop the four essential communication skills in the students i.e. reading, writing, listening and speaking
3. To develop the vocabulary and English proficiency of the students
4. Train students to common words, phrases relevant to the immediate communication tasks
5. Enable students to comprehend the concept of communication.
6. Teach students the four basic communication skills – Listening, Speaking, Reading and Writing

Course Outcome: At the end of the course the student shall be able to:

1. The students will develop an understanding regarding communication skills.
2. Development of the four essential communication skills in i.e. –reading, writing, Listening and speaking in students.
3. Enhancement of vocabulary and English proficiency of the students.

Course Contents	Hrs
Unit – I : INTRODUCTION TO COMMUNICATION	
Importance of Communication; Importance of Communicating effectively in English; Communication Process , Channels of communication; Barriers to effective communication, Need of communication skills for Engineers.	2
Unit – II : TECHNICAL COMMUNICATION	
Introduction to Technical Communication; differences between General and Technical Communication; importance of Technical Communication; Technical Communication Skills – Listening, Speaking, Reading, Writing	2
Unit – III : LISTENING SKILLS	
Listening Process; Hearing and Listening; Poor listening habits; Traits of a good listener; Types of Listening Principles of Communication – Communication as coding and decoding – signs and symbols – verbal and non –verbal symbols – Language AND communication; language VS communication – media/channels for communication.	4
Unit – IV : SPEAKING SKILLS	
Phonetics and Diction – Theory and Practical; Body Language; Miscellaneous tips and techniques on speaking. Articles reading.	3
Unit – V : READING SKILLS	
Reading Comprehension Techniques for good comprehension, Interpreting charts and tables, Practical Exercises; Developing reading speed – Theory and Practical; Loud Reading – Practical Exercises in class	3
Unit – VI : TECHNICAL WRITING	
Characteristics of Technical Writing – introduction, characteristics, techniques; Choice of right words, phrases and sentences; Principles of paragraph writing	2
Unit – VII : WRITING BUSINESS LETTERS AND EMAILS	
Business Letters – The 7 Cs of Letter Writing, structure of business letters, writing business letters (applications, enquiry, quotations, complaints, cover letters); Writing professional emails	2
Unit – VIII: OTHER WRITTEN COMMUNICATION	
Writing reports, proposals, press release, articles, essays; drafting of Notices and Advertisements (for newspapers); note-making	2
Unit – IX: VOCABULARY DEVELOPMENT	2

Effective use of dictionary; etymology; homophones and homonyms; synonyms and antonyms; words frequently confused or miss spelt, idioms and phrases

Unit – X: BASICS OF FUNCTIONAL ENGLISH GRAMMAR 2

Parts of Speech – introduction, prepositions; articles; tenses; narration; punctuation; voice

Text Books:

1. Mason, Margaret M. Examine Your English, Hyderabad: Orient Longman, 1980
2. Sharma, R.S. Technical Writing. Delhi: Radha Publication, 1999
3. Sudarsanam, R. Understanding Technical English. Delhi: Sterling Publishers Pvt. Ltd., 1992
4. Gannon, Robert, Edt. Best Science Writing: Readings and Insights. Hyderabad: University Press (India) Limited, 1991
5. M. Ashraf Rizvi, Effective Technical Communication, First Edition, Tata McGraw Hill, 2012
6. P C Wren and H Martin, High School English Grammar and Composition, Revised First Edition, S Chand, 2005
7. Meenakshi Raman & Sangeeta Sharma, Communication – Principles & Practice, First Edition, Oxford University Press, 2011

Web Reference Links:

- http://www.youtube.com/watch?v=egeyiUpFsaw
- http://www.youtube.com/watch?v=8Oos1qoYe4o
- http://www.youtube.com/watch?v=9Y88Zw7eWZc
- http://www.youtube.com/watch?v=_pFTsGzGuOk
- http://www.youtube.com/watch?v=eB9Bq3YJGcA
- http://www.youtube.com/watch?v=UWBSlMaplT0
- http://www.youtube.com/watch?v=VFrp9ROB44c&feature=pyv&ad=4735114004&kw=success
- http://www.youtube.com/watch?v=e4g0op2P_yY
- http://www.youtube.com/watch?v=AFGNKJruxdg

BIDL101: Bio Systems in Engineering

Teaching Scheme	Examination Scheme (Theory)	Examination Scheme (Lab)
Lectures:2Hrs/Week	**Teachers Assessment Exam :**Nil	**Continuous Assessment:** Nil
Tutorials: Nil	**Class Assessment Exam:** Nil	**External(PR) :**Nil
	End Semester Exam: Nil	

Credit	**Audit Course**	**-------**

Course Objective :

This course introduces general biological concepts

1. It helps students to understand importance of biological concepts in engineering fields.
2. To understand application of engineering concepts in medical instrumentation.

Course Outcome:

Upon successful completion of the course, students will be able to

1. Use bioinstrumentation, required in cellular or molecular biology investigations.
2. Apply the concepts of engineering in different streams of biomedical field.

Course Contents	Hrs
Basics of Biology: Introduction to Human Anatomy and Physiology, The Nervous System, Cardiovascular System. **Biomedical Instrumentation:** Bioelectric Signals, Biomedical Instrumentation System, Biomedical transducers, Electrodes and Their Characteristics. Bio-imaging techniques, ECG, Computer aided ECG, X-Ray, MRI, CT Scan, Blood pressure measurement instrument. **Applications of Biomedical Engineering.**	24

Text Books:

1. "Joseph J. Carr and John M. Brown, "**Introduction to Biomedical Equipment Technology**", 4 th Edition, Prentice Hall, 2000.
2. R. Rangayan, "**Biomedical Signal Analysis**", Wiley 2002**.**

Reference Books:

1. R.S.Khandpur, "**Handbook of Biomedical Instrumentation**", Tata McGraw Hill, New Delhi, 2003, Edition-II.

2. Sörnmo, "**Bioelectrical Signal Processing in Cardiac & Neurological Applications**", Elsevier.

3. "**Biomedical Instrumentation** Arumugam,Anuradha Publishers,2002,First Edition

****

Department of

Mechanical Engineering

S. Y. B. Tech. Course Book

(2016 Pattern)

(With effect from June 2020)

Engineering Management Law Schools Other Courses
NAGPUR PUNE JALGAON AMRAVATI AHMEDNAGAR CHHINDWARA
RAISONI GROUP OF INSTITUTIONS

Department of
Mechanical Engineering

Under Graduate (UG) Course Book

S.Y. B. Tech (Mechanical)

Semester- III/IV

Engineering Management Law Schools Other Courses
NAGPUR PUNE JALGAON AMRAVATI AHMEDNAGAR CHHINDWARA
RAISONI GROUP OF INSTITUTIONS

INDEX

Engineering Management Law Schools Other Courses
NAGPUR PUNE JALGAON AMRAVATI AHMEDNAGAR CHHINDWARA
RAISONI GROUP OF INSTITUTIONS

About the Institute and Department

GHRCEM, Pune is nationally acclaimed Institute that aims at creating professionals who will be driven by a firm commitment to excellence, yet rooted in the rich cultural heritage of our nation. GHRCEM, Pune is accredited by National Assessment and Accreditation Council (NAAC), Government of India. This Institute has also been granted autonomy by UGC. GHRCEM, Pune is fast emerging as a pioneering Research cum Teaching Institution molding a new generation of engineers, managers, scientists and entrepreneurs of caliber and character.

The Department of Mechanical Engineering was established in year 2006. Presently the department has well equipped laboratories, including state of art equipment's like CNC Trainer machine, CAD/CAM/CAE software etc. The department organizes Guest Lectures to students, Training services. Faculty of mechanical department organizes and participates in national/international conferences, workshops and seminars. The department has SAE, MESA, ISTE Chapters for professional growth and activities. The students of Mechanical Engineering have been recruited by renowned companies like Engineers India Limited, Infosys, NTPC, Tata Motors etc. They have also brought laurels to the department by winning various competitions of national level (BAJA SAE, SUPRA) co-curricular and extracurricular activities like paper presentations, projects, quizzes, sports etc. The department has organized National and International conference during NCRDME 2012-13, ICRAME 2014-15, NCRDME 2016-17. Department has approved Ph.D. research Centre w.e.f. 2014 under UOP Pune. The Institute offers a fulltime programme of 4-years in Mechanical Engineering and the Programme offered list is given below:

Program Offered

Sr. No.	Programme Level	Name of Course	Course Type	Medium of Instruction	Course Establishment	Sanctioned Intake
1	UG B. Tech	1st year	Regular Shift	English	2006-2007	120
		Direct 2nd year	Regular Shift	English	2007-2008	60
2	PG M. Tech	Heat Power	Regular Shift	English	2011-2012	18
		CAD CAM	Regular Shift	English	2014-2015	24
3	Ph. D	Mechanical	Regular Shift	English	2014-2015	-

INSTITUTE VISION AND MISSION

VISION

To achieve excellent standards of quality education by keeping pace with rapidly changing technologies and create technical manpower of global standards with capabilities of accepting new challenges

MISSION

Our efforts are dedicated to impart quality and value based education to raise satisfaction level of all stake-holders. Our strength is directed to create competent professionals. Our endeavour is to provide all possible support to promote research and development activities

DEPARTMENT VISION AND MISSION

VISION

To produce excellent Mechanical Engineering graduates to cater the needs of industries to face Research challenges

MISSION

Our efforts are dedicated towards

1. To imparting quality education through strengthening teaching learning process.
2. Creating competency in core Mechanical Engineering and Computer Aided Engineering.
3. To prepare students for accepting industrial and research challenges through project based learning.
4. To prepare professional engineers having lifelong learning ability and ethical values towards society and environment.

Engineering Management Law Schools Other Courses
NAGPUR PUNE JALGAON AMRAVATI AHMEDNAGAR CHHINDWARA
RAISONI GROUP OF INSTITUTIONS

Programme Educational Objectives (PEOs)

The graduate shall

1. Demonstrate core mechanical engineering skills to solve industrial problems.
2. Be able to apply analytical and soft skills while serving the industry and society at large.
3. Be able to deliver professional duties and responsibility in team effectively.
4. Be able to demonstrate lifelong abilities and ethical values looking at environmental issues.

Program Specific Objectives (PSOs)

At the end of graduation:

1. Able to grasp comprehensive and apply the knowledge of mechanical engineering acquired through core courses of engineering.
2. Will be able to apply design, develop and manufactures skills to solve the real life problems associated with industries.
3. Able to use knowledge of soft skills like software tools and multidisciplinary skills to modify and develop new products.

G. H. RAISONI COLLEGE OF ENGINEERING & MANAGEMENT
PUNE

Engineering Management Law Schools Other Courses
NAGPUR PUNE JALGAON AMRAVATI AHMEDNAGAR CHHINDWARA
RAISONI GROUP OF INSTITUTIONS

Program Outcomes (POs)

Engineering Graduates will be able to:

1. **Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
2. **Problem analysis**: Identify, formulate, review research literature, and analyse complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
3. **Design/development of solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
4. **Conduct investigations of complex problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
5. **Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.
6. **The engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
7. **Environment and sustainability**: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
8. **Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
9. **Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
10. **Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
11. **Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
12. **Life-long learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

Engineering Management Law Schools Other Courses
NAGPUR PUNE JALGAON AMRAVATI AHMEDNAGAR CHHINDWARA
RAISONI GROUP OF INSTITUTIONS

Course Code

B. TECH. MECHANICAL ENGINEERING S.Y-SEMESTER-III

S. N.	Course Code	Course Name	Scheme	Subject	Elective	Offer
1	BEML202	ENGINEERNG MATHEMATICS-III	UG Mechanical Engineering 2016 [Autonomous]	Theory	No	Yes
2	BMEL201	Machine Drawing		Theory	No	Yes
3	BMEP201	Computer Aided Machine Drawing		Practical	No	Yes
4	BMEL202	Fluid Mechanics		Theory	No	Yes
5	BMEP202	Fluid Mechanics		Practical	No	Yes
6	BMEL203	Materials Engineering		Theory	No	Yes
7	BMEP203	Materials Engineering		Practical	No	Yes
8	BMEL204	Kinematics of Machines		Theory	No	Yes
9	BMEL205	Engineering Thermodynamics		Theory	No	Yes
10	BMEP205	Engineering Thermodynamics		Practical	No	Yes
11	MBL102	General Proficiency-II		Audit Course	No	Yes

G. H. RAISONI COLLEGE OF ENGINEERING & MANAGEMENT
PUNE

Engineering Management Law Schools Other Courses
NAGPUR PUNE JALGAON AMRAVATI AHMEDNAGAR CHHINDWARA
RAISONI GROUP OF INSTITUTIONS

Course Code

B. TECH. MECHANICAL ENGINEERING S.Y-SEMESTER-IV

S.NO	COURSE CODE	COURSE NAME	SCHEME	SUBJECT	ELECTIVE	OFFER
1	BEML212	Applied Numerical Methods and Optimization	UG Mechanical Engineering 2016 [Autonomous]	Theory	No	Yes
2	BEMP212	Applied Numerical Methods and Optimization		Practical	No	Yes
3	BMEL206	Mechanics of Material		Theory	No	Yes
4	BMEL207	Manufacturing Process-I		Theory	No	Yes
5	BMEP207	Manufacturing Process-I		Practical	No	Yes
6	BMEL208	Mechatronics		Theory	No	Yes
7	BMEP208	Mechatronics		Practical	No	Yes
8	BMEL209	Fluid Machinery		Theory	No	Yes
9	BMEP209	Fluid Machinery		Practical	No	Yes
10	BMEP210	Industrial safety practices and work culture		Audit Course	No	Yes
11	MBL103	General Proficiency-III		Audit Course	No	Yes

Engineering Management Law Schools Other Courses
NAGPUR PUNE JALGAON AMRAVATI AHMEDNAGAR CHHINDWARA
RAISONI GROUP OF INSTITUTIONS

Department of Mechanical Engineering

S. Y. B. Tech.

Course Structure and Scheme of Examinations for S. Y. B. Tech.														
SEMESTER-III														
Sub. Code	**Name of the Course**	**Teaching Scheme (Hrs/Week)**				**Credits**	**Evaluation Scheme**						**Duration of Exam**
							Theory			**Practical**		**Total**	**Hours**
		TH	**TU**	**PR**	**Total**		**TAE**	**CAE**	**ESE**	**Int.**	**Ext**		
BEML202	Engineering Mathematics-III	3	1	-	4	**4**	20	20	60	-	-	100	3
BMEL201	Machine Drawing	3	-	-	3	**3**	20	20	60	-	-	100	3
BMEP201	Computer Aided Machine Drawing	-	-	2	2	**1**	-	-	-	25	-	25	-
BMEL202	Fluid Mechanics	3	-	-	3	**3**	20	20	60	-	-	100	3
BMEP202	Fluid Mechanics			2	2	**1**	-	-	-	-	25	25	-
BMEL203	Materials Engineering	3	-	-	3	**3**	20	20	60	-	-	100	3
BMEP203	Materials Engineering	-	-	2	2	**1**	-	-	-	25	-	25	-
BMEL204	Kinematics of Machines	3	1	-	4	**4**	20	20	60	-	-	100	3
BMEL205	Engineering Thermodynamics	3	-	-	3	**3**	20	20	60	-	-	100	3
BMEP205	Engineering Thermodynamics	-	-	2	2	**1**	-	-	-	-	25	25	-
MBL102	General Proficiency-II	1	-	2	3	**Audit Course**	-	-	-	G	-	-	-
	TOTAL	**18**	**2**	**10**	**30**	**24**	**120**	**120**	**360**	**50**	**50**	**700**	**-**

TAE – Teachers Assessment Evaluation
CAE – Class Assessment Examination
ESE – End Semester Examination
Cont. Ass – Continuous Assessment

Th - Theory
Tu – Tutorial
Pr – Practical
Ext – External

*TAE will be based on Home Assignment, Seminar, Quiz, Surprise Test, Group Discussion, Debate, General Behavior, Attentiveness and Attendance

Engineering Management Law Schools Other Courses
NAGPUR PUNE JALGAON AMRAVATI AHMEDNAGAR CHHINDWARA
RAISONI GROUP OF INSTITUTIONS

Course Structure and Scheme of Examinations for S. Y. B. Tech.

SEMESTER-IV

Sub. Code	Name of the Course	Teaching Scheme				Credits	Evaluation Scheme						Duration of Paper
							Theory			Practical		Total	Hours
		TH	TU	PR	Total		TAE	CAE	ESE	Int.	Ext		
BEML212	Applied Numerical methods & Optimization	3	-	-	3	3	20	20	60	-	-	100	3
BEMP212	Applied Numerical methods & Optimization	-	-	2	2	1	-	-	-	25	25	50	-
BMEL206	Mechanics of Material	3	1	-	4	4	20	20	60	-	-	100	3
BMEL207	Manufacturing Process-I	3	-	-	3	3	20	20	60	-	-	100	3
BMEP207	Manufacturing Process-I	-	-	2	2	1	-	-	-	25	-	25	-
BMEL208	Mechatronics	3	-	-	3	3	20	20	60	-	-	100	3
BMEP208	Mechatronics	-	-	2	2	1	-	-	-	25	25	50	-
BMEL209	Fluid Machinery	4	-	_-	4	4	20	20	60	-	-	100	3
BMEP209	Fluid Machinery		-	2	2	1	-	-	-	-	25	25	-
BMEP210	Industrial safety practices and work culture	1	-	2	2	Audit Course	-	-	-	G	-	-	-
MBL103	General Proficiency-III	-	-	2	2	Audit Course	-	-	-	G	-	-	-
	TOTAL	**16**	**1**	**12**	**29**	**21**	**100**	**100**	**300**	**75**	**7 5**	**650**	**-**

TAE – Teachers Assessment Examination

CAE – Class Assessment Examination

ESE – End Semester Examination

Cont. Ass – Continuous Assessment

Th - Theory

Tu – Tutorial

Pr – Practical

Ext –Externa

*TAE will be based on Home Assignment, Seminar, Quiz, Surprise Test, Group Discussion, Debate, General Behavior, Attentiveness and Attendance

Engineering Management Law Schools Other Courses
NAGPUR PUNE JALGAON AMRAVATI AHMEDNAGAR CHHINDWARA
RAISONI GROUP OF INSTITUTIONS

GROUP- I & II SEMESTER-III

Sub. Code Group-I	Name of the Course Group-I	Teaching Scheme Th.	Tu.	Pr.	Total	Credits	Evaluation Scheme Theory TAE (20)	CAE (20)	ESE (60)	Practical Con .Ass	Ext. Oral	Total	Duration Of	Sub. Code Group-II	Name of the Course Group-II
BEML202	Engineering Mathematics-III	3	1	-	4	4	20	20	60	-	-	100	3	BEML202	Engineering Mathematics-III
BMEL201	Machine Drawing	3	-	-	3	3	20	20	60	-	-	100	3	BMEL201	Machine Drawing
BMEP201	Computer Aided Machine Drawing	-	-	2	2	1	-	-	-	25	-	25	-	BMEP201	Computer Aided Machine Drawing
BMEL202	Fluid Mechanics	3	-	-	3	3	20	20	60	-	-	100	3	BMEL202	Fluid Mechanics
BMEP202	Fluid Mechanics			2	2	1	-	-	-	-	25	25	-	BMEP202	Fluid Mechanics
BMEL203	Materials Engineering	3	-	-	3	3	20	20	60	-	-	100	3	BMEL207	Mechanics of Material
BMEP203	Materials Engineering	-	-	2	2	1	-	-	-	25	-	25	-	BMEL208	Manufacturing Process I
BMEL204	Kinematics of Machines	3	1	-	4	4	20	20	60	-	-	100	3	BMEP208	Manufacturing Process I
BMEL205	Engineering Thermodynamic	3	-	-	3	3	20	20	60	-	-	100		BMEL205	Engineering Thermodynami
BMEP205	Engineering Thermodynamic	-	-	2	2	1	-	-	-	-	25	25	-	BMEP205	Engineering Thermodynami
MBL102/ MBL103	General Proficiency -II/ General Proficiency -III — II	1	-	2	3	Audit Course	-	-	-	G	-	-	-	II MBL102/	General Proficiency-II/ General Proficiency-III
	III	-	-	2	2	Audit Course	-	-	-	G	-	-	-	III MBL103	
	Total	**18**	**2**	**10**	**30**	**24**	**120**	**120**	**360**	**50**	**50**	**700**	-		

TAE – Teachers Assessment Evaluation
CAE – Class Assessment Examination
ESE – End Semester Examination
Cont. Ass – Continuous Assessment

Th - Theory
Tu – Tutorial
Pr – Practical
Ext – External

*TAE will be based on Home Assignment, Seminar, Quiz, Surprise Test, Group Discussion, Debate, General Behaviour, Attentiveness and Attendance

PUNE

Engineering Management Law Schools Other Courses
NAGPUR PUNE JALGAON AMRAVATI AHMEDNAGAR CHHINDWARA
RAISONI GROUP OF INSTITUTIONS

GROUP-I & II SEMESTER-IV

Sub. Code Group-I	Name of the Course Group-I		Teaching Scheme Th.	Tu.	Pr.	Total	Credits	Evaluation Scheme T TAE (20)	CAE (20)	ESE (60)	Practical Cont Ass.	Ext. Oral	Total	Duration		Sub. Code Group-II	Name of the Course Group-II
BEML212	Applied Numerical methods & Optimization		3	-	-	3	3	20	20	60	-	-	100	3		BEML212	Applied Numerical methods & Optimization
BEMP212	Applied Numerical methods & Optimization		-	-	2	2	1	-	-	-	25	25	50	-		BEMP212	Applied Numerical methods & Optimization
BMEL208	Mechatronics		3	-	-	3	3	20	20	60	-	-	100	3		BMEL208	Mechatronics
BMEP208	Mechatronics		-	-	2	2	1	-	-	-	25	25	50			BMEP208	Mechatronics
BMEL209	Fluid Machinery		4	-	-	4	4	20	20	60	-	-	100	3		BMEL209	Fluid Machinery
BMEP209	Fluid Machinery		-	-	2	2	1	-	-	-	-	25	25			BMEP209	Fluid Machinery
BMEP210	Industrial safety practices and work culture		1	-	2	3	Audit Course	-	-	-	G	-	-			BMEP210	Industrial safety practices and work
BMEL206	Mechanics of Material		3	1	-	4	4	20	20	60	-	-	100	3		BMEL203	Materials Engineering
BMEL207	Manufacturing Process-I		3	-	-	3	3	20	20	60	-	-	100	3		BMEP203	Materials Engineering
BMEP207	Manufacturing Process-I		-	-	2	2	1	-	-	-	25	-	25	-		BMEL204	Kinematics of
MBL103/ MBL102	General Proficiency-III/ General Proficiency-II	III	-	-	2	2	Audit Cours	-	-	-	G	-	-		III	MBL102/ MBL103	General Proficiency-II/ General Proficiency-
		II	1	-	2	3	Audit Course	-	-	-	G	-	-		II		
	Total		**18**	**1**	**12**	**30**	**21**	**100**	**100**	**300**	**75**	**75**	**650**				

TAE – Teachers Assessment Evaluation
CAE – Class Assessment Examination
ESE – End Semester Examination
Cont. Ass – Continuous Assessment

Th - Theory
Tu – Tutorial
Pr – Practical
Ext – External

*TAE will be based on Home Assignment, Seminar, Quiz, Surprise Test, Group Discussion, Debate, General Behavior, Attentiveness and Attendance

Engineering Management Law Schools Other Courses
NAGPUR PUNE JALGAON AMRAVATI AHMEDNAGAR CHHINDWARA
RAISONI GROUP OF INSTITUTIONS

Department of Mechanical Engineering

Detailed Syllabus

S. Y. B. Tech.

Semester-III

Engineering Management Law Schools Other Courses
NAGPUR PUNE JALGAON AMRAVATI AHMEDNAGAR CHHINDWARA
RAISONI GROUP OF INSTITUTIONS

BEML202: ENGINEERING MATHEMATICS-III		
Teaching Scheme	**Credit**	**Examination Scheme**
Lectures: 03 Hr/Week **Tutorials: 01** Hr /Week **Practical:** -NA-	**04**	**TAE : 20** Marks **CAE : 20** Marks **ESE : 60** Marks

Prerequisite (if any): Applied Mathematics – I,II

Course Objectives

1. To introduce the concepts of Laplace transforms, Fourier series. Partial differential equations, Matrices, Numerical methods and Z Transform.
2. To explain the physical significance and applications of above mathematical tools in mechanical engineering.

Course Outcome: On completion of the course, student will be able to

1. Apply the various methods in differential calculus, vector calculus, to solve the complex mechanical engineering problems
2. Understand the root concepts of mathematics required for the analysis of problems in in mechanical engineering problems.
3. Develop the mathematical modelling to solve mechanical engineering applications.
4. Apply the advance tool like MATLAB to solve the complex engineering problems.

Course Contents	**Hrs**
Unit–I: LINEAR DIFFERENTIAL EQUATION (LDE) & APPLICATION: LDE of n^{th} order with constant coefficients, Method of variation of parameters, Cauchy's & Legendre's Differential Equations, Simultaneous & Symmetric simultaneous Differential Equations. Modelling of mass spring systems	7
U[illegible]ERENTIAL EQUATION AND IT'S A[illegible] Partial Differential Equation of first order and first degree Lagrange's form, linear homogenous equations of higher order with constant coefficients. Method of separation of variable application to transmission line Modelling of vibrating string, Wave equation, one and two dimensional Heat Flow equations.	7
Unit–III: LAPLACE TRANSFORMS Laplace transformer and their simple properties, simple application of Laplace transform to solve ordinary differential equation including simultaneous equations, salutation of one dimensional partial differential equation by transform method.	7

Engineering Management Law Schools Other Courses
NAGPUR PUNE JALGAON AMRAVATI AHMEDNAGAR CHHINDWARA
RAISONI GROUP OF INSTITUTIONS

Unit–IV: FOURIER TRANSFORM	**7**
Introduction, The Fourier theorem, exponential form: Fourier series, integral theorem, Fourier transform and continues spectra.	
Unit–V: VECTOR CALCULAS	**7**
Physical interpretation of vector diff. Vector diff. operator Gradient, Divergent, Curl. Directional derivative, solenoid, Irrotational and conservative field. Scaler potential. Liner surface and volume integral, work done, Green theorem, Gauss Divergence theorem, Stokes theorem.	
UNIT – VI : COMPLEX VARIABLE	**7**
Functions of Complex Variable ,Analytic function, Cauchy –Riemann equations ,conformal mapping , Bilinear Transformation	
Guidelines for Tutorial	
Tutorial shall be engaged in two batches (batch size of 30-40 students maximum) per division.	
Tutorial shall consist of 10-12assignments (two per each unit) which are not covered in Lectures.	

Text Books

1. Grewal, B.S, Higher Engineering Mathematics, Thirty Eighth Edition, Khanna Publishers, 2004.
2. Higher Engineering mathematics, B.V. Ramana-2005

Reference Books

1. Jain, R.K. and Iyengar, S.R.K, Advanced Engineering Mathematics, Third Edition, NEW DELHI Narosa Publishers, 2007.
2. Higher Engineering Mathematics. Green berg -2006
3. Kreyszig, E., Advanced Engineering Mathematics, Eighth Edition, John Wiley & Sons, 2000.
4. N. P. Bali and Manish Goyal: A Text Book of Engineering Mathematics, Laxmi Publishers,7th Ed., 2010
5. H. K. Dass and Er. RajnishVerma: "Higher Engineering Mathematics", S. Chand publishing, 1st edition, 2011.

Engineering Management Law Schools Other Courses
NAGPUR PUNE JALGAON AMRAVATI AHMEDNAGAR CHHINDWARA
RAISONI GROUP OF INSTITUTIONS

BEML201: MACHINE DRAWING			
Teaching Scheme	**Credit**	**Examination Scheme**	
Lectures: 03 Hr/Week **Tutorials: Nil** **Practical:** 02 Hr/Week	**03** **01**	**Theory :** **TAE : 20** Marks **CAE : 20** Marks **ESE : 60** Marks	**Practical:** **Internal Assessment:** 25 Marks **External** :Nil
Prerequisite (if any): Engineering Graphics			
Course Objectives			
1. To study the basics of engineering drawing in mechanical engineering and applications.			
2. To study design data and for selection of standard components.			
3. To provide the exposure to the orthographic and sectional views with dimensions.			
4. To understand the principles and techniques of assembly drawing.			
5. To be able to read production drawing with different geometrical features.			
Course Outcome: On completion of the course, student will be able to			
1. Apply basic knowledge of engineering drawing and convert the 2-dimensional components into 3-dimensional Object.			
2. Apply basic knowledge of working of components and convert the part drawing into the assembly drawing.			
3. Understand the use of ISI standards and handbook to represent machine components.			
4. Draw the production drawing of machine components by mentioning tolerances on the same and produce part list and process planning sheet.			
5. Create and model the machine components using advanced CAD tools.			
6. Apply the knowledge of machine drawing to conduct the project			

Course Contents	**Hrs**
UNIT I DRAWING STANDARDS BIS Specification-Welding symbols, Machining Symbols, Surface Finish Symbols, Heat Treatment, Manufacturing Instructions, Fits and Tolerance allocation for mating parts-tolerance data sheet - tolerance table preparation - Geometric Tolerance and Allowance. Indicating on the drawing of position, as per standard and as per prevalent in industry	**6**
UNIT II INTERPRETATION OF ORTHOGRAPHIC PROJECTION Orthographic Projections of elements, Sectional Multiple-Missing views, Profiles, Cross Sections, References, Alignment &Dimensioning.	**6**
UNIT III STANDARD PRACTICES AND STUDY FOR FOLLOWING ELEMENTS	**6**

Engineering Management Law Schools Other Courses
NAGPUR PUNE JALGAON AMRAVATI AHMEDNAGAR CHHINDWARA
RAISONI GROUP OF INSTITUTIONS

(EXCLUDING DESIGN CALCULATIONS)	
Reference to Hand Book for selection of Standard Components like – Bolts , Washers, rivets, Welds, Keys and Keyways, Splines, Couplings, Cotter joints, Fabrication Bolts	
UNIT IV ASSEMBLY DRAWING	**7**
Principles, Techniques, Types and Standards for Preparation of assembled views given parts details - couplings: flange, universal - Bearing: footstep, Plummer block - Lathe tailstock - Stop valves, Screw Jack – etc.	
UNIT V PRODUCTION DRAWING	**7**
Elements of production drawing Information (Plates, Part list, Formats) on: tolerances, manufacturing methods, Production planning Sheet, Process planning Sheet.	
UNIT VI Computer Aided Drawing and Tools	**8**
Introduction – solid modeling, introduction to Graphical User Interface (GUI) of any commercially used solid modeling software Introduction –Parametric solid modeling – fundamentals apply/modify constraints and dimensions; transform the parametric 2-D sketch into 3D solid, feature operations.	

Text Books
1. K L Narayana, P. Kannaih , K. Venkata Reddy, 'Machine Drawing', New Age International (P)Ltd. Publishers, 3rd Edition,2006.
2. Ajeet Singh, 'Machine Drawing', Tata McGraw Hill Education, 2nd Edition, 2012.
Reference Books
1. R.K.Dhawan, 'A Textbook of Machine Drawing', S Chand & Co Ltd; 2nd Edition, 1998.
2. N. D. Bhatt , 'Machine Drawing, CharotarPublishing House, 26th Edition,1991
3. PSG College of Technology, 'Design Data Book', 1996
4. CMTI , 'Machine Tool Design Handbook', TMH,2012

PUNE

Engineering Management Law Schools Other Courses
NAGPUR PUNE JALGAON AMRAVATI AHMEDNAGAR CHHINDWARA
RAISONI GROUP OF INSTITUTIONS

BMEP201: Computer Aided Machine Drawing	
Pencil Drawing of standard assemblies with components. The students must be made to disassemble machines and take actual dimensions and prepare parts drawings, assembly drawings, exploded views and isometric views as record work. Some Machines of Interest are: Lathe Chuck, Gear Reducer, Gear Pump, Steam Stop Valve, Pneumatic Cylinder assembly, Pneumatic Valves, Centrifugal Pump Assembly, Engine Cylinder-Piston, Connection Rod And Crankshaft Assembly, I.C. Automobile Gear Box. For sheet 5, 6 and 7 use any solid modelling software (Any two is compulsory from 5, 6&7).	
Name of Practical	**Hrs.**
1. Report on Dimensioning, Symbols (Welding, Machining & Surface Finish)	**1**
2. Sheet 1 : Orthographic Projections & Missing Views, Sectional Views (Manual drawing)	**2**
3. Sheet 2 : Sketching Of Machine Components, Keys, Cotters & Coupling Joint (Manual drawing)	**2**
4. Sheet 3 & 4 : Assembling and Disassembling (manual drawing)	**4**
5. Sheet 5 : Production Drawing & Process Planning Sheets(On CAD Software)	**4**
6. Sheet 6:2-D sketching with geometrical and dimensional constraints using any commercially used solid modelling software.	**4**
7. Sheet 7: Parametric solid modelling of a machine component using various commands and features of the software.	**4**
NOTE: The examination must include:	
1. Total Assembly Test.	
2. Identifying the Missing Element of the Assembly.	
3. CAD modelling test	

Engineering Management Law Schools Other Courses
NAGPUR PUNE JALGAON AMRAVATI AHMEDNAGAR CHHINDWARA
RAISONI GROUP OF INSTITUTIONS

BMEL202: Fluid Mechanics			
Teaching Scheme	**Credit**	**Examination Scheme**	
Lectures: 03 Hr/Week **Tutorials: Nil** **Practical:** 02 Hr/Week	03 01	**Theory :** **TAE : 20** Marks **CAE : 20** Marks **ESE : 60** Marks	**Practical:** **Internal Assessment: Nil** **External** : 25 Marks

Prerequisite (if any): Engineering Mathematics, Engineering Physics

Course Objectives

1. To understand the basic fluid properties like density, specific gravity etc
2. To understand type of fluid flows, continuity equation, venturimeter, orifice meter
3. To understand the concept of boundary layer
4. To understand the momentum equation and its application to various fluid machineries
5. To study various techniques of dimensional analysis.
6. To understand the concepts of mass, momentum and energy conservation to flows.

Course Outcome: On completion of the course, student will be able to

1. Discuss the basic terms and principles of fluid properties and equations.
2. Explain working of different flow measuring devices and their applications.
3. Classify various losses in pipe flow devices in various arrangements.
4. Evaluate forces on different flow devices and blades using velocity diagrams.
5. Determine type of flows using dimensionless numbers.

Course Contents	Hrs
UNIT–I :PROPERTIES OF FLUIDS	7
Density, Specific gravity, Specific Weight, Specific Volume Dynamic Viscosity, Kinematic Viscosity, Surface tension, Capillarity ,Vapour Pressure, Compressibility Fluid pressure, Pressure head, Pressure intensity Concept of absolute vacuum, gauge pressure, atmospheric Pressure, absolute pressure. Simple and differential manometers, Bourdon pressure gauge. Concept of Total pressure on immersed bodies, center of pressure	
UNIT–II: FLUID FLOW	7
Types of fluid flows, Kinematics of fluid flow, Continuity equation, Euler's and Bernoulli's theorem and equation ,Venturimeter – Construction, principle of working, Coefficient of discharge, Derivation for discharge through venturimeter. Orifice meter – Construction, Principle of working, hydraulic coefficients, Derivation for discharge through Orifice meter Pitot tube – Construction, Principle of Working ,Current Meter, Turbine Meter, Elbow meter.	

Engineering Management Law Schools Other Courses
NAGPUR PUNE JALGAON AMRAVATI AHMEDNAGAR CHHINDWARA
RAISONI GROUP OF INSTITUTIONS

UNIT–III : FLOW THROUGH PIPES	**8**
Laws of fluid friction (Laminar and turbulent), Darcy’s equation and Chezy’s equation for frictional losses. Minor losses in pipes Hydraulic gradient and total gradient line. Hydraulic power transmission through pipe, Energy Gradient; Pipe in series and parallel ; Branched pipes; three reservoir system; Syphon; Transmission of power through pipes; Water Hammer pressure due to sudden closure of valve.	
UNIT–IV: BOUNDARY LAYER CONCEPTS:	**8**
Nominal thickness, Displacement thickness and Momentum thickness .energy of the boundary layer; Boundary layer along a long thin plate and its characteristics; Laminar boundary layer; Turbulent boundary layer; Separation of boundary layer on plane and curved surfaces. Drag & Lift: Definition of drag and lift; Flow past plates, Cylinders and sphere; Drag on sphere, cylinder and flat plate.	
UNIT–V :MOMENTUM PRINCIPLE AND ITS APPLICATION	**5**
Impulse- momentum principle, Calculation of force exerted on fixed plate, moving flat plates& curved vanes, Calculation force exerted on series of moving vanes, velocity diagrams & their analysis.	
UNIT–VI: DIMENSIONAL ANALYSIS:	**5**
Fundamental dimensions, dimensional Homogeneity, Rayleigh's method and Buckingham’s' method. Dimension less numbers and their significance. Hydraulic similitudes, Type of models, Problems related to Reynolds number & Froude number.	

Text Books

1. LalJagdish, ‘Hydraulic machines’, Metropolitan Book Co. Pvt. Ltd., 6th edition 1984
2. D.S. Kumar, ‘Fluid Mechanics and Fluid Machines’, S. K. Kataria& Sons, 4th edition 1992

Reference Books

1. Bansal R.K., ‘Fluid Mechanics and Fluid Machines’, Laxmi Publications,7th edition 2002
2. Massey B.S., ‘Mechanics of Fluids’, Van Nostrand Reinhold Co., 6th edition 1989
3. R. K. Rajput, ‘A Text book of Fluid Mechanics and Hydraulic Machines’, S. Chand Co.Ltd.,2002.
4. Modi & Seth,’ Fluid Mechanics & Fluid Machinery’, Standard Book House 2002.

Engineering Management Law Schools Other Courses
NAGPUR PUNE JALGAON AMRAVATI AHMEDNAGAR CHHINDWARA
RAISONI GROUP OF INSTITUTIONS

BMEP202: Fluid Mechanics
List of Practical (Perform any 8 experiments)
1. Pressure measurement using any two types of manometer.
2. Determination of viscosity of liquids and its variation with temperature.
3. Determination of metacentric height of floating object.
4. Laminar and Turbulent flow by Reynolds's apparatus.
5. Draw flow net using electrical analogy apparatus.
6. Verification of modified Bernoulli's equation.
7. Determination of hydraulic coefficients of Orifice meter/ Venturimeter
8. Calibration of V-notch
9. Determination of minor losses due to pipe fittings.
10. Determination of Major losses through metal & non-metal pipes.

G. H. RAISONI ... MANAGEMENT
PUNE

Engineering Management Law Schools Other Courses
NAGPUR PUNE JALGAON AMRAVATI AHMEDNAGAR CHHINDWARA
RAISONI
GROUP OF INSTITUTIONS

BMEL203: MATERIALS ENGINEERING			
Teaching Scheme	**Credit**	**Examination Scheme**	
Lectures: 03 Hr/Week **Tutorials: Nil** **Practical:** 02 Hr/Week	**03** **01**	**Theory :** **TAE : 20** Marks **CAE : 20** Marks **ESE : 60** Marks	**Practical:** **Internal Assessment:** 25 Marks **External** :Nil
Prerequisite (if any):			
Course Objectives			
1. To introduce various materials used in manufacturing metallic.			
2. To introduce & correlate between science and Engineering of metallic materials.			
3. To introduce the quantitative measurement of material properties.			
4. To introduce various techniques for enhancing the inherent characteristics of materials.			
Course Outcome: On completion of the course, student will be able to			
1. Understand basic metallic materials especially steels and cast iron.			
2. Analyse different equilibrium diagram and phase diagrams.			
3. Identify and study the microstructure of metallic materials and their concepts.			
4. Explain the fundamentals of heat treatment process and their impact on materials.			
5. Identify and compare the behaviour of materials under various mechanical testing methods			

Course Contents	**Hrs**
UNIT – I : CONSTITUTION OF ALLOYS AND PHASE DIAGRAMS	**8**
Introduction to Basic Terms (System, Phase, Variables, and Components Etc.) related to equilibrium diagram. Alloys and solid solutions, compounds. Polymorphism, Hume Ruther rules Time Temperature cooling curves, Construction of equilibrium diagrams using cooling curves, Binary phase diagrams Iso amorphous, Metallic systems completely miscible in liquid state and completely immiscible in solid-state Lever rule, equilibrium cooling, Microstructures under equilibrium cooling conditions, Eutectic, Hyper and hypoeutectic alloys and their applications.	
UNIT – II : FERROUS MATERIALS	**8**
Plain Carbon Steel and Alloy Steels a) Allotropy of Iron, Iron –Iron carbide equilibrium diagram, Invariant reactions microstructure under equilibrium cooling condition,	

Engineering Management Law Schools Other Courses
NAGPUR PUNE JALGAON AMRAVATI AHMEDNAGAR CHHINDWARA
RAISONI GROUP OF INSTITUTIONS

b) Purpose of alloying, Different alloying elements and their effect on enhancing the different characteristics, Tool steels, Stainless steel, spring steel, designation. C) Cast iron, White cast iron, Maurer Diagram, malleable cast iron, malleablizing cycle, Grey cast iron, Types of grey cast iron, Nodular cast iron., Alloy cast iron. Microstructure, properties and application of every cast iron	
UNIT – III: Study of Plastics and Composites	**7**
Introduction & Classification of Materials, Definition, Classification & characteristics of polymers, Types of polymerization, Polymer processing, Elastomers, properties and applications of engineering polymers. Properties, processing and applications of ceramic materials (WC, TIC, Al2O3), Cermets. Composite materials, Classification & Types of composite, Properties & applications, Metal matrix composite, Ceramic matrix composite, Fiber Reinforced plastic , b) Introduction to Plastics, Types, Applications. Numerical based on composite (isostress & isostrain conditions).	
UNIT – IV: Heat Treatment	**7**
a) Introduction, importance of heat treatment, Basic heat treatments such as annealing, normalizing, hardening and tempering, procedure, allied phases - martensite, retained austenite related properties, and microstructure and their co-relation. TTT diagram, construction, heat treatment based on it. Industrial application of different heat treatment process, Jominy end quench test. b) Surface Treatments based on above such as Induction hardening.	
UNIT –V: NON-FERROUS MATERIALS AND NEW GENERATION MATERIALS	**6**
Brief introduction to different nonferrous materials and study of the Aluminium and its alloy, eg. Aluminium Silicon, related phase diagram, Na modification Copper and its alloys. Introduction to nano materials, Smart materials, high temperature smart materials, properties and relevant applications.	
UNIT –VI: TESTING OF MATERIALS	**6**
Need of testing, Destructive and non-destructive testing Mechanical testing, Tensile test, Impact test Izod and Charpy test Hardness measurement, Rockwell , Brinell hardness, micro hardness. Magnetic particle inspection and applications of hardness testing. Advanced testing Methods.	
Text Books: (Book Title, Name of the author, name of the Publisher, edition, year of publication)	
1. Introduction to Physical Metallurgy by S. H. Avener McGraw Hill Publication,,2001	
2. Engineering Physical Metallurgy & Heat Treatment, Lakhtin Y.; 6th Ed; Mir Publishers, 1998	
3. George Ellwood Dieter, Mechanical Metallurgy, McGraw-Hill.	

Engineering Management Law Schools Other Courses
NAGPUR PUNE JALGAON AMRAVATI AHMEDNAGAR CHHINDWARA
RAISONI GROUP OF INSTITUTIONS

Reference Books
1. Metallurgy for Engineers, Rollason E.C.;Edward Arnold publications.
2. Introduction to Engineering Metallurgy, Grewal B.K
3. William D. Callister, Material science and Engineering and Introduction, Wiley, 2006.
4. V. Raghavan, Materials Science and Engineering, , PHI, 2002

BMEP203: Materials Engineering
List of Practical (Perform any eight)
1. A) Study & Demonstration of Specimen Preparation for microscopic examination. B) Study of Optical Metallurgical microscope. C) Study and Drawing of Microstructure of Steels of various compositions.
2. A) Study and Drawing of Microstructure of Cast Irons B) Study and Drawing of Microstructure of Non Ferrous Metals.
3. Heat treatment of Plain Carbon Steel and determination of relative hardness.
4. Study and Drawing of Microstructure of Heat Affected Zone in Welding.
5. Jominy End Quench Test for hardenability.
6. Impact Test
7. Vickers Hardness Test
8. Brinell & Poldi Hardness Test
9. Magnetic Particle & Dye Penetrant Test
10. Stress-strain diagram for Ductile and Brittle specimen under tensile test
11. Open Ended Experiment: Torsional Testing of circular shafts

Note: Out of above 12, any 8 Practical's should be conducted. Out of above, experiment number 1, 2,5,6,8 are compulsory.

Engineering Management Law Schools Other Courses
NAGPUR PUNE JALGAON AMRAVATI AHMEDNAGAR CHHINDWARA
RAISONI GROUP OF INSTITUTIONS

BMEL204: KINEMATICS OF MACHINES		
Teaching Scheme	**Credit**	**Examination Scheme**
Lectures: 03 Hrs/Week **Tutorials: 1 Hr/Week**	**04**	**TAE : 20** Marks **CAE : 20** Marks **ESE**: **60** Marks

Prerequisite (if any): Basics of Mechanical Engineering, Engineering Mechanics

Course Objectives
1. To understand basic concepts of different mechanisms and its applications to various fields.
2. To develop competency in graphical and analytical methods in solving problems of quantitative Kinematic analysis of mechanism.
3. To make students conversant with Concepts of cam mechanism
4. To make the students conversant with basic concepts of gears, its applications and torque analysis
5. To develop analytical competency in designing efficiency of various gears
6. To make the students conversant with static force analysis and synthesis of mechanism.
Course Outcome: On completion of the course, student will be able to
1. Illustrate the fundamental concepts of mechanism of machines and its applications.
2. Apply the principles and theories of graphical and analytical methods for mechanism of mechanical systems.
3. Analyse the different types of forces acting on the mechanism of CAM & Followers, and Various Gears.
4. Explain applications of various gears and its applications

Course Contents	**Hrs**
Unit I Introduction to Mechanism	**7**
Basic concept of mechanism, link, kinematic pairs, kinematic chain, mechanism, machine, simple and compound chain, Degree of freedom, estimation of degree of freedom of mechanism by Grubbler's criterion and other methods. Harding's notations, classification of four bar chain [class – I & class – II], inversion of four–bar–chain, Kutch Bach theory of multiple drives.	
Unit II Velocity and Acceleration analysis	**7**
Quantitative kinematic analysis of mechanism :- Displacement, Velocity and Acceleration analysis of planer mechanism by graphical method as well as analytical method [complex number method / matrix method']Coriolis component of acceleration, Instantaneous centre method, Kennedy's theorem	
Unit III Cam & Follower	**7**
Concepts of cam mechanism, comparison of cam mechanism with linkages. Types of cams and followers and applications. Synthesis of cam for different types of follower motion like	

Engineering Management Law Schools Other Courses
NAGPUR PUNE JALGAON AMRAVATI AHMEDNAGAR CHHINDWARA
RAISONI GROUP OF INSTITUTIONS

constant velocity, parabolic, SHM, cycloidal etc. Pressure angle in cam, parameters affecting cam performance.	
Unit IV Spur Gear	**7**
Concept of motion transmission by toothed wheels, comparison with cams and linkages, various tooth profiles, their advantages and limitations, gear tooth terminologies, concept of conjugate action, law of conjugate action, kinematics of involutes gear tooth pairs during the contact duration, highlighting locus of the point of contact, arc of contact, numbers of pairs of teeth in contact, path of approach and path of recess, interference, undercutting for involutes profile teeth	
Unit V Helical ,Bevel & Worm gear	**7**
Kinematics of helical, bevel, spiral, worm gears, rack and pinion gears, kinematic analysis, and torque analysis of simple Epicyclic and double Epicyclic gear trains, (Numerical)	
Unit VI Static force analysis	**7**
Static force Analysis: Free body diagram, condition of equilibrium. Analysis of all links of given linkage, cam, gear mechanism and their combinations without friction. Introduction to coupler curves, Robert's Law of cognate linkages. Synthesis of four bar chain for gross motion, transmission angle optimization. Frudenstein equation and its application for function generation.	
Kinematics of Machines Tutorials:	
Tutorials to be submitted in the form of Journal: (Study any Five of the following)	Hrs.
1. Draw (any 4) configurations of mechanisms and determine types of pairs, links, degree of freedom.	2
2. Two problems on velocity and acceleration analysis using relative velocity and acceleration method.	2
3. Two problems on velocity and acceleration analysis using relative velocity and acceleration method involving Coriolis component.	2
4. To draw the cam profiles and study the effect of (a) Different follower motions. (b) Different follower (roller) dimensions	2
5. To study various types of gearboxes- constant mesh, sliding mesh, synchromesh gear box, Industrial gearbox, differential gearbox.	2
6. Kinematic analysis of transmission system of any machine such as automobile/ machine tool	2

Engineering Management Law Schools Other Courses
NAGPUR PUNE JALGAON AMRAVATI AHMEDNAGAR CHHINDWARA
RAISONI GROUP OF INSTITUTIONS

Text Books: (Book Title, Name of the author, name of the Publisher, edition, year of publication)
1. "Theory of Machines", Rattan S.S, Tata McGraw-Hill Publishing Company Ltd., New Delhi, and 2 nd edition -2005.
2. "Theory of Machines", Sadhu Singh, Pearson Education (Singapore) Pvt. Ltd., Indian Branch, New Delhi, 2 ND Edi. 2006.
3. J.S. Rao & Dukki Patti, 'Mechanism and Machine Theory'
Reference Books
1. "Theory of Machines & Mechanisms" ,Shigley. J. V. and Uickers, J.J., OXFORD University press.2004
2. "Theory of Machines -I", by A. S. Ravindra, Sudha Publications, Revised 5th Edi. 2004.
3. Ghosh and Malik, 'Theory of Mechanism and Machine'
4. Theory of Machines and Mechanism by John Uiker, Garden Pennock& Late. J. F. shigley

Engineering Management Law Schools Other Courses
NAGPUR PUNE JALGAON AMRAVATI AHMEDNAGAR CHHINDWARA
RAISONI GROUP OF INSTITUTIONS

BMEL205: ENGINEERING THERMODYNAMICS

Teaching Scheme	Credit	Examination Scheme	
Lectures: 03 Hr/Week **Tutorials: Nil** **Practical:** 02 Hr/Week	**03** **01**	**Theory :** **TAE : 20** Marks **CAE : 20** Marks **ESE : 60** Marks	**Practical:** **Internal Assessment:** Nil **External** : 25 Marks

Prerequisite (if any):

1. Engineering Mathematics
2. Engineering Physics/chemistry
3. Basic Mechanical Engineering

Course Objectives
1. Identify the unique vocabulary associated with thermodynamics through the precise definition of Basic concepts
2. To form a sound foundation for the development of the scientific principles
3. Review the English and the metric SI Unit systems that will be used throughout the text
4. Explain the basic concepts of thermodynamics such as system, state, state postulate, equilibrium, Process, cycle, energy, and various forms of energy such as system, state, state postulate, equilibrium, process, cycle, energy, and various forms of energy
5. Review concepts of temperature, temperature scales, pressure, and absolute and gage pressure
6. Introducing basics of ideal and real gases, steam formation, basic laws of thermodynamics and their properties.
7. Introduce an intuitive systematic problem- solving technique that can be used as a model in solving engineering problem

Course Outcome: On completion of the course, student will be able to
1. Define basic concepts and properties of thermodynamics.
2. Explain laws of thermodynamics and their applications.
3. Calculate the performance of power cycles used in various applications.
4. Analyse gas power cycles and processes.
5. Compare features of real gas, steam formation and their T-S and H-S diagrams with reference to their performance

Course Contents	**Hrs**
Unit I: BASIC CONCEPTS AND PROPERTIES	**6**

Engineering Management Law Schools Other Courses
NAGPUR PUNE JALGAON AMRAVATI AHMEDNAGAR CHHINDWARA
RAISONI GROUP OF INSTITUTIONS

Introduction, thermodynamic system, control volume, macroscopic and microscopic approaches, properties and state of a system, point and path functions, thermodynamic equilibrium, processes and cycles, quasi-static process, properties such as specific volume, pressure, temperature, zeroth law of thermodynamics, temperature scales	
Unit II: IDEAL GASES AND VAPORS	**7**
Difference between gases and vapors, ideal gases, gas laws, equation of state, gas constant, universal gas constant, work and heat, definition of work, thermodynamic work, work in compressible system, work-a path function, work done during various processes, p-diagram, definition of heat, heat transfer a path function, comparison of heat and work, Phase change process of a pure substance: specific heats, sensible heat and latent heat, triple point, critical point, superheat and total heat of steam	
Unit III:FIRST LAW OF THERMODYNAMICS	**8**
Energy of systems, classification of energy, law of conservation of energy, first law appliedto closed system undergoing a cycle, Joule experiment, energy-a property of system, internal energy: a function of temperature, enthalpy, specific heat at constant volume and constant pressure, change in internal energy and heat transfer During various non-flow processes. First law applied to flow processes: steady-state steady flow process, mass balance and energy balance in steady flow process, steady flow energy equation and its application to nozzles and Diffusers, throttling valve, turbines and compressors, pumps, heat exchangers etc. Work done and heat transfer during steady flow processes.	
Unit IV: SECOND LAW OF THERMODYNAMICS	**8**
Limitations of first law, heat engines, refrigerators and heat pumps, Kelvin-plank and Clausius statements, their equivalence, reversible and irreversible processes, factors that render Processes irreversible, Carnot cycle, perpetual motion machine. Thermodynamic scale, reversed Carnot cycle, COP of heat pump and refrigeration. Entropy: Inequality of Clauses, entropy: a property of system, entropy change for ideal gases, entropy change of a system during irreversible process, lost work, principle of increase of entropy	
Unit V: THERMODYNAMIC PROCESSES AND POWER CYCLES	**7**
Thermodynamic processes: Constant volume, isothermal, adiabatic, polytrophic Processes, throttling and free expansion- p-v and T-s diagrams-work done, heat exchanged, change in internal energy, Availability and irreversibility. Gas power cycles: Otto cycle, Diesel cycle, semi-Diesel, Sterling cycles, their efficiency and mean effective pressure calculations, Dual cycle, Ericsson cycle	

Engineering Management Law Schools Other Courses
NAGPUR PUNE JALGAON AMRAVATI AHMEDNAGAR CHHINDWARA
RAISONI GROUP OF INSTITUTIONS

Unit VI: VAPORS POWER CYCLES	6
Properties of steam, specific volume and entropy of steam, dryness fraction of steam, throttling of steam, determination of dryness fraction, steam tables and their use, T-s and H-s diagram, Rankine and modified Rankine cycle, work done and efficiency, specific steam consumption, comparison of Rankine and Carnot cycle, representation on P-v, T-s and h-s diagram.	

Text Books: (Book Title, Name of the author, name of the Publisher, edition, year of publication)
1. R.K Rajput, Engineering Thermodynamics, EVVS Thermo Laxmi Publication
2. P.K. Nag, Engineering Thermodynamics, Tata McGraw Hill Publicatio
3. Y V C Rao, “Chemical Engineering Thermodynamics, Universities press 1997
Reference Books
1. Y. Cengel&Boles: Thermodynamics-An Engineering approach
2. P.L Ballany : Thermal Engineering ,Khanna Publishers
3. C.P Arora: Engineering Thermodynamics, Tata Mcgraw Hill
4. S. Domkundwar, C.P Kothandaraman, And Domkundwar, Thermal Eng. Dhanpatrai

BMEP 205: Engineering Thermodynamics
List of Practical (Any six experiments of the following and two assignments)
1. Joule’s experiment
2. Trial on steam calorimeter
3. Trial on Bomb calorimeter
4. Cloud and Pour point of Lubricant
5. Flash and Fire point
6. Trial on Redwood Viscometer
7. Gas calorimeter
8. Test on carbon residue
9. Open ended Experiments: Write an application/experimental procedure to analyses/demonstrate thermodynamic concept/process/laws of Thermodynamics

Engineering Management Law Schools Other Courses
NAGPUR PUNE JALGAON AMRAVATI AHMEDNAGAR CHHINDWARA
RAISONI GROUP OF INSTITUTIONS

MBL102: GENERAL PROFICIENCY II- Foreign Language			
Teaching Scheme	**Credit**	**Examination Scheme**	
Lectures: 01 Hr/Week **Tutorials: Nil** **Practical: 2 Hrs/Week**	----	**TAE : NIL** **CAE : NIL** **ESE**: **NIL**	**Practical:** **Internal Assessment:** G **External** : Nil

Prerequisite (if any): NIL
Course Objectives
1. To learn foreign languages to improve interpersonal skills.
2. To enable improving business communications and having access to literature in globally recognized languages.
3. To help communicate at international forums and explore opportunities for employment
Course Outcome: On completion of the course, student will be able to
1. Associate effectively in more than one globally recognized language like French, Spanish, German, Japanese, etc.
2. Demonstrate comprehension of the spoken foreign language in a variety of listening situations.
3. Read and write the foreign language alphabets, their pronunciation techniques, numbers etc.
4. Offer insights into the culture and society of countries where the language is spoken
5. Understand the family and relations, Days, weeks, months, weather, etc.
6. Understand and speak in foreign language like ordering eatables in restaurant, vocabulary of food items, etc.

Topic	Learning Goals	Activities	Hrs
The Alphabets and accents	Pronunciations techniques	Worksheet and charts	1
Number 1 to 20			1
Salutations	Articles , Personal Pronoun	Day timing , Daily routines forms of respects , Vocabulary	1
Family and relations	Shapes and colors , Possessive Pronouns , Gender , Negative Sentence	Relations, Day of Week	1
Weather and Seasons	Climate , Fabrics & Clothes , sizes , interrogatives , Basic	Group Activities , Paragraph writing including , Names of	1

Engineering Management Law Schools Other Courses
NAGPUR PUNE JALGAON AMRAVATI AHMEDNAGAR CHHINDWARA
RAISONI GROUP OF INSTITUTIONS

	verbs	months , Seasons , Sky , Stars	
House & Household things	Describing neighbourhood. Present Tense	Furniture , Household articles, Colors	1
supermarket	Learning the shopping etiquettes , vocabulary of food items , conversing with shopkeepers etc	Project on vocabulary of vegetables and fruits , Bakery products , Group Activity / Role play	1
Timing , Telephonic Conversions	How to Ask time , converse on telephone	Timing and clock (Hours & Minutes)	1
Prominent places and Park	Nature, Directions, Means of transportations, Tenses contd.	Self-introductions , Role-play , preparing Charts	1
In Restaurant / Hotel	Ordering eatables , Table manner ,Verbs	Enhancing vocabulary of food Dishes , Cutlery	1
Visit to Doctor	Health matters, illness. Commonly used verbs contd.	Worksheets , projects	1
French / German /Spanish culture – monuments , delicacies , wines visa vis Indian culture Diwali festival	Vocabulary of clothes Accessories , Cuisines , Beverages , Adjectives	Presentations by students , situation based conversations	1
Receiving Guests/ Entertaining people / Good Bye"s	Customs , Traditions , Manners , welcome &Audieu"s	Activities , Role play , Assignments	1

Engineering Management Law Schools Other Courses
NAGPUR PUNE JALGAON AMRAVATI AHMEDNAGAR CHHINDWARA
RAISONI GROUP OF INSTITUTIONS

Department of Mechanical Engineering

S. Y. B. Tech.

Semester-IV

Engineering Management Law Schools Other Courses
NAGPUR PUNE JALGAON AMRAVATI AHMEDNAGAR CHHINDWARA
RAISONI GROUP OF INSTITUTIONS

Course Structure and Scheme of Examinations for S. Y. B. Tech.

SEMESTER-IV

Sub. Code	Name of the Course	Teaching Scheme				Credits	Evaluation Scheme						Duration of Paper
							Theory			Practical		Total	Hours
		TH	TU	PR	Total		TAE	CAE	ESE	Int.	Ext		
BEML212	Applied Numerical methods & Optimization	3	-	-	3	3	20	20	60	-	-	100	3
BEMP212	Applied Numerical methods & Optimization	-	-	2	2	1	-	-	-	25	25	50	-
BMEL206	Mechanics of Material	3	1	-	4	4	20	20	60	-	-	100	3
BMEL207	Manufacturing Process-I	3	-	-	3	3	20	20	60	-	-	100	3
BMEP207	Manufacturing Process-I	-	-	2	2	1	-	-	-	25	-	25	-
BMEL208	Mechatronics	3	-	-	3	3	20	20	60	-	-	100	3
BMEP208	Mechatronics	-	-	2	2	1	-	-	-	25	25	50	-
BMEL209	Fluid Machinery	4	-	_-	4	4	20	20	60	-	-	100	3
BMEP209	Fluid Machinery		-	2	2	1	-	-	-	-	25	25	-
BMEP210	Industrial safety practices and work culture	1	-	2	2	Audit Course	-	-	-	G	-	-	-
MBL103	General Proficiency-III	-	-	2	2	Audit Course	-	-	-	G	-	-	-
	TOTAL	**16**	**1**	**12**	**29**	**21**	**100**	**100**	**300**	**75**	**7 5**	**650**	**-**

PUNE

Engineering Management Law Schools Other Courses
NAGPUR PUNE JALGAON AMRAVATI AHMEDNAGAR CHHINDWARA
RAISONI GROUP OF INSTITUTIONS

Department of Mechanical Engineering

Detailed Syllabus

S. Y. B. Tech.

Semester-IV

Engineering Management Law Schools Other Courses
NAGPUR PUNE JALGAON AMRAVATI AHMEDNAGAR CHHINDWARA
RAISONI GROUP OF INSTITUTIONS

BEML212 : Applied Numerical Methods and Optimization			
Teaching Scheme	**Credit**	**Examination Scheme**	
Lectures: 03 Hr/Week **Tutorials: Nil** **Practical:** 02 Hr/Week	**03** **01**	**Theory :** **TAE : 20** Marks **CAE : 20** Marks **ESE : 60** Marks	**Practical:** **Internal Assessment:** 25 Marks **External** : 25 Marks

Prerequisite (if any):

1. Engineering Mathematics-I
2. Engineering Mathematics-II
3. Engineering Mathematics-III

Course Objectives

1. Recognize the difference between analytical and Numerical Methods.
2. Effectively use Numerical Techniques for solving complex Mechanical engineering Problems.
3. Prepare base for understanding engineering analysis software.
4. Develop logical sequencing for solution procedure and skills in soft computing.
5. Optimize the solution for different real life problems with available constraints.
6. Build the foundation for engineering research.

Course Outcome: On completion of the course, student will be able to

e appropriate Numerical Methods to solve complex mechanical engineering problems.

ply the algorithms and programming for complex mechanical engineering problems. .

nerate Solutions for real life problem using optimization techniques.

mmarize ordinary Differential Equations and Partial Differential Equations and how to apply them to gineering problems.

Course Contents	**Hrs**
Unit – I : ERRORS AND APPROXIMATIONS	**8**
Types of Errors: Absolute, Relative, Algorithmic, Truncation, Round off Error, Error Propagation, Concept of convergence-relevance to numerical methods. **Roots of Equation** Bisection Method, False position Method, Newton Raphson method and Successive approximation method	
Unit – II : SIMULTANEOUS EQUATIONS	**8**
Gauss Elimination Method, Partial pivoting, Gauss-Seidal method and Thomas algorithm for	

Engineering Management Law Schools Other Courses
NAGPUR PUNE JALGAON AMRAVATI AHMEDNAGAR CHHINDWARA
RAISONI GROUP OF INSTITUTIONS

Tridiagonal Matrix	
Unit – III : OPTIMIZATION	**8**
Introduction to optimization, Classification, Constrained optimization: Graphical and Simplex method. One Dimensional unconstrained optimization: Newton‟s Method. Modern Optimization Techniques: Genetic Algorithm (GA), Simulated Annealing (SA).	
Unit – IV : CURVE FITTING & INTERPOLATION	**8**
Curve Fitting Least square technique- Straight line, Power equation, Exponential equation and Quadratic equation. **Interpolation** Lagrange's Interpolation, Newton's Forward interpolation, Hermit Interpolation, inverse interpolation.	
Unit – V : NUMERICAL INTEGRATION	**8**
Trapezoidal rule, Simpson's Rule (1/3rd and 3/8th), Gauss Quadrature 2 point and 3 point method. Double Integration: Trapezoidal rule	
Unit – VI :Calculus of variation	**8**
Ordinary Differential Equations [ODE] Taylor series method, Euler Method, Modified Euler Method (Iterative), Runge Kutta fourth order Method, Simultaneous equations using RungeKutta2nd order method. **Partial Differential Equations [PDE]: Finite Difference methods** Introduction to finite difference method, PDEs- Parabolic explicit solution, Elliptic explicit solution	

Text Books: (Book Title, Name of the author, name of the Publisher, edition, year of publication)

1.	Advanced Engineering Mathematics", Erwin Kreyszig, John Wiley and sons, inc.
2.	"Higher Engineering Mathematics", B V Ramana, Tata McGraw-Hill, 2007.
3.	"Advanced Engineering Mathematics", R.K. Jain, S.R.K. Iyengar, Narosa Publications.

Reference Books

1.	Michael D. Greenberg; Advanced Engineering Mathematics; Pearson Education Asia
2.	Dr.B.S.Grewal; Higher Engineering Mathematics; Khanna publication ,Delhi
3.	Peter V. O'Neil; Advanced Engineering Mathematics; 5th edition, Thomson Brooks/Cole.
4.	Mathematical Methods in science and Engineering, A Datta

Engineering Management Law Schools Other Courses
NAGPUR PUNE JALGAON AMRAVATI AHMEDNAGAR CHHINDWARA
RAISONI GROUP OF INSTITUTIONS

BEMP212: Applied Numerical Methods and Optimization
List of Practical (Any six experiments of the following and two assignments)
1. Program on Roots of Equation (Validation by suitable solver, all four compulsory) a). Bisection Method, b. False position Method, c). Newton Raphson method d. Successive approximation method
2. Program on Simultaneous Equations (Validation by suitable solver, all three compulsory) a) Gauss Elimination Method, b) Thomas algorithm for tridiagonal matrix, c) Gauss-Seidal method.
3. Program on Numerical Integration(Validation by suitable solver, all four compulsory) a) Trapezoidal rule, b) Simpson's Rules (1/3rd, 3/8th) [In one program only] c) Gauss Quadrature Method- 2 point, 3 point. [In one program only] d) Double integration: Trapezoidal rule, Simpson's 1/3rdRule.
4. Program on Curve Fitting using Least square technique (Validation by suitable solver) a) Straight line, b) Power equation c) Exponential equation d) Quadratic equation
5. Program on Interpolation(Validation by suitable solver, all three compulsory) a) Lagrange's Interpolation, b) Newton's Forward interpolation, c) Inverse interpolation
6. Program on ODE(Validation by suitable solver, all three compulsory) a) Euler Method(Iterative), b) Runge-Kutta Methods- fourth order and Simultaneous equations.(Runge-Kutta 2nd order)
7. Program on PDE (Validation by suitable solver)
8. Open Ended Practical: Theory assignment on Modern Optimization techniques
1. Program on Roots of Equation (Validation by suitable solver, all four compulsory) a). Bisection Method, b). False position Method, c). Newton Raphson method d). Successive approximation method

Engineering Management Law Schools Other Courses
NAGPUR PUNE JALGAON AMRAVATI AHMEDNAGAR CHHINDWARA
RAISONI GROUP OF INSTITUTIONS

BMEL206: MECHANICS OF MATERIAL		
Teaching Scheme	**Credit**	**Examination Scheme**
Lectures: 03 Hrs/Week **Tutorials: 1 Hr/Week**	**04**	**TAE : 20** Marks **CAE : 20** Marks **ESE**: **60** Marks
Prerequisite (if any): Basics of Mechanical Engineering		
Course Objectives		
1. To teach the fundamentals of simple stresses and strains.		
2. To enhance skills in Principal stresses and strains.		
3. To imbibe the concepts of shear force and bending moment with practical exposure and applications		
4. To facilitate the concept of bending and its theoretical analysis		
5. To learn torsion of shaft		
6. To study strain energy and impact loading conditions for various applications.		
Course Outcome: On completion of the course, student will be able to		
1. Understand the basic Concepts of stress strain and their relation between them.		
2. Apply knowledge to Derive the torsion equation and their application to solve engineering problem		
3. Understand Different types of beams, columns and struts for various loading.		
4. Solve numerical problems related to SFD and BMD for different types of beams.		

Course Contents	**Hrs**
UNIT – I Stresses and Strains	**7**
Concept of simple stresses and strains: Introduction, stress, strain, types of stresses, stress – strain diagram for brittle and ductile material, elastic limit, Hooks law, modulus of elasticity. Modulus of rigidity, factor of safety, analysis of tapered rod, analysis of composite section, thermal stress and strain, thermal stresses with heat flow in cylinders and plates, Hertz's contact stresses Longitudinal strain and stress, lateral stresses and strains, Poisson's ration, volumetric stresses and strain with uni-axial, bi-axial and tri-axial loading, bulk modulus, relation between Young's modulus and modulus or rigidity, Poisson's ratio and bulk modulus. **Principal stresses and strains** :- Definition of principal planes and principal stresses, analytical method of determining stresses on oblique section when member is subjected to direct stresses in one plan in mutually perpendicular two planes, when member is subjected	

Engineering Management Law Schools Other Courses
NAGPUR PUNE JALGAON AMRAVATI AHMEDNAGAR CHHINDWARA
RAISONI GROUP OF INSTITUTIONS

to shear stress and direct stresses in two mutually perpendicular planes, Mohr's circle for representation of stresses. Derivation of maximum and minimum principal stresses and maximum shear stresses when the member is subjected to combined stress)	
UNIT – II: SFD and BMD	**8**
Shear force and bending moment: Types of beam (cantilever beam, simply supported beam, overhung beam etc.). Types of loads (Concentrated and UDL), shear force and bending moment diagrams for different types of beams subjected to different types of loads, sign conventions for bending moment and shear force, shear force and bending moment diagrams for beams subjected to couple, Relation between load, shear force and bending moment. Stresses in beams: Pure bending, theory of simple bending with assumptions and expressions for bending stress, derivation of bending equation, bending stresses in symmetrical sections, section modulus for various shapes of beam sections. Shear stresses in beams: Concept, derivation of share stress distribution formula, stress distribution diagram for common symmetrical sections, maximum and average shear stress.	
UNIT – III :Slope and Deflection	**7**
Deflection of beams: Derivation of differential equation of elastic curve with the assumptions made in it. Deflection and slope of cantilever, simply supported, overhung beams subjected to concentrated load UDL, Relation between slope, deflection and radius curvature Macaulay's method, area moment method to determine deflection of beam.	
UNIT – IV Torsion, Column and Strut	**7**
Torsion of circular shafts: Derivation of torsion equation with the assumptions made int. Torsion shear stress induced in the shaft, when it is subjected to torque. Strength and rigidity criteria. For design of shaft. Torque transmitted by solid and hollow circular shaft. Derivation of maximum, minimum principal stresses and maximum shear stress induced in shaft when it is subjected to bending moment, torque and axial load. Column and Struts: Failure of long and short column, slenderness ration, assumptions made in Euler's column theory, end conditions for column. Expression for crippling load for various end conditions if column. Effective length of column, limitations of Euler's formula, Rankine formula, Johnson's parabolic formula.	
UNIT – V Strain Energy	**5**
Strain energy and impact loading: Definition of strain energy stored in a body when it is subjected to gradually applied load, suddenly applied loads and impact loads. Strain energy	

Engineering Management Law Schools Other Courses
NAGPUR PUNE JALGAON AMRAVATI AHMEDNAGAR CHHINDWARA
RAISONI GROUP OF INSTITUTIONS

stored in bending and torsion. Castiglione’s theorem.	
UNIT – VI Theories of failure	**6**
Factor of safety, Statistical methods in determining factor of safety. Theories of failure, modes of failure, compound stresses, eccentric axial loading, variable stresses in machine parts, stress concentration and stress raisers, notch sensitivity, stress concentration factor, methods for reducing stress concentration. Goodmans criteria, Soderberg criteria, Gerber’s criteria, fatigue design for finite and infinite life of the parts subjected to variable loads.	
Mechanics of Materials- Tutorials:	
Tutorials to be submitted in the form of Journal: (Study any Four of the following)	Hrs.
1. Tension test for given material on Universal Testing Machine.	2
2. Compression test for given material on Universal Testing Machine.	2
3. Shear test of ductile material on Universal Testing Machine.	2
4. Experimental verification of flexural formula in bending for simply supported beam.	2
5. Measurement of stresses and strains in beams for different end conditions using strain gauges.	2
6. Experimental verification of torsion formula for circular bar.	2
Assignments:	
1. Shear force and bending moment diagram	
2. Shear and bending stresses	
3. Principal stresses and strains	
4. Theories of failure	

Text Books: (Book Title, Name of the author, name of the Publisher, edition, year of publication)
1. Strength of materials, S. Timoshenko and Young - CBS Publications
2. Strength of materials, R. K. Bansal - Laxmi Publications Ltd, New Delhi
3. S Ramamrutham, “Strength of Materials’ ,DhanpatRai Publication
Reference Books
1. R. K. Rajput, ‘Strength of material “,S. Chand Publications
2. F.L. Singer, ‘Strength of Materials’
3. Strength of Material, S. S. Rattan – Tata McGraw Hill Pub. Ltd.
4. L.S. Srinath, ‘Advanced Strength of Materials’- Tata McGraw Hill Pub. Ltd.

Engineering Management Law Schools Other Courses
NAGPUR PUNE JALGAON AMRAVATI AHMEDNAGAR CHHINDWARA
RAISONI GROUP OF INSTITUTIONS

BMEL207: Manufacturing Process-I			
Teaching Scheme	**Credit**	**Examination Scheme**	
Lectures: 03 Hr/Week **Tutorials: Nil** **Practical:** 02 Hr/Week	**03** **01**	**Theory :** **TAE : 20** Marks **CAE : 20** Marks **ESE : 60** Marks	**Practical:** **Internal Assessment:** 25 Marks **External** : Nil

Prerequisite (if any): Engineering Graphics

Course Objectives
1. To select appropriate manufacturing process for producing part under consideration.
2. To identify various process parameter and their effects on processes
3. To analyse and understand the metal cutting phenomenon
4. To select process parameter and tools for obtaining desired machining characteristic
5. To understand design of manufacturing processes.
6. To provide details of manufacturing operations for gears and super finishing processes
Course Outcome: On completion of the course, student will be able to
1. Identify machining parameters for a given manufacturing process.
2. Classify and select the appropriate manufacturing processes for new product development.
3. Explain the principles of foundry, metal forming and metal joining process.
4. Design and construct dies for various metal forming processes.
5. Selection and Explain the Principles of super finishing processes.

Course Contents	**Hrs**
UNIT – I :Introduction to Machining Parameters and Lathe Machine :	**7**
a) Machining Parameters : Introduction to machining, properties nomenclature and tools geometry of single point cutting tool, classification, HSS, carbide tool, coated tools, diamond coated tool, coolant materials. Multi Point cutting tool, Advanced cutting tools. b) Lathe :Introduction, type, construction of simple lathe, mechanism and attachments for various operations, machine specifications, basis for selection of cutting speed, feed and depth of cut, time estimation for turning operations such as facing, step turning, taper turning, threading, knurling, Numerical on machining time.	
UNIT – II: Drilling and Broaching Machine	**7**
a) Drilling : Introduction, tools for drilling, classification of drills, twist drills, drill size	

Engineering Management Law Schools Other Courses
NAGPUR PUNE JALGAON AMRAVATI AHMEDNAGAR CHHINDWARA
RAISONI GROUP OF INSTITUTIONS

and specifications, carbide tipped drills, type of drilling machines – portable drilling machine, bench drilling machine, upright drilling machine, radial drilling machine, universal drilling machine, multi- spindle drilling machine, Drilling machines operations, time estimation for drilling. Reaming: Introduction, description of reamers, type of reaming operations. Boring: Introduction, types of boring machine, horizontal boring machine, vertical boring machine, jig boring machine, micro boring, and boring operations. b) Broaching: Introduction, type of broaches, nomenclature of broaches and type of broaching machines	
UNIT – III : Casting Process:	7
Casting Process: Introduction, Pattern Making: Types, material used, pattern making allowances, colour code core making: types, core material & its properties. Recent development in pattern making Moulding: types of sand mould, mouldings and composition, moulding sand properties, moulding machines Gating Design: elements of gating system, pouring time, riser design, melting furnace types, electric furnace, induction furnace, cupola- construction & operation, cleaning, inspection and casting defects. Recent trends in melting. Foundry mechanism: special casting processes such as Investment casting, centrifugal casting, shell moulding, Co- moulding, slush casting, Die casting. Automation in foundry operations.	
UNIT – IV :Metal Forming Processes	7
Hot and Cold Working – Concepts and comparative study , friction and lubrication in metal forming Rolling – Types of rolling mills, power required per roll for simple single pass two rollers. (Simple Numerical). Forging – Types, process parameter, Analysis of open die forging (Numerical) Extrusion – Types, process parameter, Extrusion dies, Drawing – Wire drawing and its analysis (Numerical). Sheet Metal Working: Types of sheet metal operations, Types of dies and punches, Die design for Progressive and Drawing Die, clearance analysis, blank size determination (Numerical).	
UNIT – V: Welding and Joining Process	7
Joining Process: introduction to welding, soldering, Brazing processes. Types of welding: Arc welding, MIG, SMAW, GTAW, FCAW, Submerged arc welding, Stud welding. Resistance welding – Theory, Spot, seam and projection weld process & Gas welding	

Engineering Management Law Schools Other Courses
NAGPUR PUNE JALGAON AMRAVATI AHMEDNAGAR CHHINDWARA
RAISONI GROUP OF INSTITUTIONS

processes, defects in various joints and their remedies & inspection of welding joints, electrodes, weld ability of metals, welding equipment of fixtures.	
UNIT – VI : Grinding and Super finishing process:	**7**
a) Grinding :Grinding operations, grinding wheel, specifications and selection, cylindrical and Centre less grinding operation, surface grinding, tool and cutter grinding. b) Super Finishing Process: Honing, Lapping, polishing, buffing, metal spraying, galvanizing and electroplating. Process parameters and attainable grades of surface finish, surface roughness measurement.	

Text Books: (Book Title, Name of the author, name of the Publisher, edition, year of publication)
1. P. N. Rao, "Manufacturing Technology – Foundry, Forming, Welding", Tata McGraw Hill Publishing Co. Ltd.,New Delhi, 2nd Edition, 1998
2. A. Ghosh and A. K. Malik, "Manufacturing Science", Affiliated East West press Pvt. Ltd., New Delhi, 1985
3. S. K. Hajra Choudhary, "Elements of Workshop Technology – Vol. I & II Machine Tools", Media Promoters and Publishers Pvt. Ltd., Mumbai, 12th edition, 2007
Reference Books
1. Manufacturing Engineering and Technology – S. Kalpakjian and SR Schmid
2. Technology of machine Tools – Krar and Oswald
3. Manufacturing Processes – M Begman
4. Processes and Materials of Manufacture – R. Lindberg
5. Production Technology – HMT
6. Workshop Technology (Volume I & II) – By Bawa

BMEP207: MANUFACTURING PROCESS	
List of Practical (perform any 10 Experiment, Experiment No. 7 & 8 are compulsory)	
1.	Tools for left hand and right hand turning
2.	Tools for external and internal turning (Boring)
3.	Study of cutting tool manual (any one)
4.	Study of mechanisms in Lathe
5.	Study of mechanism in drilling
6.	Study of grinding operations
7.	Job on arc welding/TIG/MIG welding

Engineering Management Law Schools Other Courses
NAGPUR PUNE JALGAON AMRAVATI AHMEDNAGAR CHHINDWARA
RAISONI GROUP OF INSTITUTIONS

8. Practical on turning involving facing, step turning, taper turning, boring, boring with internal steps and taper, drilling (on lathe), internal and external threading
9. Practical on grinding
10. Study of moulding process
11. Practical on use of drilling machines.
12. Open ended Practicals a) Simulation study of casting process b) Practical on soldering/brazing c) Industrial Visit

Engineering Management Law Schools Other Courses
■ NAGPUR ■ PUNE ■ JALGAON ■ AMRAVATI ■ AHMEDNAGAR ■ CHHINDWARA
RAISONI GROUP OF INSTITUTIONS

BEML208: MECHATRONICS

Teaching Scheme	Credit	Examination Scheme	
Lectures: 03 Hr/Week **Tutorials: Nil** **Practical:** 02 Hr/Week	**03** **01**	**Theory :** **TAE : 20** Marks **CAE : 20** Marks **ESE : 60** Marks	**Practical:** **Internal Assessment:** 25 Marks **External** : 25 Marks

Prerequisite (if any):

1. Applied Physics
2. Basic Electrical Engineering
3. Basic Electronics Engineering

Course Objectives

1. Understand key elements of Mechatronics system, representation into block diagram
2. Understand concept of transfer function, reduction and
3. Understand principles of sensors, its characteristics, interfacing with DAQ microcontroller
4. Understand the concept of PLC system and its ladder programming, and significance of PLC systems in industrial application
5. Understand the system modeling and analysis in time domain and frequency domain.
6. Understand control actions such as Proportional, derivative and integral and study its significance in industrial applications.

Course Outcome: On completion of the course, student will be able to

1. Demonstrate the mechatronics system and functioning of its different elements.
2. Choose and construct the key elements of mechatronics system with reference to various control systems.
3. Identify and explain the application of Programmable Logic Controller in household and industry.
4. Distinguish between various sensors, transducers and actuators and their applications.

Course Contents	Hrs
Unit – I : 1: Introduction to Mechatronics, Sensors & Actuators	7
Introduction to Mechatronics and its Applications; Measurement Characteristics: Static and Dynamic; Sensors: Position sensors- Potentiometer, LVDT, incremental Encoder; Proximity sensors-Optical, Inductive, Capacitive; Temperature sensor-RTD, Thermocouples; Force /	

Engineering Management Law Schools Other Courses
NAGPUR PUNE JALGAON AMRAVATI AHMEDNAGAR CHHINDWARA
RAISONI GROUP OF INSTITUTIONS

Pressure Sensors-Strain gauges; Flow sensors-Electromagnetic; Actuators: Stepper motor, Servo motor, Solenoids; Selection of Sensor & Actuator.	
Unit – II: Block Diagram Representation	**7**
Introduction to Mechatronics System Design; Identification of key elements of Mechatronics systems and represent into Block Diagram; Open and Closed loop Control System; Concept of Transfer Function; Block Diagram & Reduction principles; Applications of Mechatronics systems: Household, Automotive, Industrial shop floor.	
Unit – III : Programmable Logic Control	**7**
Introduction to PLC; Architecture of PLC; Selection of PLC; Ladder Logic programming for different types of logic gates; Latching; Timers, Counter; Practical examples of Ladder Programming. Applications in Industry.	
Unit – IV : Data Acquisition,	**7**
Introduction to Signal Communication & Types-Synchronous, Asynchronous, Serial, Parallel; Bit width, Sampling theorem, Aliasing, Sample and hold circuit, Sampling frequency; Interfacing of Sensors / Actuators to Data Acquisition system; 4 bit Successive Approximation type ADC; 4 bit R2R type DAC; Current and Voltage Amplifier.	
Unit – V: Frequency Domain Modelling and Analysis	**7**
Transfer Function based modelling of Mechanical, Thermal and Fluid system; concept of Poles & Zeros; Stability Analysis using Routh Hurwitz Criterion; Bode Plots: Introduction to Bode Plot, Gain Margin, Phase Margin, Relative Stability Analysis, Frequency Domain Parameters-Natural Frequency, Damping Frequency and Damping Factor; Mapping of Pole Zero plot with damping factor, natural frequency and unit step response	
Unit – VI : Control System	**7**
Proportional (P), Integral (I) and Derivative (D) control actions; PI, PD and PID control systems in parallel form; Unit step Response analysis via Transient response specifications: Percentage overshoot, Rise time, Delay time, Steady state error; Manual tuning of PID control; Linear Quadratic Control (LQR).	
Text Books: (Book Title, Name of the author, name of the Publisher, edition, year of publication)	
1. K.P. Ramchandran, G.K. Vijyaraghavan, M.S. Balasundaram, Mechatronics: Integrated Mechanical Electronic Systems, Willey Publication, 2008	
2. Bolton, Mechatronics - A Multidisciplinary approach, 4th Edition, Prentice Hall, 2009.	
3. Mahalik, Mechatronics – Principles, concepts and applications, Tata Mc-Graw Hill	

Engineering Management Law Schools Other Courses
NAGPUR PUNE JALGAON AMRAVATI AHMEDNAGAR CHHINDWARA
RAISONI GROUP OF INSTITUTIONS

publication, New Delhi
Reference Books
1. Alciatore & Histand, Introduction to Mechatronics and Measurement system, 4th Edition, Mc-Graw Hill publication, 201
2. Bishop (Editor), Mechatronics – An Introduction, CRC Press, 2006
3. C. D. Johnson, Process Control Instrumentation Technology, Prentice Hall, New Delhi
4. “Mechatronics” by J. Paolo Davim

BMEP208: MECHATRONICS
List of Practical (Perform any 8 Experiments)
1. Measurement of Load / Force using a suitable sensor
2. Measurement of Temperature using a suitable sensor
3. Measurement of Position using a suitable sensor
4. Demonstration of any one of the following applications: □ Water Level Indicator □ Bottle Filling Plant □ Pick and Place Robot □ Any other. suitable application which comprises of components of Mechatronic system
5. Interfacing of suitable sensor with Data Acquisition system
6. Ladder Diagram simulation, using suitable software, for logic gates
7. Real time application of PLC using Ladder logic
8. Real time control of Temperature / Flow using PID control
9. Real time control of speed of DC motor using PID control
10. PID control Design, Tuning using suitable Simulation Software
11. Study of Modeling and Analysis of a typical Mechanical System (Estimation of poles, zeros, % overshoot, natural frequency, damping frequency, rise time, settling time)
12. Open Ended Practicals: a) Design of Mechatronic System (to be performed in a group of 4) b) Matlab Usage in Control System Design

Engineering Management Law Schools Other Courses
NAGPUR PUNE JALGAON AMRAVATI AHMEDNAGAR CHHINDWARA
RAISONI GROUP OF INSTITUTIONS

BMEL209: FLUID MACHINERY			
Teaching Scheme	**Credit**	**Examination Scheme**	
Lectures: 04 Hr/Week **Tutorials: Nil** **Practical:** 02 Hr/Week	**04** **01**	**Theory :** **TAE : 20** Marks **CAE : 20** Marks **ESE : 60** Marks	**Practical:** **Internal Assessment:** Nil **External** : 25 Marks

Prerequisite (if any):

1. Fluid Mechanics
2. Engineering Mathematics

Course Objectives
1. A foundation in the fundamentals of fluid mechanics
2. Practice in the analytical formulation of fluid mechanics problems using Newton's Laws of motion and thermodynamics
3. An introduction to experimental methods
4. An exposure to practical applications, work on a small design project, and the writing of a technical report related to the design project

Course Outcome: On completion of the course, student will be able to
1. Explain the working principle of different turbines and pumps.
2. Illustrate the performance characteristics of turbines and pumps.
3. Evaluate performance of various pumps and its selection characteristics.
4. Summarize the working principles of different hydrostatic and hydrokinetic systems and their modeling.

Course Contents	Hrs
UNIT – I : INTRODUCTION TO FLUID MACHINES & IMPULSE HYDRAULIC TURBINES	**8**
Impulse momentum principle and its applications, Force excreted on fixed plate, moving flat plate and curved vanes, series of plates, velocity triangles and their analysis, work done equations , efficiency. Pelton wheel- construction, principle of working, velocity diagrams and analysis, design aspects, governing and performance characteristics, specific speed, selection of turbines, multi-jet.	
UNIT – II : REACTION WATER TURBINES	**8**

Engineering Management Law Schools Other Courses
NAGPUR PUNE JALGAON AMRAVATI AHMEDNAGAR CHHINDWARA
RAISONI GROUP OF INSTITUTIONS

Classifications, Francis, Propeller, Kaplan Turbines, construction features, velocity diagrams and analysis, DOR, draft tubes- types and analysis, cavitation causes and remedies, specific speed, performance characteristics and governing of reaction turbines, selection of turbines.	
UNIT – III : PUMPS	**7**
Classification of roto-dynamic pumps, components of centrifugal pump, types of heads, velocity triangles and their analysis, effect of outlet blade angle, cavitation, NPSH, Thoma's cavitation factor, priming of pumps, installation, specific speed, performance characteristics of centrifugal pump, series and parallel operation of pumps, system resistance curve, selection of pumps. Reciprocating pumps: Types, Component and Working of Reciprocating pump, Discharge, Work done and power required to drive for single acting and double acting, Coefficient of discharge, slip, Effect of acceleration of piston on velocity and pressure, indicator diagram, Air Vessel	
UNIT – IV : COMPRESSIBLE FLOW	**7**
Perfect gas relationship, speed of sound wave, mach number, Isothermal and isotropic flows, Shock waves, fanno and Rayliegh lines.	
UNIT – V : HYDROSTATIC AND HYDROKINETIC SYSTEMS	**8**
Hydrostatic systems, their function, components and application such as Hydraulic press, lift, crane and fluid drive for machine tools. Intensifier and accumulator. Hydrokinetic systems: Fluid couplings and torque converter.	
UNIT – VI : EXPERIMENTAL TESTING AND MODELLING	**7**
Model Testing: application to hydraulic turbines and hydrodynamic pumps. Water Lifting devices, incomplete similarities, Wind tunnel testing, and flow with free surfaces.	
Text Books: (Book Title, Name of the author, name of the Publisher, edition, year of publication)	
1. V.P. Vasandani, "Hydraulic Machines – Theory and Design"	
2. Bansal R.K., "Fluid Mechanics and Fluid Machines‟, Laxmi Publications,7th edition 2002	
3. Modi&Seth,‟Fluid Mechanics & Fluid Machinery‟,Standard Book House 2002.	
Reference Books	
1. R.K. Rajput, "A Text book of Fluid Mechanics and Hydraulic Machines‟, S.Chand Co.Ltd.,2002	
2.Massey B.S., "Mechanics of Fluids‟, Van Nostrand Reinhold Co., 6th edition 1989	
3.A.K. Jain, „Fluid Mechanics‟	

Engineering Management Law Schools Other Courses
NAGPUR PUNE JALGAON AMRAVATI AHMEDNAGAR CHHINDWARA
RAISONI GROUP OF INSTITUTIONS

4. D S. Kumar, "Fluid mechanics and Fluid Power Engineering"
5.J.J. Pippenger, "Industrial Hydraulics"
6. Jagdish Lal, "Hydraulic Machines".

BMEP208: MECHATRONICS
List of Practical (Perform any 8 Experiments)
1. Verification of impulse momentum principle
2. 2. To find the value of coefficient of a given venturi meter fitted in a pipe.
3. 3. To find the value of coefficient of discharge for a given of orifice meter.
4. 4. Study and trial on Pelton wheel and plotting of main / operating characteristics
5. 5.Study and trial on Francis Turbine and plotting of main / operating characteristics
6. 6.Study and trial on Kaplan Turbine and plotting of main / operating characteristics
7. 7. Study and trial on centrifugal pump and plotting of operating characteristics
8. 8. Study experiment on Fluidic devices
9. 9. Study of different types of nozzles
10. 10. Visit to Hydro Electric Power Plant.
11. 11. Open Ended Practical: Simulation of any Two type of turbo machine

Engineering Management Law Schools Other Courses
NAGPUR PUNE JALGAON AMRAVATI AHMEDNAGAR CHHINDWARA
RAISONI GROUP OF INSTITUTIONS

BMEP210: INDUSTRIAL SAFETY PRACTICES AND WORK CULTURE			
Teaching Scheme	**Credit**	**Examination Scheme**	
Lectures: 01 Hr/Week **Tutorials: Nil** **Practical: 2 Hrs/Week**	**Audit Course**	**TAE : NIL** **CAE : NIL** **ESE**: **NIL**	**Internal Assessment:** G **External Assessment:** Nil

Course Objectives
1. To enable understanding of the importance of industrial safety
2. To develop personal habits and work culture aimed at minimizing hazards, accidents and waste
Course Outcome: On completion of the course, student will be able to
1. Implement Industrial safety rules and practices.
2. Follow the work culture in industry
3. Understand six sigma data-driven approach and ISO Standards.
4. Know the principles of total quality management and peculiarities of their implementation.

Course Contents	**Hrs**
1. Study and working of Thermal power stations, types and applications.	**4**
2. Study of Production industries, types, working process and case study.	**4**
3. Industrial Safety Practices, Types of risk, safety norms in typical industries and industrial Audit	**4**
4. Introduction and case study of ISO in production industries, Six sigma norms, TQM/ KANBAN/KHAIZAN.	**4**

BMEP210: INDUSTRIAL SAFETY PRACTICES AND WORK CULTURE	
It is expected to visit the nearby industry and study the industrial safety practices and work culture. Students are required to submit the brief report on the safety practices and work culture in the industry. The following list of Practical/ industrial visits can be made(Perform any 4):	**Hrs**
1) Study and Visit to thermal power station and report submission.	**4**
2) Study and Visit to Production Industry and report submission.	**4**
3) Study and Visit to Industry to study safety practices and safety audit	**4**
4) Study of 6 sigma &ISO in Industry.	**4**
5) Study of TQM/KAIZAN	**6**

Engineering Management Law Schools Other Courses
NAGPUR PUNE JALGAON AMRAVATI AHMEDNAGAR CHHINDWARA
RAISONI GROUP OF INSTITUTIONS

MBL103: GENERAL PROFICIENCY-III: Hobby Classes			
Teaching Scheme	**Credit**	**Examination Scheme**	
Lectures: Nil **Tutorials: Nil** **Practical: 2 Hrs/Week**	----	**TAE : NIL** **CAE : NIL** **ESE**: **NIL**	**Internal Assessment:** G **External Assessment:** Nil
Audit course: G			

Course Objectives
1. To enhance the inherent qualities of oneself and provide a platform to show hidden talent.
2. To nurture one's special capability and interest in activities like sports, drama, singing.
3. To help express oneself and be more compatible with outer world in the hobby domain.
4. To enhance creativity & imagination to flow freely

Course Outcome: On completion of the course, student will be able to
1. Explore and demonstrate the inherent talents within.
2. Develop self-expression and communication skills.
3. Improve new skill and increase self-confidence and to boost self-esteem.
4. Participate in extra-curricular activities like sports, indoor games, Dance and movie club
5. Improve technical skill by Participating in events like BAJA, SUPRA, ROBO Clubs, etc.

Course Contents	Activities	Hrs
Stress management sessions	Yoga, pranayama, meditation, relaxation techniques	2
Outdoor activities	Nature walks, treks, cycling, horse riding	2
Painting	Canvas, fabric , Sketching, knife, glass	2
Music (vocals and instrument)	Singing, Guitar, Synthesizer, Harmonium, Piano, Flute	2
Dance	Bharatanatyam, Kathak	2
Indoor sports	Chess, carom, table tennis	2
Movie club	Motivational movies and documentaries to be shown	2
Other creative skills	Embroidery , knitting, use of making things from waste materials, photography, puzzle solving	2
Developing technical skills	Robot Club, IOT Based clubs, Quality Circle, BAHA clubs, SAE	2

Engineering Management Law Schools Other Courses
NAGPUR PUNE JALGAON AMRAVATI AHMEDNAGAR CHHINDWARA
RAISONI GROUP OF INSTITUTIONS

SAVITRIBAI PHULE PUNE UNIVERSITY

FACULTY OF ENGINEERING

SYLLABUS FOR
T. E. (MECHANICAL ENGINEERING)
(2015 Course)

WITH EFFECT FROM YEAR 2017-2018

SPPUQuestionPapers.com

Savitribai Phule Pune University
T.E. Mechanical Engineering 2015 – Course
T. E. (Mechanical) (2015 Course) Semester – I

Code	Subject	Teaching Scheme Hrs / week			Examination Scheme					Total Marks	Credits	
		Lecture	Tut	Pract	In-Sem	ESE	TW	PR	OR		Th	TW / PR / OR
302041	Design of Machine Elements-I	4	-	2	30@	70@	50	-		150	4	1
302042	Heat Transfer*	4	-	2	30	70		50	-	150	4	1
302043	Theory of Machines-II$^{\$}$	3	1		30	70	25	-	25	150	3	1
302044	Turbo Machines	3	-	2	30	70	-	-	25	125	3	1
302045	Metrology and Quality Control$^{\$}$	3	-	2	30	70	-	-	25	125	3	1
302046	Skill Development	-	-	2	-	-	25	25	-	50	-	1
Total		17	1	10	150	350	100	75	75	750	17	6
											23	

T. E. (Mechanical) (2015 Course) Semester – II

Code	Subject	Teaching Scheme Hrs / week			Examination Scheme					Total Marks	Credits	
		Lecture	Tut	Pract	In-Sem	ESE	TW	PR	OR		Th	TW / PR / OR
302047	Numerical Methods and Optimization*	4	-	2	30	70	-	50	-	150	4	1
302048	Design of Machine Elements-II	4	-	2	30@	70@	25	-	25	150	4	1
302049	Refrigeration and Air Conditioning	3	-	2	30	70	-	-	25	125	3	1
302050	Mechatronics$^{\%}$	3	1		30	70	-	-	25	125	3	1
302051	Manufacturing - Process-II$^{\$}$	3	-	-	30	70	-	-	-	100	3	-
302052	Machine Shop-II$^{\$}$	-	-	2	-	-	50	-	-	50	-	1
302053	Seminar$^{\$}$	-	-	2	-	-	25	-	25#	50	-	1
302054	Audit Course*	--	--	--	--	--	-	-	-	-	-	-
Total		17	1	10	150	350	100	50	100	750	17	6
											23	

Though it is under Oral head Internal Panel to be appointed by Principal and HOD. Examination schedule will not be prepared at University level.

* Marked subjects are common with TE (Auto. Engg.) and TE Mech. Sandwich

$^{\$}$ Marked subjects are common with TE (Auto. Engg.) only

$^{\%}$ Marked subjects are common with TE Mech. Sandwich only

@ Examination time for Insem examination 1 Hr 30 Min. and Endsem examination 3Hrs.

SPPUQuestionPapers.com

Savitribai Phule Pune University, Pune
Third Year of Mechanical
(2015 Course)

Course Code: 302041 **Course Name : Design of Machine Elements – I**

Teaching Scheme:	Credits	Examination Scheme:		
TH: -- 4 Hrs/ Week	TH:--04	TH	In-Sem:	-- 30
			End-Sem:	-- 70
PR: - 2 Hrs/ Week	TW:--01		TW:	-- 50

Course Objective:

1. Student shall gain appreciation and understanding of the design function in Mechanical Engineering, different steps involved in designing and the relation of design activity with manufacturing activity.

2. The student shall learn to choose proper materials for different machine elements depending on their physical and mechanical properties. They will learn to apply the knowledge of material science in real life situations.

3. Student shall gain a thorough understanding of the different types of failure modes and criteria. They will be conversant with various failure theories and be able to judge which criterion is to be applied for a particular situation.

4. Student shall gain design knowledge of the different types of elements used in the machine design process, for e.g. fasteners, shafts, couplings etc. and will be able to design these elements for each application.

SPPUQuestionPapers.com

Course Outcome:

1. Ability to identify and understand failure modes for mechanical elements and design of machine elements based on strength.
2. Ability to design Shafts, Keys and Coupling for industrial applications.
3. Ability to design machine elements subjected to fluctuating loads.
4. Ability to design Power Screws for various applications.
5. Ability to design fasteners and welded joints subjected to different loading conditions.
6. Ability to design various Springs for strength and stiffness.

Course Contents

UNIT 1: Design of Simple Machine Elements (10 hrs)

Machine Design, Design cycle, Design considerations - Strength, Rigidity, Manufacture, Assembly and Cost, Standards and codes, Use of preferred series, Factor of safety, Service factor. Design of Cotter joint, Knuckle joint, Levers - hand / foot lever, lever for safety valve, bell crank lever, and components subjected to eccentric loading.

UNIT 2: Design of Shafts, Keys and Couplings (08 hrs)

Shaft design on the basis of strength, torsional rigidity and lateral rigidity, A.S.M.E. code for shaft design. Transmission shaft:- Theoretical treatment only. Design of keys and splines. Design of Flange Coupling and Flexible Bushed Pin Coupling.

UNIT 3: Design for Fluctuating Load (08 hrs)

Stress concentration - causes & remedies, fluctuating stresses, fatigue failures, S-N curve, endurance
limit, notch sensitivity, endurance strength modifying factors, design for finite and infinite life, cumulative damage in fatigue failure, Soderberg, Gerber, Goodman, Modified Goodman diagrams, Fatigue design of components under combined stresses:- Theoretical treatment only.

UNIT 4: Power Screws (06 hrs)

Forms of threads, multiple start screws, Torque analysis and Design of power screws with square and trapezoidal threads, Self locking screw, Collar friction torque, Stresses in power screws, design of a C-Clamp. Design of screw jack, Differential and Compound Screw and Re-circulating Ball Screw (Theoretical treatment only).

SPPUQuestionPapers.com

UNIT 5: Threaded joints and Welded joints s **(10 hrs)**

Basic types of screw fasteners, Bolts of uniform strength, I.S.O. Metric screw threads, Bolts under tension, eccentrically loaded bolted joint in shear, Eccentric load perpendicular and parallel to axis of bolt, Eccentric load on circular base, design of Turn Buckle. Welding symbols, Stresses in butt and fillet welds, Strength of butt, parallel and transverse fillet welds, Axially loaded unsymmetrical welded joints, Eccentric load in plane of welds, Welded joints subjected to bending and torsional moments.

UNIT 6: Mechanical Springs **(06 hrs)**

Types, applications and materials for springs, Stress and deflection equations for helical compression Springs, Style of ends, Design of helical compression and tension springs, Springs in series and parallel, Concentric helical springs, Surge in springs, Design of Multi-leaf springs. Helical torsion Spring (Theoretical treatment only).

Books:

Text:

1) Bhandari V.B., Design of Machine Elements, Tata McGraw Hill Publication Co. Ltd.
2) Shigley J.E. and Mischke C.R., Mechanical Engineering Design, McGraw Hill Publication Co. Ltd.
3) Spotts M.F. and Shoup T.E., Design of Machine Elements, Prentice Hall International.
4) Juvinal R.C., Fundamentals of Machine Components Design, John Wiley and Sons

References:

1) Black P.H. and O. Eugene Adams, Machine Design, McGraw Hill Book Co. Inc.
2) Willium C. Orthwein, Machine Components Design, West Publishing Co. and Jaico Publications House.
3) Hall A.S., Holowenko A.R. and Laughlin H.G, Theory and Problems of Machine Design, Schaum's Outline Series.
4) C. S. Sharma and Kamlesh Purohit, Design of Machine Elements, PHI Learing Pvt. Ltd.
5) D. K. Aggarwal & P. C. Sharma, Machine Design, S.K Kataria and Sons
6) P. C. Gope, Machine Design: Fundamentals and Applications, PHI Learing Pvt. Ltd.
7) Design Data - P.S.G. College of Technology, Coimbatore.
8) Bhandari, V. B. Machine Design data book, Tata McGraw Hill Publication Co. Ltd.
9) K. Mahadevan, K. Balveera Reddy, Design Data Handbook for Mechanical Engineers, CBS Publishers.
10) Kanhhia, Design of Machine Elements-1, Scitech Publications

SPPUQuestionPapers.com

Term-Work

Term work shall consist of

1. **Two design projects on Assemblies covering above syllabus**.
   The design project shall consist of half imperial sheets (A2 size) involving assembly-drawing with a bill of material and overall dimensions and drawings of individual components. The Project should be assigned to a group of three to five students.

   Project 1 shall be based on any one of the following topics-
   i) Cotter joint/ knucle joint/turn buckle for a specified application.
   ii) Transmission Shaft/Machine tool spindles/coupling for specified application.
   iii) Hand or foot operated levers/lever for safety valve.
   Project 2 shall be based on any one of the following topics-
   i) Bench vice/Machine vice for specified applications.
   ii) Bottle type/toggle jack for vehicles.
   iii) Lead screw for machine tool/other applications.
   Manufacturing tolerances, surface finish symbols and geometric tolerances should be specified for important surfaces. A design report giving all necessary calculations of the design of components and assembly should be submitted in a separate file. Design data book shall be used wherever necessary for selection of standard components.

   Drawings of design project should be done manually.
2. **Assignments**
   The assignment shall be internally presented in the form of power point presentation, by a group of three to five students**.** A report of assignment (Max 8 to 10 pages) along with print out of ppt is to be submitted. Each student shall complete any two of the following assignments, with Assignment
   (a) compulsory.

   a. Use of dimensional tolerances, Geometrical tolerances and surface finish symbols in machine component drawings.

   A. Selection of materials using weighted point method.
   B. Selection of manufacturing methods for machine elements designed in any one of the above design projects.
   C. Theories of failures and their applications.

SPPUQuestionPapers.com

Savitribai Phule Pune University, Pune
Third Year of Mechanical, Mechanical Sandwich & Automobile
(2015 Course)

Course Code: 302042 **Course Name : HEAT TRANSFER**

Teaching Scheme:	Credits	Examination Scheme:		
TH: - 4 Hrs/ Week	TH:--04	TH	In-Sem:	-- 30
			End-Sem:	-- 70
PR: - 2 Hrs/ Week	PR:--01		PR:	-- 50

Course Objectives:

1. Identify the important modes of heat transfer and their applications.
2. Formulate and apply the general three dimensional heat conduction equations.
3. Analyze the thermal systems with internal heat generation and lumped heat capacitance.
4. Understand the mechanism of convective heat transfer
5. Determine the radiative heat transfer between surfaces.
6. Describe the various two phase heat transfer phenomenon. Execute the effectiveness and rating of heat exchangers.

Course Outcomes:

CO 1: Analyze the various modes of heat transfer and implement the basic heat conduction equations for steady one dimensional thermal system.

CO 2: Implement the general heat conduction equation to thermal systems with and without internal heat generation and transient heat conduction.

CO 3: Analyze the heat transfer rate in natural and forced convection and evaluate through experimentation investigation.

CO 4: Interpret heat transfer by radiation between objects with simple geometries.

CO 5: Analyze the heat transfer equipment and investigate the performance.

Course Contents

SPPUQuestionPapers.com

UNIT 1: **(10 hrs)**

Introduction and Basic Concepts: Application areas of heat transfer, Modes and Laws of heat transfer, Three dimensional heat conduction equation in Cartesian coordinates and its simplified equations, thermal conductivity, Thermal diffusivity, Thermal contact Resistance

Boundary and initial conditions: Temperature boundary condition, heat flux boundary condition, convection boundary condition, radiation boundary condition.

One dimensional steady state heat conduction without heat generation: Heat conduction in plane wall, composite slab, composite cylinder, composite sphere, electrical analogy, concept of thermal resistance and conductance, three dimensional heat conduction equations in cylindrical and spherical coordinates (no derivation) and its reduction to one dimensional form, critical radius of insulation for cylinders and spheres, economic thickness of insulation.

UNIT 2: **(08 hrs)**

One dimensional steady state heat conduction with heat generation: Heat conduction with uniform heat generation in plane wall, cylinder & sphere with different boundary conditions.

Heat transfer through extended surface: Types of fins and its applications, Governing Equation for constant cross sectional area fins, solution for infinitely long & adequately long (with insulated end) fins, efficiency & effectiveness of fins.

UNIT 3: **(06 hrs)**

Thermal Insulation – Types and selection, Economic and cost considerations, Payback period

Transient heat conduction: Validity and criteria of lumped system analysis, Biot and Fourier number, Time constant and response of thermocouple, Transient heat analysis using charts.

UNIT4: **(08hrs)**

Convection

Fundamentals of convection: Mechanism of natural and forced convection, local and average heat transfer coefficient, concept of velocity & thermal boundary layers.

Forced convection: Dimensionless numbers and their physical significance, empirical correlations for external & internal flow for both laminar and turbulent flows.

Natural convection: Introduction, dimensionless numbers and their physical significance, empirical correlations for natural convection.

UNIT 5: Radiation **(08 hrs)**

Fundamental concepts, Spectral and total emissive power, real and grey surfaces, Stefan Boltzmann law, Radiation laws – Planks, Wiens, Kirchoff's and Lambart's cosine law with simple applications, Irradiation and radiosity, Electrical analogy in radiation, Radiation shape factor, radiation heat exchange between two black and diffuse gray surfaces, radiation shield.

SPPUQuestionPapers.com

UNIT 6: Heat Transfer Equipments **(08 hrs)**

Condensation and Boiling: Boiling heat transfer, types of boiling, pool boiling curve and forced boiling phenomenon, condensation heat transfer, film wise and drop wise condensation (simple numerical treatment).

Heat exchangers: Classification and applications, heat exchanger analysis – LMTD for parallel and counter flow heat exchanger, effectiveness– NTU method for parallel and counter flow heat exchanger, cross flow heat exchanger, LMTD correction factor, design criteria for heat exchanger, Introduction to TEMA standards.

Introduction to heat pipe, Introduction to electronic cooling - Discussion on active and passive methods.

Books:

Text:

1. F.P. Incropera, D.P. Dewitt, Fundamentals of Heat and Mass Transfer, John Wiley.
2. Y. A. Cengel and A.J. Ghajar, Heat and Mass Transfer – Fundamentals and Applications, Tata McGraw Hill Education Private Limited.
3. S.P. Sukhatme, A Textbook on Heat Transfer, Universities Press.
4. R.C. Sachdeva, Fundamentals of Engineering Heat and Mass Transfer, New Age Science.
5. P.K. Nag, Heat & Mass Transfer, McGraw Hill Education Private Limited.
6. M. M. Rathod, Engineering Heat and Mass Transfer, Third Edition, Laxmi Publications, New Delhi
7. V. M. Domkundwar, Heat Transfer,

References:

1. A.F. Mills, Basic Heat and Mass Transfer, Pearson.
2. S. P. Venkatesan, Heat Transfer, Ane Books Pvt. Ltd.
3. Holman, Fundamentals of Heat and Mass Transfer, McGraw – Hill publication.
4. M. Thirumaleshwar, Fundamentals of Heat and Mass Transfer, Pearson Education India.
5. B.K. Dutta, Heat Transfer-Principles and Applications, PHI.
6. C.P. Kothandaraman, S. V. Subramanyam, Heat and Mass Transfer Data Book, New Academic Science.
7. Databook, SPPU provided by the Exam Center

SPPUQuestionPapers.com

LIST OF EXPERIMENTS

Any eight experiments (1-11) and two assignments (12-14) from the following list

1. Determination of Thermal Conductivity of metal rod
2. Determination of Thermal Conductivity of insulating powder
3. Determination of Thermal Conductivity of Composite wall
4. Determination of Thermal Contact Resistance
5. Determination of heat transfer coefficient in Natural Convection
6. Determination of heat transfer coefficient in Forced Convection
7. Determination of temperature distribution, fin efficiency in Natural / Forced Convection
8. Determination of Emissivity of a Test surface
9. Determination of Stefan Boltzmann Constant
10. Determination of effectiveness of heat exchanger
11. Study of pool boiling phenomenon and determination of critical heat flux
12. Assignment on 1-D transient heat transfer program using finite difference methods.
13. Assignment to solve transient heat transfer problem using Heisler and Grober charts.
14. Assignment on multi-pass / cross-flow heat exchanger using effectiveness charts.

SPPUQuestionPapers.com

Savitribai Phule Pune University, Pune

TE Mechanical and TE Automobile (2015 course)

Course Code: 302043 **Course Name : Theory of Machine – II**

Teaching Scheme:	**Credits**	**Examination Scheme:**
TH: -- 03 Hrs/week	**TH:--03**	**TH In-Sem: -- 30** **End-Sem: --70**
Tut.:- 01 Hr /week	**TW/OR:--01**	
		OR: -- 25
		TW: -- 25

Course Objectives:

1. To develop competency in understanding of theory of all types of gears.
2. To understand the analysis of gear train.
3. To develop competency in drawing the cam profile.
4. To make the student conversant with synthesis of the mechanism.
5. To understand step-less regulations.
6. To understand mechanisms for system control – Gyroscope.

Course Outcomes:

1. Student will be able to understand fundamentals of gear theory which will be the prerequisite for gear design.
2. Student will be able to perform force analysis of Spur, Helical, Bevel, Worm and Worm gear.
3. The student to analyze speed and torque in epi-cyclic gear trains which will be the prerequisite for gear box design.
4. Student will be able to design cam profile for given follower motions and understand cam Jump phenomenon, advance cam curves.
5. The student will synthesize a four bar mechanism with analytical and graphical methods.
6. *a.* The student will analyze the gyroscopic couple or effect for stabilization of Ship Aeroplane and Four wheeler vehicle.
   b. Student will choose appropriate drive for given application (stepped / step-less).

Course Contents

Unit – I: Spur Gear **(08 hrs)**

Classification, Spur gear: definition, terminology, fundamental law of toothed gearing, involute and cycloidal profile, path of contact, arc of contact, conjugate action, contact ratio, interference and under cutting – Methods to avoid interference. Minimum number of teeth on gear and pinion only, Force analysis and Friction in gears.

SPPUQuestionPapers.com

Unit – II: Helical, Bevel, Worm and Worm Wheel **(06 hrs)** Helical and Spiral Gears: terminology, geometrical relationships, tooth forces, torque transmitted and efficiency, virtual number of teeth for helical gears Bevel Gear & Worm and worm wheel: terminology, geometrical relationships, tooth forces, torque transmitted. Bevel Gear: Theoretical treatment only	
Unit – III Gear Trains **(06 hrs)** Types of Gear Trains, analysis of epicyclic gear trains, Holding torque – Simple, compound and epicyclic gear trains, torque on sun and planetary gear train, compound epicyclic gear train, Bevel epicyclic Gear train.	
Unit –IV Cam and Follower **(08 hrs)** Types of cams and followers, analysis of standard motions to the follower, Determination of cam profiles for different follower motions, Methods of control: pressure angle, radius of curvature and undercutting. Jump phenomenon of Eccentric cam, Introduction to advanced cam curves (up to 3-4-5 Polynomial cam only)	
Unit –V Synthesis of Mechanism **(06 hrs)** Steps in synthesis process: Type, number and dimensional synthesis. Tasks of Kinematic synthesis: Path, function and motion generation (Body guidance). Precision Positions, Chebychev spacing, Mechanical and structural errors. Three position synthesis of four bar mechanism using Freudenstein's equation. Analytical synthesis using kinematic coefficient in four bar mechanism.	
Unit –VI Step–Less-Regulation (Theoretical Treatment only) & Gyroscope **(06 hrs)** Continuous Variable Transmissions - Geometry, Velocity and torque analysis of Faceplate variators, conical variators, Spheroidal and cone variators, Variators with axially displaceable cones, PIV drives. Gyroscopes, Gyroscopic forces and Couples, Gyroscopic stabilisation for ship and Aeroplane, Stability of four wheel vehicle moving on curved path.	
Books:	
Text: 1. S. S. Rattan, Theory of Machines, Third Edition, McGraw Hill Education (India) Pvt. Ltd. New Delhi. 2. Bevan T, Theory of Machines, Third Edition, Longman Publication. 3. A. G. Ambekar, Mechanism and Machine Theory, PHI. 4. N. K. Mehta, Machine Tool Design and Numerical Control, Tata McGraw Hill Publication, 5. J. J. Uicker, G. R. Pennock, J. E. Shigley, Theory of Machines and Mechanisms, Third Edition, International Student Edition, OXFORD.	

SPPUQuestionPapers.com

References:

1. Ghosh Malik, Theory of Mechanism and Machines, East-West Pvt. Ltd.
2. Hannah and Stephans, Mechanics of Machines, Edward Arnolde Publication.
3. R L Norton, Kinematics and Dynamics of Machinery, First Edition, McGraw Hill Education (India) P Ltd. New Delhi
4. Sadhu Singh, Theory of Machines, Pearson
5. D.K. Pal, S.K. Basu, Design of Machine Tools, Oxford & Ibh Publishing Co Pvt. Ltd.
6. Dr. V. P. Singh, Theory of Machine, Dhanpatrai and sons.
7. C. S. Sharma & Kamlesh Purohit, "Theory of Machine and Mechanism", PHI.

Tutorial (Term-work) shall consist of

Part A: Compulsory

1. To study manufacturing of gear using gear generation with rack as a cutter and to generate involute profile
2. Kinematic analysis of synchromesh, machine tool gear box, differential gear box (Self Study)
3. Speed and torque analysis of epicyclic gear train to determine holding torque
4. To draw the cam profile and study variation in pressure angle with respect to change in base circle diameter and draw pitch circle for both the cases.(Half imperial drawing sheet)
5. To synthesize the four bar and slider crank mechanism using relative pole and inversion method with three accuracy points. (Half imperial drawing sheet)
6. To determine the effect of active gyroscopic couple on a spinning disc and verify the gyroscopic effect.
7. Study of Continuous Variable Transmission and Infinite Variable Transmission.

Part B: Any two from the following

1. To draw conjugate profile for any general type of gear tooth. (Half imperial drawing sheet)
2. To verify the cam jump phenomenon for an eccentric cam.
3. Synthesis a four bar mechanism based on Freudenstein's equation using any programming Language.
4. To measure the range of speeds obtained using any one type of continuously variable transmission device.
5. Industrial visit to understand Machines and Mechanisms.

SPPUQuestionPapers.com

Savitribai Phule Pune University, Pune

T.E Mechanical (2015 course)

Course Code: 302044 **Course Name : Turbo Machines**

Teaching Scheme:	Credits:	Examination Scheme:
TH: -- 03 hrs/week	TH:-- 03	TH In-Sem: -- 30
PR: -- 02 hrs/week	OR:-- 01	End-Sem: -- 70
		OR: -- 25

Course Objectives:

1. To provide the knowledge of basic principles, governing equations and applications of turbo machine.
2. To provide the students with opportunities to apply basic thermo-fluid dynamics flow equations to Turbo machines.
3. To explain construction and working principle and evaluate the performance characteristics of Turbo Machines.

Course Outcomes:

On successful completion of the course, the student will be able to,

1. Apply thermodynamics and kinematics principles to turbo machines.
2. Analyze the performance of turbo machines.
3. Ability to select turbo machine for given application.
4. Predict performance of turbo machine using model analysis.

Course Contents

SPPUQuestionPapers.com

Unit – I: Introduction to Turbo Machinery **(08hrs)** Turbo machines (Hydraulic & Thermal), Classification of Turbo machines, Comparison with positive displacement machines, Fundamental equation governing turbo machines, Different losses associated with turbo-machinery, Applications of Turbo machines. **Impact of Jet** Impulse momentum principle and its applications, Force exerted on fixed and moving flat plate, hinged plate, curved vanes, series of flat plates and radial vanes, velocity triangles and their analysis, work done equations, vane efficiency.	
Unit –II: Impulse Water Turbines **(06hrs)** Introduction to Hydro power plant, classification of hydraulic turbines construction, principle of working, velocity diagrams and analysis, design aspects, performance parameters, performance characteristics, specific speed, selection of turbines, multi-jet Pelton wheel.	
Unit –III: Reaction Water Turbines **(08 hrs)** Classifications, Francis, Propeller, Kaplan Turbines, construction features, velocity diagrams and analysis, degree of reaction, performance characteristics. Draft tubes: types and analysis, causes and remedies for cavitation phenomenon Governing of turbines, Similitude and dimensional analysis of hydraulic turbines	
Unit –IV: Steam Turbines **(08 hrs)** **Steam nozzles:** types and applications, Equation for velocity and mass flow rate [No numerical treatment]. **Steam Turbines:** Classifications, construction details, compounding of steam turbines, velocity diagrams and analysis of Impulse and reaction turbines (single & multi stage), governing, dimensional analysis, performance characteristics. Losses in steam turbines, selection of turbines.	

SPPUQuestionPapers.com

Unit –V: Centrifugal Pumps **(08 hrs)**

Classification of rotodynamic pumps, components of centrifugal pump, types of heads, velocity triangles and their analysis, effect of outlet blade angle, cavitation, NPSH, Thoma's cavitation factor, priming of pumps, installation, specific speed, performance characteristics of centrifugal pump, series and parallel operation of pumps, system resistance curve, selection of pumps.

Dimensional and Model analysis of hydraulic machines

Unit –VI: Centrifugal & Axial Compressor **(07 hrs)**

Centrifugal compressor: Classification of compressors, Construction, velocity diagram, flow process on T-S Diagram, Euler's work, actual work input, performance characteristics, various losses in centrifugal compressor.

Axial Compressor: Construction, stage velocity triangles and its analysis, enthalpy entropy diagram, stage losses and efficiencies, performance characteristics. [No numerical treatment]

Books:

Text:

1. Turbines, Compressors & Fans, S.M. Yahya, Tata-McGraw Hill
2. Turbomachines, B. U. Pai, Wiley India
3. Fluid mechanics and hydraulic machines, Dr. R.K. Bansal
4. Hydraulic Machines, Dr. J. Lal, Metropolitan Book Co. Pvt. Ltd., Delhi.
5. Hydraulics, Fluid Mechanics and Machinery, Modi P N & Seth S N, Standard Book House ,New Delhi.
6. R. Yadav, Steam and Gas Turbines and Power Plant Engineering, VII edition, Central Publ. house

References:

1. William W. Perg, Fundamentals of Turbomachinery, John Wiley & Sons.
2. Thermal Turbomachines, Dr. Onkar Singh, Wiley India
3. V. P. Vasandani, Theory of Hydraulic Machinary, Khanna Publishers, Delhi.
4. Karassik, Hand Book of Pumps, Tata McGraw Hills Ltd., New Delhi.
5. S.L. Dixon, Fluid Mechanics, Thermodynamics of Turbomachinery, IV edition, Butterworth-Heinemann Publ., 1966.

SPPUQuestionPapers.com

Term-Work

List of Experiments

1. Verification of impulse momentum principle
2. Study and trial on impulse water turbine (Pelton wheel) and plotting of main and operating characteristics
3. Study and trial on any one hydraulic reaction turbine (Francis/Kaplan) and plotting of main and operating characteristics
4. Study and trial on centrifugal pump and plotting operating characteristics
5. Study and trial on centrifugal air compressor and plotting its characteristics
6. Visit to hydro/steam power plant and report to be submitted.
7. Study of different types of nozzles and trial on convergent-divergent air/steam nozzle.
8. Study of axial flow compressors/ centrifugal air blower.
9. Study of multi-staging of steam turbines.
10. Design of pumping system installation using manufacturers' catalogue, specific to housing or industrial application.
11. Visit to pumping station and report to be submitted.

Notes

1. Eight experiments from above list should be performed; out of which at least four trials should be conducted. Data from any one trial performed should be analyzed by using suitable software.
2. One Experiment out of Expt. no. 10 and 11 is compulsory.
3. Visit to Hydro or Steam power plant is compulsory.

SPPUQuestionPapers.com

Savitribai Phule Pune University, Pune

TE Mechanical and TE Automobile (2015 course)

Course Code: 302045 **Course Name : Metrology And Quality Control**

Teaching Scheme:	**Credits**		**Examination Scheme:**	
TH: 03 Hrs/week	**TH:--03**	**TH**	**In-Sem:**	**-- 30**
			End-Sem:	**-- 70**
PR: 02 Hrs/week	**OR:--01**			
			OR:	**-- 25**

Course Objectives:
Students are expected to –

1. Select suitable instrument / gauge / method of inspection for determining geometrical and dimensional measurements.
2. Calibrate measuring instruments and also design inspection gauges.
3. Understand the advances in Metrology such as use of CMM, Laser, Machine Vision System for Metrology etc.
4. Select and apply appropriate Quality Control Technique for given application.
5. Select and Apply appropriate Quality Management Tool and suggest appropriate Quality Management System (QMS).

Course Outcomes:
The student should be able to –

1. Understand the methods of measurement, selection of measuring instruments / standards of measurement, carryout data collection and its analysis.
2. Explain tolerance, limits of size, fits, geometric and position tolerances and gauge design
3. Understand and use/apply Quality Control Techniques/ Statistical Tools appropriately.
4. Develop an ability of problem solving and decision making by identifying and analyzing the cause for variation and recommend suitable corrective actions for quality improvement.

SPPUQuestionPapers.com

Course Contents

Unit – I Measurement standards and Design of gauges (06 hrs)

Introduction: Principles of Engineering metrology, Measurement standards, Types and sources of errors, Accuracy and Precision, Calibration: Concept and procedure, traceability,

Geometric Form Measurement: Straightness, Flatness, Roundness - Straight edge, use of level beam comparator, autocollimator testing of flatness of surface plate.

Design of Gauges: Tolerances, Limits and Fits [IS 919-1993], Taylor's principle, Types of gauges, Wear allowance on gauges, Types of gauges-plain plug gauge, ring gauge, snap gauge, limit gauge and gauge materials, Considerations of gauge design (numerical).

Unit –II Comparators, Thread and Gear Metrology, Surface Roughness Measurement (08 hrs)

Comparators: Mechanical, Pneumatic, Optical, Electrical (LVDT).

Measurement of Thread form: Thread form errors, Measurement of Minor, Major and Effective diameter (Three Wire Method), Flank angle and Pitch, Floating Carriage Micrometer (Numerical).

Gear Metrology: Errors in Spur Gear form, Gear tooth Vernier, Constant chord, Base tangent (Numerical), Gear Rolling Tester. Profile Projector, Tool maker's microscope and their applications

Surface Roughness Measurement: Introduction to Surface texture, Parameters for measuring surface roughness, Surface roughness measuring instrument: TalySurf.

Unit – III Advances in Metrology (06 hrs)

Coordinate Measuring Machine (CMM): Fundamental features of CMM – development of CMMs – role of CMMs – types of CMM and Applications, – types of probes
Machine Vision Systems: vision system measurement – Multisensory systems.
Interferometer: Principle, NPL Interferometer
Laser Metrology: Basic concepts of lasers, advantages of lasers, laser interferometers, types, applications

SPPUQuestionPapers.com

Unit – IV Introduction to Quality and Quality Tools (06 hrs)

Concept of Quality: Various Definitions and Quality Statements, Cost of quality & value of quality, Deming's cycles & 14 Points, Juran Trilogy approach, Old New Seven Tools, Quality Circles.

Importance of Quality deployment at Design and Manufacturing Engineering: Opportunities for improvement product design, Importance of– initial planning for quality, concept of controllability: self-controls – defining quality responsibilities on the factory flow – self inspection.

Unit –V Statistical quality control (08 hrs)

Statistical quality control: Statistical concept, Frequency diagram, Concept of variance analysis, Control Chart for Variable (**X & R** Chart) & Attribute (**P & C** Chart), Process capability(Indices: cp, cpk, ppk), Statistical Process Control (Numerical). Production Part Approval Method (PPAP).

Acceptance Sampling: Sampling Inspection, OC Curve and its characteristics, sampling methods, Sampling Plan: Single, Double (Numerical), Multiple, Comparison of Plan, calculation of sample size, AOQ, Probability of Acceptance (Numerical)

Unit –VI Total Quality Management (06 hrs)

TQM: Introduction, Quality Function Deployment, 5S, Kaizen, Poka yoke, Kanban, JIT, FMECA, Zero defects, TPM. Six Sigma: DMAIC - Concept and Applications.

Quality Management System
Need for quality management system – design of quality management system - quality management system requirements – ISO 9001, TS-16949, ISO-14000, Quality Audit.

Books:

Text:

1. Jain R.K., Engineering Metrology, Khanna Publication.

2. I. C. Gupta, Engineering Metrology, Dhanpath Rai.

3. Bewoor A. K. and Kulkarni V. A., Metrology and Measurements, Tata McGraw hill Publication.

4. Juran J. M., Quality Handbook, McGraw Hill Publications.

5. Grant S.P., Statistical Quality Control, Tata McGraw hill Publication.

SPPUQuestionPapers.com

References:

1. Narayana K.L., Engineering Metrology.

2. Galyer J.F & Shotbolt C.R., Metrology for engineers

3. Gupta I.C., Engineering Metrology, Dhanpatrai Publiartions

4. Judge A.W., Engineering Precision Measurements, Chapman and Hall

5. Francis T. Farago, Mark A. Curtis, Handbook of dimensional measurement.

6. ASTME, Handbook of Industrial Metrology, Prentice Hall of India Ltd.

7. Connie Dotson, Fundamentals of Dimensional Metrology, Thamson Publn., 4th Edition.

8. Basterfield D. H., Quality control, Pearson Education India, 2004.

9. Kulkarni V. A. and Bewoor A. K., Quality Control, John Wiley Publication.

10. Harrison M. Wordsworth, Stefeen Godfrey, Modern Methods for Quality control and Improvement, Willy Publication.

Online Education resources: viz. NPTEL web site:

(1) nptel.ac.in/courses/112106179;

(2) www.nptelvideos.in/2012/12/mechanical-measurements-and-metrology.html;

(3) www.me.iitb.ac.in/~ramesh/courses/ME338/metrology6.pdf; nptel.ac.in/courses/110101010/;

(4) freevideolectures.com › Mechanical › IIT Madras

(5) nptel.ac.in/courses/112107143/37;

SPPUQuestionPapers.com

Term-Work

LIST OF EXPERIMENTS

Part: A] Experiment no. 1, 4 and 6 are mandatory. Perform any three from experiment no. 2 to 5 & any three from experiment no. 7 to 10.

1. Demonstration of linear and angular measuring instruments, slip gauges and their applications.
2. Error determination of linear / angular measuring instruments and determination of linear and angular dimensions of given part, (MSA: Gauge R & R).
3. Calibration of measuring instrument. Example – Dial gauge, Micrometer, Vernier (any one) (Refer ISO 17025).
4. Verification of dimensions and geometry of given components using Mechanical /Pneumatic comparator. [An assignment with this experiment write-up as, Introduction to use of Standard CODE viz. ASME-Y14.5, ISO-1101].
5. Machine tool alignment testing on machine tool – Lathe / Drilling / Milling.
6. Demonstration of surfaces inspection using optical flat/interferometers. / Demonstration of surface roughness measurement using surface roughness tester.
7. Determination of geometry and dimensions of given composite object / single point tool, using profile projector and tool maker's microscope.
8. Measurement of thread parameters using floating carriage diameter measuring machine.
9. Measurement of spur gear parameters using Gear Tooth Vernier / Span Micrometer / Gear Rolling Tester.
10. Determination of given geometry using coordinate measuring machine (CMM).

Part: B] Statistical Quality Control (SQC) (Any Two)
Note - Use of computational tools [such as Minitab / Matlab / MS Excel] are recommended

1. Analyze the fault in given batch of specimens by using seven quality control tools for engineering application. Submission of these assignments USING STANDAED FORMATS.
2. Determination of process capability from given components and plot variable control chart/ attribute chart.
3. Case study on various tools in Total Quality Management (TQM).

Part: C] Industrial visit to:

Calibration lab /Quality control lab / CMM Lab / Gear Inspection Unit

OR

QA/QC Unit of Automotive Industry / Engineering Industry.

SPPUQuestionPapers.com

Savitribai Phule Pune University, Pune
Third Year of Mechanical
(2015 Course)

Course Code: 302046 **Course Name: Skill Development**

Teaching Scheme:	Credits	Examination Scheme:
PR: -- 2 Hrs/ Week	TW/PR:--01	TW:-- 25 PR:-- 25

COURSE OBJECTIVES

1. To develop the skill for required in shop floor working.
2. To have knowledge of the different tools and tackles used in machine assembly shop.
3. Use of theoretical knowledge in practice.
4. Practical aspect of the each component in the assembly of the machine.

Course Contents

SPPUQuestionPapers.com

List of Experiments

1. Tail stock assembly
2. Valve Assembly (PRV, Sluice valve, Steam stop valve)
3. IC engine of Two Wheeler (4 stroke single cylinder)
4. Hermetically sealed compressor
5. Hydraulic actuator
6. Industrial Gear box
7. Sheet drawing (Sheet will be given per group and a group consist of 04 students. The sheet will be drawn manually by every student)

Note: 1-6 experiments are for assembly and disassembly only

Term-Work

1. Sheet drawing of assembly, which should contain the display of Geometric tolerances, Limits, Fits, BOM, Dimensional measurements techniques. Special Operations.. Students should make process sheet of each assembly. (One topic per four students group will be given for sheet drawing and each student should draw the sheet manually)

Practical Examination

Practical examination will be based on opening and closing of any assembly. In addition to this some questioning will be asked to the student based on assembly drawing, GD&T Sequencing and tools and tackles. For this the assemblies and their drawings should be provided to students for examination

Note: Term work will carry 25 Marks and practical examination will carry 25 marks.

A. The assessment has to be carried out based on close monitoring of involvement and intellectual contribution of student.
B. The student should maintain the record of work in the form of diary and has to be submitted at the end of semester.
C. The batch teacher should assess the concerned student

SPPUQuestionPapers.com

SEM-II

SPPUQuestionPapers.com

Savitribai Phule Pune University, Pune

TE Mechanical, Mechanical Sandwich and Automobile (2015 course)

Course Code: 302047 **Course Name : Numerical Methods and Optimization**

Teaching Scheme:	Credits	Examination Scheme:
TH: -04 hrs/week	TH:--04	TH In-Sem: -- 30
		End-Sem: --70
PR: 02 hrs /week	PR:--01	PR: -- 50

Course Objectives:
Students are expected to –
1 Recognize the difference between analytical and Numerical Methods.
2 Effectively use Numerical Techniques for solving complex Mechanical engineering Problems.
3 Prepare base for understanding engineering analysis software.
4 Develop logical sequencing for solution procedure and skills in soft computing.
5 Optimize the solution for different real life problems with available constraints.
6 Build the foundation for engineering research.

Course Outcomes:
The student should be able to –
1. Use appropriate Numerical Methods to solve complex mechanical engineering problems.
2. Formulate algorithms and programming.
3. Use Mathematical Solver.
4. Generate Solutions for real life problem using optimization techniques.
5. Analyze the research problem

Course Contents

Unit – I: Roots of Equation and Error Approximations (08 hrs.)

Roots of Equation
Bisection Method, Newton Raphson method and Successive approximation method.

Error Approximations
Types of Errors: Absolute, Relative, Algorithmic, Truncation, Round off Error, Error Propagation, Concept of convergence-relevance to numerical methods.

Unit – II: Simultaneous Equations (08 hrs.)

Gauss Elimination Method with Partial pivoting, Gauss-Seidal method and Thomas algorithm for Tri-diagonal Matrix, Jacob iteration method.

SPPUQuestionPapers.com

Unit – III: Optimization (08 hrs.)

Introduction to optimization, Classification, Constrained optimization (maximum two constrains): Graphical and Simplex method, One Dimensional unconstrained optimization: Newton's Method. Modern Optimization Techniques: Genetic Algorithm (GA), Simulated Annealing (SA).

Unit – IV: Numerical Solutions of Differential Equations (10 hrs.)

Ordinary Differential Equations [ODE]

Taylor series method, Euler Method, Runge-Kutta fourth order, Simultaneous equations using RungeKutta2nd order method.

Partial Differential Equations [PDE]: Finite Difference methods

Introduction to finite difference method, Simple Laplace method, PDEs- Parabolic explicit solution, Elliptic-explicit solution.

Unit – V: Curve Fitting and Regression Analysis (08 hrs.)

Curve Fitting

Least square technique- Straight line, Power equation, Exponential equation and Quadratic equation.

Regression Analysis

Introduction to multi regression analysis, Lagrange's Interpolation, Newton's Forward interpolation, Inverse interpolation (Lagrange's method only).

Unit – VI: Numerical Integration (06 hrs.)

Numerical Integration (1D only)

Trapezoidal rule, Simpson's 1/3rd Rule, Simpson's 3/8th Rule, Gauss Quadrature 2 point and 3 point method.

Double Integration

Trapezoidal rule, Simpson's 1/3rd Rule.

Books:

Text:

1. Steven C. Chapra, Raymond P. Canale, Numerical Methods for Engineers, 4/e, Tata McGraw Hill Editions

2. Dr. B. S. Garewal, Numerical Methods in Engineering and Science, Khanna Publishers,.

3. Steven C. Chapra, Applied Numerical Methods with MATLAB for Engineers and Scientist, Tata Mc-Graw Hill Publishing Co-Ltd

4. Rao V. Dukkipati, Applied Numerical Methods using Matlab, New Age International Publishers

SPPUQuestionPapers.com

References:
1. Gerald and Wheatley, Applied Numerical Analysis, Pearson Education Asia

2. E. Balagurusamy, Numerical Methods, Tata McGraw Hill

3. P. Thangaraj, Computer Oriented Numerical Methods, PHI

4. S. S. Sastry, Introductory Methods of Numerical Analysis, PHI.

Term-Work

1. Program on Roots of Equation (Validation by suitable solver, all three compulsory)
a) Bisection Method, b) Newton Raphson method c) Successive approximation method

2. Program on Simultaneous Equations (Validation by suitable solver, all three compulsory)
a) Gauss Elimination Method, b) Thomas algorithm for tridiagonal matrix, c) Gauss-Seidal method.

3. Demonstration of optimization technique using suitable solver.

4. Program on ODE(Validation by suitable solver, all three compulsory)
a) Euler Method, b) Runge-Kutta Methods- fourth order, c) Simultaneous equations.(Runge-Kutta 2nd order: *One step only*).Simple pendulum equation or Spring mass damper equation

5. Program on PDE(Validation by suitable solver): Laplace equation

6. Program on Curve Fitting using Least square technique (Validation by suitable solver, all four compulsory)
a) Straight line, b) Power equation, c) Exponential equation, d) Quadratic equation

7. Program on Interpolation(Validation by suitable solver, all three compulsory)
a) Lagrange's Interpolation, b) Newton's Forward interpolation,

8. Program on Numerical Integration(Validation by suitable solver, all four compulsory)
a) Trapezoidal rule, b) Simpson's Rules (1/3rd, 3/8th) [In one program only], c) Gauss Quadrature Method- 2 point, 3 point. [In one program only], d) Double integration: Trapezoidal rule

NOTE:
1. Solver is compulsory for all above programs and compared with actual solution.
2. Manual solution for each problem.
3. Algorithms and Flowcharts are compulsory for all programs.

GUIDELINES TO CONDUCT PRACTICAL EXAMINATION

Any one program from each set A & B with flowchart and solver: **Duration: 2 hrs.**

Set A: (Weightage – 60 %)
a) Simultaneous Equation, b) Partial Differential Equation (Laplace equation with solver)
c) Interpolation: Lagrange's interpolation, Newton's Forward interpolation (Any one)

Set B: (Weightage – 40 %)
a) Roots of Equations, b) Curve Fitting, c) Ordinary Differential Equations, d) Integration

SPPUQuestionPapers.com

Savitribai Phule Pune University, Pune
Third Year of Mechanical (2015 Course)

Course Code: 302048 **Course Name : Design of Machine Elements – II**

Teaching Scheme:	Credits	Examination Scheme:		
TH: -- 4 Hrs/ Week	TH:--04	TH:	In-Sem:	-- 30
			End-Sem:	-- 70
PR: - 2 Hrs/ Week	TW/OR:--01		TW:	-- 25
			OR:	-- 25

Course Objective:

1. Enable students to attain the basic knowledge required to understand, analyze, design and select machine elements required in transmission systems.
2. Reinforce the philosophy that real engineering design problems are open-ended and challenging
3. Impart design skills to the students to apply these skills for the problems in real life industrial applications
4. Inculcate an attitude of team work, critical thinking, communication, planning and scheduling through design projects
5. Create awareness amongst students about safety, ethical, legal, and other societal constraints in execution of their design projects
6. Develop an holistic design approach to find out pragmatic solutions to realistic domestic and industrial problems

SPPUQuestionPapers.com

Course Outcome:

The student should be able to –

CO 1: To understand and apply principles of gear design to spur gears and industrial spur gear boxes.

CO 2 : To become proficient in Design of Helical and Bevel Gear

CO 3: To develop capability to analyse Rolling contact bearing and its selection from manufacturer's Catalogue.

CO 4: To learn a skill to design worm gear box for various industrial applications.

CO 5: To inculcate an ability to design belt drives and selection of belt, rope and chain drives.

CO 6: To achieve an expertise in design of Sliding contact bearing in industrial applications.

Course Contents

Unit –I Spur Gears **(08 hrs)**

Introduction to gears: Gear Selection, material selection, Basic modes of tooth failure, Gear Lubrication Methods.

Spur Gears: Number of teeth and face width, Force analysis, Beam strength (Lewis) equation, Velocity factor, Service factor, Load concentration factor, Effective load on gear, Wear strength (Buckingham's) equation, Estimation of module based on beam and wear strength, Estimation of dynamic tooth load by velocity factor and Buckingham's equation**.**

Unit –I Helical and Bevel Gears **(08 hrs)**

Types of helical and Bevel gears, Terminology, Virtual number of teeth**,** and force analysis of Helical and Straight Bevel Gear. Design of Helical and Straight Bevel Gear based on Beam Strength, Wear strength and estimation of effective load based on Velocity factor (Barth factor) and Buckingham's equation. Mountings of Bevel Gear**. (No numerical on force analysis of helical & Bevel Gear)**

Unit – III Rolling Contact Bearings **(08 hrs)**

Types of rolling contact Bearings, Static and dynamic load carrying capacities, Stribeck's Equation,

Equivalent bearing load, Load- life relationship, Selection of bearing life Selection of rolling contact bearings from manufacturer's catalog, Design for cyclic loads and speed, bearing with probability of survival other than 90%

Taper roller bearing: Force analysis and selection criteria. (Theoretical Treatment only)

SPPUQuestionPapers.com

Unit - IV:
Worm and worm gear terminology and proportions of worm and worm gears, Force analysis of worm gear drives, Friction in Worm gears, efficiency of worm gears, Worm and worm gear material, Strength and wear ratings of worm gears (Bending stress factor, speed factor, surface stress factor, zone factor) IS 1443-1974, Thermal consideration in worm gear drive, Types of failures in worm gear drives, Methods of lubrication

Unit - V:
Belt drive: Materials and construction of flat and V belts, geometric relationships for length of belt, power rating of belts, concept of slip & creep, initial tension, effect of centrifugal force, maximum power condition,
Selection of Flat and V-belts from manufacturer's catalog, belt tensioning methods, relative advantages and limitations of Flat and V- belts, construction and applications of timing belts.
Wire Ropes (Theoretical Treatment Only): Construction of wire ropes, lay of wire rope, stresses in wire rope, selection of wire ropes, rope drums construction and design.
Chain Drives (Theoretical Treatment Only): Types of chains and its Geometry, selection criteria for chain drive, Polygon effect of chain, Modes of failure for chain, Lubrication of chains

UNIT VI:
Classification of sliding contact bearing.
Lubricating oils: Properties, additives, selection of lubricating oils, Properties & selection of bearing materials.
Hydrodynamic Lubrication: Theory of Hydrodynamic Lubrication, Pressure Development in oil film, 2DBasic Reynolds Equation, Somerfield number, Raimondi and Boyd method, Thermal considerations, Parameters of bearing design, Length to Diameter ratio, Unit bearing Pressure, Radial Clearance, minimum oil film thickness.

Books:

Text:
1) Bhandari V.B, Design of Machine Elements, Tata McGraw Hill Publication Co. Ltd.
2) Shigley J.E. and Mischke C.R., Mechanical Engineering Design, McGraw Hill Publication Co. Ltd.
3) Spotts M.F. and Shoup T.E., Design of Machine Elements, Prentice Hall International.
4) Juvinal R.C, Fundamentals of Machine Components Design, John Wiley and Sons.

SPPUQuestionPapers.com

References:

1. Black P.H. and O. Eugene Adams, Machine Design, McGraw Hill Book Co. Inc.
2. Willium C. Orthwein, Machine Components Design, West Publishing Co. and Jaico Publications House.
3. Hall A.S., Holowenko A.R. and Laughlin H.G, Theory and Problems of Machine Design, Schaum's Outline Series
4. C.S. Sharma and Kamlesh Purohit, Design of Machine Elements, PHI Learing Pvt. Ltd.
5. D. K. Aggarwal & P.C. Sharma, Machine Design, S.K Kataria and Sons
6. P. C. Gope, Machine Design: Fundamentals and Applications, PHI Learing Pvt. Ltd.
7. Design Data - P.S.G. College of Technology, Coimbatore.
8. Bhandari, V. B. Machine Design data book, Tata McGraw Hill Publication Co. Ltd.
9. K. Mahadevan, K. Balveera Reddy, Design Data Handbook for Mechanical Engineers, CBS Publishers

SPPUQuestionPapers.com

Term-Work

Term work shall consist of

1. One design project based on either Design of a Two Stage Gear Box (the two stages having different types of gear pair) or single stage worm gear box.

The design project shall consist of two full imperial (A1) size sheets involving assembly drawing with a part list and overall dimensions and drawings of individual components.

Manufacturing tolerances, surface finish symbols and geometric tolerances should be specified for important surfaces. A design report giving all necessary calculations of the design of components and assembly should be submitted in a separate file. Design data book shall be used wherever necessary to achieve selection of standard components

Note:

1. Design project should be assigned to group of 5 to 7 students.
2. Assembly drawing of project should be drawn using any CAD software.
3. Detailed parts of project should be drawn manually.

Design projects should be practical oriented, below is the list of practical applications:

i) Design of gearbox for wind mill application
ii) Design of gearbox for sluice gate application.
iii) Design of gearbox for machine tool applications like Lathe, Drilling, Milling machines etc.
iv) Design of in-line gearbox for Automobile application.
v) Design of gearbox for building Elevator
vi) Design of gearbox for Hoist.
vii) Design of gearbox for 2 wheeler .
viii) Design of gearbox for Tumbling barrel (Mixer).
ix) Design of gearbox for Cannon adjustment mechanism (Military application).
x) Design of gearbox for Worm gear box for Sugar Industry.

2. Presentation (PPT/slides) (on following topics (Any Two):
   i) Application of belt drive and its selection method for Industrial application. (By using Manufacturer's Catalog).
   ii) Application of chain drive and its selection method for Automobile application. (By using Manufacturer's Catalog).
   iii) Mounting of machine elements on transmission shaft (like Bearings, gears, Pulley, Sprocket, etc).
   iv) Selection of Bearing from Manufacturer's Catalog.
   v) Construction and details of Gears.

SPPUQuestionPapers.com

Savitribai Phule Pune University, Pune

TE Mechanical (2015 course)

Course Code: 302049 **Course Name : Refrigeration and Air Conditioning**

Teaching Scheme:	Credits	Examination Scheme:
TH : 03 hrs/week	TH:-- 03	TH In-Sem: -- 30 End-Sem: -- 70
PR : 02 hrs/ week	OR:- 01	OR: -- 25

Prerequisites:

Basic Thermodynamics- Laws of thermodynamics, Ideal gas processes, Thermodynamic cycles, Properties of pure substance, Mollier Charts, Basic Psychrometry terms and process, Fluid properties, Fluid dynamics, Modes of heat transfer, Governing Equations in Heat Transfer, Extended Surfaces, Condensation and Boiling, Heat Exchangers.

Course Objectives:

- Learning the fundamental principles and different methods of refrigeration and air conditioning.
- Study of various refrigeration cycles and evaluate performance using Mollier charts and/ or refrigerant property tables.
- Comparative study of different refrigerants with respect to properties, applications and environmental issues.
- Understand the basic air conditioning processes on psychometric charts, calculate cooling load for its applications in comfort and industrial air conditioning.
- Study of the various equipment-operating principles, operating and safety controls employed in refrigeration air conditioning systems

SPPUQuestionPapers.com

Course Outcomes:
At the end of this course the students should be able to
- Illustrate the fundamental principles and applications of refrigeration and air conditioning system
- Obtain cooling capacity and coefficient of performance by conducting test on vapour compression refrigeration systems
- Present the properties, applications and environmental issues of different refrigerants
- Calculate cooling load for air conditioning systems used for various
- Operate and analyze the refrigeration and air conditioning systems.

Course Contents

Unit I: Applications of Refrigeration and Air Conditioning and Refrigerants **[8 hrs]**

Applications

Domestic Refrigerator, Domestic Air Conditioners, Automotive Air Conditioners, Evaporative coolers, water coolers, Commercial Refrigeration- Dairy, Cold storage, Ice plant, Commercial Air Conditioning-Multiplex, Hospitals.

Refrigerants

Classification of refrigerants, Designation of refrigerants, Desirable properties of refrigerants, environmental issues, Ozone depletion and global warming, ODP, GWP & LCCP, selection of environment friendly refrigerants, secondary refrigerants, anti-freeze solutions, Zeotropes and Azeotropes, refrigerant: recovery reclaims, recycle and recharge.

Unit II: Vapour Refrigeration Systems **[8 hrs]**

Vapour compression systems

Working of simple vapour compression system, representation of vapour compression cycle (VCC) on T-s and P-h diagram, COP, EER, SEER, IPLV, NPLV, effect of operating parameters on performance of VCC, actual VCC, methods of improving COP using flash chamber, sub-cooling, liquid vapour heat exchanger, comparison of VCC with Reverse Carnot cycle.

Vapour absorption systems

Introduction, Working of simple vapour absorption system (VAS), desirable properties of binary mixture (aqua-ammonia), performance evaluation of simple VAS (simple numerical treatment), actual VAS, Li-Br absorption system, three fluid system (Electrolux refrigeration), applications of VAS, comparison between VCC and VAC

Unit III: Multiple pressure Refrigeration Systems **[8 hrs]**

Introduction, need of multistage system, Intermediate pressure, two stage compression with flash gas removal and liquid intercooler, single compressor with multiple evaporator: individual and multiple expansion valves, individual compressors, cascade system: application and numerical(numerical only by using p-h chart),
Introduction to cryogenics (Linde - Hampson cycle) and applications (no numerical treatment)

SPPUQuestionPapers.com

Unit IV: Psychrometry and Air conditioning load estimation **[8 hrs]**

Psychrometry

Basic Psychrometry and processes, BPF of coil, ADP, adiabatic mixing of two air streams, SHF, RSHF, GSHF, ESHF. Factors contributing to cooling load, Numerical based on load analysis

Human Comfort

Thermodynamics of human body, comfort and comfort chart, factors affecting human comfort, concept of infiltration and ventilation, indoor air quality requirements,

Unit V: Air Conditioning Systems **[8 hrs]**

Air Conditioning Systems

Working of summer, winter and all year round AC systems, all air system, all water system, air water system, variable refrigerant flow and variable air volume systems, unitary and central air conditioning.

Components of refrigeration and air conditioning systems

Working of reciprocating, screw and scroll compressors, working of air cooled, water cooled and evaporative condensers, working of DX, Flooded, Forced feed evaporators, Expansion devices – Capillary tube, TXV, EXV, operating and safety controls.

Unit VI **[8 hrs]**

Air Distribution Systems

Part A] Ducts

Classification of ducts, duct material, pressure in ducts, flow through duct, pressure losses in duct (friction losses, dynamic losses), air flow through simple duct system, equivalent diameter, Methods of duct system design: equal friction, velocity reduction, static regain method (numerical on duct system design)

Part B] Air handling unit

Air handling unit, Fan coil unit, types of fans used air conditioning applications, fan laws, filters, supply and return grills, sensors (humidity, temperature, smoke).

Books:

Text:

1. Arora C. P., Refrigeration and Air Conditioning, Tata McGraw-Hill
2. Manohar Prasad, Refrigeration and Air Conditioning, Willey Eastern Ltd, 1983
3. McQuiston, ― Heating Ventilating and air Conditioning: Analysis and Design‖ 6th Edition, Wiley India
4. Arora and Domkundwar, Refrigeration & Air Conditioning, Dhanpatrai & Company, New Delhi
5. Khurmi R.S. and Gupta J.K., Refrigeration and Air conditioning, Eurasia Publishing House Pvt. Ltd, New Delhi,1994.
6. Ballaney P.L., Refrigeration and Air conditioning, Khanna Publishers, New Delhi, 1992

SPPUQuestionPapers.com

References:

1. Dossat Ray J, Principles of refrigeration, S.I. version, Willey Eastern Ltd, 2000
2. Stockers W.F and Jones J.W., Refrigeration and Air conditioning, McGraw Hill International editions 1982.
3. Threlkeld J.L, Thermal Environmental Engineering, Prentice Hall Inc., New Delhi4. Aanatnarayan, Basics of refrigeration and Air Conditioning, Tata McGraw Hill Publications
5. Roger Legg, Air Conditioning System Design, Commissioning and Maintenance
6. ASHRAE & ISHRAE handbook

Term-Work

The term work shall consist of minimum eight experiments out of the following (It should include the visit to clod storage plant or central air-condition plant) :

1. Test on Domestic Refrigerator for evaluation of EER
2. Test on vapour compression test rig
3. Test on air conditioning test rig
4. Test on ice plant test rig
5. Test on Heat Pump test rig
6. Test/visit on Vapour absorption refrigeration test rig
7. Estimation of cooling load of simple air conditioning system (case study)
8. Visit to cold storage plant.
9. Visit to any air conditioning plant
10. Thermal analysis of refrigeration cycle using suitable software
11. Installation and servicing of split air conditioner.

SPPUQuestionPapers.com

Savitribai Phule Pune University, Pune

TE Mechanical and Mechanical Sandwich (2015 course)

Course Code: 302050		**Course Name : Mechatronics**
Teaching Scheme:	**Credits**	**Examination Scheme:**
TH: -- 03 hrs/week	**TH:--03**	**TH In-Sem: -- 30** **End-Sem: --70**
Tut.: - 01 hr/week	**OR:- 01**	
		OR: --25

Course Objectives:

- Understand key elements of Mechatronics system, representation into block diagram
- Understand concept of transfer function, reduction and analysis
- Understand principles of sensors, its characteristics, interfacing with DAQ microcontroller
- Understand the concept of PLC system and its ladder programming, and significance of PLC systems in industrial application
- Understand the system modeling and analysis in time domain and frequency domain.
- Understand control actions such as Proportional, derivative and integral and study its significance in industrial applications

Course Outcomes:

On completion of the course, students will be able to –

- Identification of key elements of mechatronics system and its representation in terms of block diagram
- Understanding the concept of signal processing and use of interfacing systems such as ADC, DAC, digital I/O
- Interfacing of Sensors, Actuators using appropriate DAQ micro-controller
- Time and Frequency domain analysis of system model (for control application)
- PID control implementation on real time systems
- Development of PLC ladder programming and implementation of real life system.

SPPUQuestionPapers.com

Course Contents
UNIT 1: Introduction to Mechatronics, Sensors & Actuators (08 Hrs) Introduction to Mechatronics and its Applications; Measurement Characteristics: Static and Dynamic; Sensors: Position sensors- Potentiometer, LVDT, incremental Encoder; Proximity sensors-Optical, Inductive, Capacitive; Temperature sensor-RTD, Thermocouples; Force / Pressure Sensors-Strain gauges; Flow sensors-Electromagnetic; Actuators: Stepper motor, Servo motor, Solenoids; Selection of Sensor & Actuator.
UNIT 2: Block Diagram Representation (08 Hrs) Introduction to Mechatronic System Design; Identification of key elements of Mechatronics systems and represent into Block Diagram; Open and Closed loop Control System; Concept of Transfer Function; Block Diagram & Reduction principles; Applications of Mechatronic systems: Household, Automotive, Industrial shop floor.
UNIT 3: Data Acquisition (08 Hrs) Introduction to Signal Communication & Types-Synchronous, Asynchronous, Serial, Parallel; Bit width, Sampling theorem, Aliasing, Sample and hold circuit, Sampling frequency; Interfacing of Sensors / Actuators to Data Acquisition system; 4 bit Successive Approximation type ADC; 4 bit R-2R type DAC; Current and Voltage Amplifier.
UNIT 4: Programmable Logic Control (08 Hrs) Introduction to PLC; Architecture of PLC; Selection of PLC; Ladder Logic programming for different types of logic gates; Latching; Timers, Counter; Practical examples of Ladder Programming.
UNIT 5: Frequency Domain Modelling and Analysis (08 Hrs) Transfer Function based modeling of Mechanical, Thermal and Fluid system; concept of Poles & Zeros; Stability Analysis using Routh Hurwitz Criterion; Bode Plots: Introduction to Bode Plot, Gain Margin, Phase Margin, Relative Stability Analysis, Frequency Domain Parameters-Natural Frequency, Damping Frequency and Damping Factor; Mapping of Pole Zero plot with damping factor, natural frequency and unit step response.
UNIT VI: Control System (08 Hrs) Proportional (P), Integral (I) and Derivative (D) control actions; PI, PD and PID control systems in parallel form; Unit step Response analysis via Transient response specifications: Percentage overshoot, Rise time, Delay time, Steady state error; Manual tuning of PID control; Linear Quadratic Control (LQR).
Books:
Text: • K.P. Ramchandran, G.K. Vijyaraghavan, M.S. Balasundaram, Mechatronics: Integrated Mechanical Electronic Systems, Willey Publication, 2008 • Bolton, Mechatronics - A Multidisciplinary approach, 4th Edition, Prentice Hall, 2009.

SPPUQuestionPapers.com

References:

- Alciatore & Histand, Introduction to Mechatronics and Measurement system, 4th Edition, Mc-Graw Hill publication, 2011
- Bishop (Editor), Mechatronics – An Introduction, CRC Press, 2006
- Mahalik, Mechatronics – Principles, concepts and applications, Tata Mc-Graw Hill publication, New Delhi
- C. D. Johnson, Process Control Instrumentation Technology, Prentice Hall, New Delhi

Term Work shall consist of following assignments:

The common minimum submission mentioned in point 1 and 2 should comprise of the following. From the table below: Submission No. 04, 05, 10, 11 and 12 are mandatory; any one from 01 to 03, any one from 06 or 07, any one from 08 or 09.

Submission No	Title
01	Measurement of Load / Force using a suitable sensor
02	Measurement of Temperature using a suitable sensor
03	Measurement of Position using a suitable sensor
04	Demonstration of **any one** of the following applications: • Water Level Indicator • Bottle Filling Plant • Pick and Place Robot • Any other suitable application which comprises of components of Mechatronic system
05	Interfacing of suitable sensor with Data Acquisition system
06	Ladder Diagram simulation, using suitable software, for logic gates
07	Real time application of PLC using Ladder logic
08	Real time control of Temperature / Flow using PID control
09	Real time control of speed of DC motor using PID control
10	PID control Design, Tuning using suitable Simulation Software
11	Study of Modeling and Analysis of a typical Mechanical System (Estimation of poles, zeros, % overshoot, natural frequency, damping frequency, rise time, settling time)
12	Case Study: Design of Mechatronic System (to be performed in a group of 4)

SPPUQuestionPapers.com

Savitribai Phule Pune University, Pune
Third Year of Mechanical & Automobile
(2015 Course)

Course Code: 302051 **Course Name : MANUFATCURING PROCESS – II**

Teaching Scheme:	**Credits**	**Examination Scheme:**
TH: -- 3 Hrs/ Week	**TH:03**	**TH In-Sem: -- 30** **End-Sem: -- 70**

Course Objective:

1. To analyze and understand the metal cutting phenomena.
2. To select process parameter and tools for obtaining desired machining characteristic
3. To understand principles of manufacturing processes.

Course Outcome:

1. Student should be able to apply the knowledge of various manufacturing processes.
2. Student should be able to identify various process parameters and their effect on processes.
3. Student should be able to figure out application of modern machining.
4. Students should get the knowledge of Jigs and Fixtures for variety of operations.

Course Contents

Unit – I Theory of Metal cutting **(07hrs)**

Single point cutting tool: Tool geometry, Mechanics of shearing (orthogonal and oblique), Shear plane angle, Shear stress, strain and Shear strain rate. Process parameters and their effect on machining.

Merchant's circle of forces (analytical) Estimation of shear force, Normal shear force, Friction force, Normal friction force, Material Removal Rate (MRR), Cutting power estimation, Calculation of Total power and Specific energy. Introduction to tool dynamometers.

Machinability - Factors affecting machinability, Tool life, Tool wear, Types of tool wear and remedial actions, Cutting fluid and their types, Effect of process parameters on tool life, Taylor's tool life equation (Derivation along with numerical).

Unit – II Machine tools and their application **(07 hrs)**

Drilling machine: Types of drills and operations. Twist drill geometry, Types of drilling machine, Tool holder. Machining time calculations.

Milling machine: Types of milling machines, Cutter-types and geometry and their applications. Universal dividing head, Methods of Indexing: Simple, Compound, Differential. (Numericals based on simple and compound Indexing).Machining time calculations

Broaching: Introduction to broaching, Broach tool geometry, Planner and Boring Machines: Introduction.

SPPUQuestionPapers.com

Unit – III Finishing processes **(07hrs)**

Grinding machines

Introduction: Types and Operations of grinding machines.

Grinding wheel – Shapes, Designation and selection, Mounting, Balancing and Dressing of grinding wheels, Machining time calculation for cylindrical and plunge grinding.

Super-finishing processes – Introduction to Honing, Lapping, Buffing and Burnishing. (Construction, working and controlling parameters)

Unit – IV Advanced Machining Processes **(07 hrs)**

Introduction, classification of advanced machining processes.

Principles, Working, Process Parameters, Advantages, Limitations and Application for following processes:

Electric Discharge Machining (EDM), LASER Beam Machining (LBM), Abrasive Jet Machining (AJM), Ultra Sonic Machining (USM) and Electro Chemical Machining (ECM)

Introduction to micro machining.

Unit –V CNC Technology **(07 hrs)**

Introduction, Classification, Construction and working of NC, CNC, DNC and machining center. CNC axes and drives. Automatic Tool Changer (ATC) and Automatic pallet changer (APC)

CNC Programming: Word address format (WAF) –ISO Standards, G & M codes, Type of CNC Control systems, Manual part programming (plain milling and Turning), Subroutine, Canned cycles.

Unit –VI Jigs and fixtures **(07 hrs)**

Concept of degree of freedom, 3-2-1 principle of location, General guidelines to design Jigs and fixtures, advantages of jig and fixtures

Jigs: Definition. Elements of jig with the types, Location guidelines, Principles of clamping, Principles of guiding element, Channel jig, Template jig, Plate jig, Angle plate jig, Turn over jig, Box jig, and Latch type jig.

Fixtures: Definition. Elements of fixtures, Location guidelines, Principles of clamping, Principles of setting element, Turning fixture, Welding fixture, Milling fixture, Introduction to Assembly and Inspection fixtures. Indexing fixtures.

Concept, elements and advantages of modular fixture, Pokayoke concept in jigs and fixtures.

Books:

Text:

1. S. K Hajra Choudhury , Elements of workshop technology – Vol. II,, Media Promoters And Publishers, Mumbai
2. Amitabh Ghosh and Asok kumar Mallik, Manufacturing science, Ellis Horwood Ltd
3. Mikell. P. Grover, Fundamentals of Modern Manufacturing, Pearson Publications
4. P. C. Sharma, Production Engineering, S. Chand Publication.

SPPUQuestionPapers.com

References:

1. Production technology –HMT, Tata McGraw Hill publication
2. Lindberg, Roy A., Processes and materials of manufacture, P H I Learning
3. Serope Kalpakjian and Steven R. Schmid, Manufacturing Processes for Engineering Materials, Pearson Education, Fourth Edition.
4. G. K Lal, Fundamentals of Design and Manufacturing, Alpha Science International Ltd(2005)
5. M.C Shaw, Metal Cutting Principles, Oxford university press
6. Yoram Koren , Numerical Control of Machine Tools Khanna Publication
7. P. K Mishra, Non- conventional machining, Narosa Publishing House
8. V. K Jain, Advanced machining processes , Allied Publisher, New Delhi
9. M. H. A Kempster, An Introduction to Jig and Tool Design, ELBS
10. P. H. Joshi, Jigs and fixtures , Tata McGraw Hill
11. P. N. Rao, CAD/CAM Principles and Applications, McGraw Hill Education, Third Edition.
12. Cyrll Donaldson, George H. LeCain and V. C. Goold, Tool design, Tata McGraw- Hill. Third Edition

SPPUQuestionPapers.com

Savitribai Phule Pune University, Pune
Third Year of Mechanical & Automobile
(2015 Course)

Course Code: 302052 **Course Name : MACHINE SHOP – II**

Credits	Examination Scheme:
PR: -2 Hrs/ Week	
TW:-01	
	TW: 50

Course Objective:

1. To set the manufacturing set–up appropriately and study the corresponding set up parameters.
2. To select appropriate process parameter for obtaining desired characteristic on work piece.
3. To understand the operational problems and suggest remedial solution for adopted manufacturing process.

Course Outcome:

1. Ability to develop knowledge about the working and programming techniques for various machines and tools

Term-Work

Each student must complete and submit following term work:

I. **Jobs (Both the following jobs should be completed individually)**

a. Any one marketable assembly consisting of at least three components with tolerance involving use of lathe, drilling, milling, grinding and any additional machine tool or processes as per requirement.

b. Development and execution of one simple turning job on CNC (Trainer) machine.

II. **Journal consisting of following assignments.**

a. Two views of at least one jig and one fixture designed, for a component on a half imperial sheet.(manual drafting)

b. Process planning sheets for job 1.a and 1.b.

c. Report based on industrial visit to manufacturing plant.

Note: - Practical are to be performed under the guidance of concerned faculty member.
Job drawing essentially consisting of Geometric Dimensioning and Tolerance

SPPUQuestionPapers.com

Savitribai Phule Pune University, Pune
Third Year of Mechanical & Automobile
(2015 Course)

Course Code: 302053 **Course Name : SEMINAR**

Teaching Scheme:	Credits	Examination Scheme:
PR:-- 2 Hrs/Week	OR:--01	TH In-Sem: --
		End-Sem: --
		TW: -- 25
		OR: -- 25

Prerequisites:

Course Objective:

1. Identify and compare technical and practical issues related to the area of course specialization.
2. Outline annotated bibliography of research demonstrating scholarly skills.
3. Prepare a well organized report employing elements of technical writing and critical thinking.
4. Demonstrate the ability to describe, interpret and analyze technical issues and develop competence in presenting.

Course Outcome:

With this seminar report and presentation, the student is expected to learn/achieve the following:

- Establish motivation for any topic of interest and develop a thought process for technical presentation.
- Organize a detailed literature survey and build a document with respect to technical publications.
- Analysis and comprehension of proof-of-concept and related data.
- Effective presentation and improve soft skills.
- Make use of new and recent technology (e.g. Latex) for creating technical reports

SPPUQuestionPapers.com

Course Contents:

The evaluation of the seminar report is proposed with the following stages.

Stage-I

In this stage the student is expected to deliver the following:

1. Topic selection
2. Literature review
3. State of the art related to the topic of interest

Stage-II

1. Problem statement
2. Methodology
3. Scope and objectives

A review of the student's progress should be made after In-Sem examination, within a week. During this review, the student is expected to complete Stage-1 and Stage-2.

Stage-III

1. Quantification of results
2. Concluding remarks or summary

Stage-IV

3. Final report
4. Final presentation/viva

The final presentation/viva will be assessed by a committee including an expert (preferably from industry with minimum 5 years experience) and an internal panel. The internal panel will consist of the seminar guide and two subject experts, approved by the HOD and the principal of the institute.

Examination schedule will be prepared at institute level (and not at University level), though it is under Oral head. The appointment of the internal panel and the external (industrial) expert will be taken care by the respective institute. The seminar presentation will be help after the term end and before university external viva

Contents of the Seminar report

The contents of the seminar report as mentioned in section-3 are expected to include the following:

- Abstract/Summary
- Introduction: Scope and Methodology
- Literature review: The review should be conducted from at least five research papers published during last five year.
- Case study
- References

SPPUQuestionPapers.com

Instructions for seminar report writing

It is important that the procedures listed below be carefully followed by all the students.

1. Prepare two spiral bound copies of your Seminar report.
2. Limit your seminar report to preferably 20 to 25 pages only.
3. Header For e.g. Title of the seminar.
4. The footer For e.g. page numbers
5. Institute Name, Mechanical Engineering and centrally aligned.
6. The report shall be prepared using LateX preferably (default font througout) with double spacing throughout on A4 page.

Page	Left margin	Right margin	Top margin	Bottom margin
A-4 (8.5 11 inch)	1.5"	1"	1"	1"

7. Section titles should be bold typed in all capital letters and should be left aligned.
8. Sub-Section headings should be aligning at the left, bold and Title Case (the first letter of each word is to be capitalized).
9. Figure No. and Title at bottom with 10 pt; Legends below the title in 10 pt
10. Please use SI system of units only.
11. References should be either in order as they appear in the report or in alphabetical order by last name of first author.
12. Symbols and notations if any should be included in nomenclature section only

SPPUQuestionPapers.com

The report will be made in the following order:

1. Cover page and Front page as per specimen on separate sheet
2. Certificate from Institute as per specimen on separate sheet
3. Acknowledgement
4. List of Figures
5. List of Tables
6. Nomenclature
7. Contents
8. All section headings and subheadings should be numbered. For sections use numbers 1, 2, 3, ... and for subheadings 1.1, 1.2, ... etc and section subheadings 2.1.1, 2.1.2, ... etc.
9. References should be given in the body of the text and well spread. No verbatim copy or excessive text from only one or two references. If figures and tables are taken from any reference then indicate source of it. Please follow the following procedure for references

Reference Books: Collier, G. J. and Thome, J. R., Convective boiling and condensation, 3 rd ed., Oxford University Press, UK, 1996, pp. 110 112.

Papers from Journal or Transactions:

1. Jung, D. S. and Radermacher, R., Transport properties and surface tension of pure and mixed refrigerants, ASHRAE Trans, 1991, 97 (1), pp. 90 98.
2. Bansal, P. K., Rupasinghe, A. S. and Jain, A. S., An empirical correction for sizing capillary tubes, Int. Journal of Refrigeration, 1996, 19 (8), pp.497 505.

Papers from Conference Proceedings:

1. Colbourne, D. and Ritter, T. J., Quantitative assessment of flammable refrigerants in room air conditioners, Proc. of the Sixteenth International Compressor Engineering Conference and Ninth International Refrigeration and Air Conditioning Conference, Purdue University, West Lafayette, Indiana, USA, 2002, pp. 34 40.

Reports, Handbooks etc.

1. United Nations Environmental Programme, Report of the Refrigeration, Air Conditioning and Heat Pumps, Technical Option Committee, 2002, Assessment - 2002. ASHRAE Handbook: Refrigeration, 1994 (Chapter 44)

Patent: Patent no, Country (in parenthesis), date of application, title, year.

Web-links: www.(Site) [Give full length URL]

SPPUQuestionPapers.com

Savitribai Phule Pune University, Pune
Third Year of Mechanical, Mechanical Sandwich & Automobile
(2015 Course)

Course Code: 302054 **Course Name : Audit Course I :- Fire & Safety Technology**

Teaching Scheme:	**Credits**	**Examination Scheme:** Audit (P/F) Written and MCQ
PR:	**Th/Tut:--**	**TH In-Sem: --**
		End-Sem: --
Tut:	**TW:**	**PR: --**
		OR: --

Description:

To generate, develop and sustain a voluntary movement on Fire & Safety Engineering at the National Level aimed at educating and influencing society to adopt appropriate policies, practices and procedures that prevent and mitigate human suffering and economic loss arising from all types of accidents.

Course Objective:

On completion of this Basic Fire Safety Course, participants will be able to:-

- Describe the chemistry of fire
- Identify fire hazards in the workplace
- Follow evacuation procedures
- Select and use appropriate firefighting equipment

SPPUQuestionPapers.com

Course Outcome:

- **Students will be able**

1. To create and sustain a community of learning in which students acquire knowledge in fire, safety and hazard management and learn to apply it professionally with due consideration for ethical, human life & property safety issues.
2. To pursue research and development in fire safety engineering, hazard management and disseminate its findings.
3. To meet the challenges of today and tomorrow in the most effective, efficient and contemporary educational manner.
4. To help in building national capabilities in fire safety engineering, disaster management, hazard management, industrial safety education through practical training to ensure a fire safe nation.

SPPUQuestionPapers.com

Course Contents:

1. **Fire & Safety Overview**

   Fire & safety legislation, Safety Personnel Supplier for construction sites/commissioning of plants. Understanding the physics and chemistry of fire. Development and spread of fire. Action in the event of fire

2. **Fire Fighting Techniques**

   Means of raising alarm, means of summoning the fire brigade, action on hearing the fire alarm Evacuation procedures Practical demonstration in the use of foam and CO_2 fire extinguishers using our state of the art gas fired training system.

3. **Fundamentals of Fire Engineering Science**

Fire Tech & Design, Fire Risk Assessment, Fire Control Technology, Fire Fighting Drills, Fire Tender with Crew on Hire. Fire & Safety Audit. Fire & Safety Consultancy Services.

4. **Industrial Aspects of Fire & Safety**

   Industrial Training on Fire & Safety and Disaster Management. Repair of all kinds of Fire Equipment including Flooding System. Repair of Fire Tender including Pump and power take-off systems.

5. **Maintenance of Fire Safety Equipments**

   AMC of Fire System. Refilling of Fire Extinguishers. Ultrasonic Thickness Test of Extinguishers, Vessels and Pipe lines. Hydro Testing of Fire Extinguishers, Vessels and Pipe Lines. Supply of Fire & Safety Equipment and Spares.

SPPUQuestionPapers.com

Case Study & Group Work:

- Identification of fire & safety technology
- To study the Fire Fighting Properties of Foam Concentrate
- Case Studies of Salvage operations in different types of occupancy
- Design and drawing of parts contained in the syllabus
- Compilation of Results & Presentation
- Case Study on the projects (products or processes) carried out by your institution or an organization in your vicinity, for safety.

Books:

References:

1. Accident Prevention manual for Industrial Operations, NSC, Chicago 1982.
2. The manual of fire ship – 6 – A by HMSO
3. Electricity Fire Risks – G.S. Hodges
4. Fire Pumps and Hydraulics: I.E. Ditts and T. M. Harris.
5. Fire Service Manual (Volume 2) Fire Service Operations – Petrochemical Incidents
6. The Principles and Practice of Fire Salvage Operation by Fire Salvage association.

SPPUQuestionPapers.com

Savitribai Phule Pune University, Pune
Third Year of Mechanical, Mechanical Sandwich & Automobile
(2015 Course)

Course Code: 302054 **Course Name : Audit Course II - Entrepreneurship Development**

Teaching Scheme:	**Credits**	**Examination Scheme:** Audit (P/F) Written and MCQ
PR:	**Th/Tut:--**	**TH In-Sem: --**
		End-Sem: --
Tut:	**TW:**	**PR: --**
		OR: --

Description:

EDP is a program meant to develop entrepreneurial abilities among the people. In other words, it refers to inculcation, development, and polishing of entrepreneurial skills into a person needed to establish and successfully run his enterprise. Thus, the concept of entrepreneurship development programme involves equipping a person with the required skills and knowledge needed for starting and running the enterprise.

This course will help in developing the awareness and interest in entrepreneurship and create employment for others. Students get familiar with the characteristics and motivation of successful entrepreneurs. Students learn how to identify and refine market opportunities, how to secure financing, how to develop and evaluate business plans and manage strategic partnerships. Students learn various concepts including the basics of management, leadership, motivation, decision-making, conflict management, human resource development, marketing and sustaining an organization. Students also get basic knowledge of accounting practices and finance. The core course in Entrepreneurship Development & Management equips students with skills and knowledge required to start and sustain their own business.

SPPUQuestionPapers.com

Course Objective: • To impart basis managerial knowledge and understanding; • Develop and strengthen entrepreneurial quality, i.e., motivation or need for achievement. • To analyze environmental set up relating to small industry and promoting it. • Collect and use the information to prepare project report for business venture. • Understand the process and procedure involved in setting up small units. • Develop awareness about enterprise management.
Course Outcome: **The students will be able to** • Appreciate the concept of Entrepreneurship • Identify entrepreneurship opportunity. • Develop winning business plans

SPPUQuestionPapers.com

Course Contents:

Entrepreneurship- Definition; Growth of small scale industries in developing countries and their positions large industries; role of small scale industries in the national economy; characteristics and types of small scale industries; demand based and resources based ancillaries Government policy for small scale industry; stages in starting a small scale industry, requirements to be an entrepreneur, SWOT Analysis.

Projects: Identification and Selection of projects; project report: contents and formulation, concept of project evaluation, methods of project evaluation: internal rate of return method and net present value method.

Market Assessment and Product feasibility

Marketing -Concept and Importance Market Identification,

Customer needs assessment, Market Survey Product feasibility analysis

Business Finance & Accounts

Business Finance: Costing basics, Sources of Finance, Break Even Analysis,

Business Accounts: Preparation of balance sheets and assessment of economic viability, decision, making, expected costs, planning and production control, quality control, marketing, Book Keeping, Financial Statements, Financial Ratios and its importance, Concept of Audit.

Project Planning and control:

The financial functions cost of capital approach in project planning and control. Economic evaluation, risk analysis, capital expenditures, policies and practices in public enterprises. Profit planning and programming, planning cash flow, capital expenditure and operations. Control of financial flows, control and communication.

Institutional Support and Policies: institutional support towards the development of entrepreneurship in India, technical consultancy organizations, E-Commerce: Concept and process, government policies for small scale enterprises.

Case Study & Group Work:

- Assess yourself-are you an entrepreneur?
- Prepare a Project Report for starting a small scale business.
- An Interview with an Entrepreneur.

SPPUQuestionPapers.com

Books:
References:

Books:

References:

1. Ram Chandran, 'Entrepreneurial Development', Tata McGraw Hill, New Delhi
2. Saini, J. S., 'Entrepreneurial Development Programmes and Practices', Deep & Deep Publications (P), Ltd.
3. Khanka, S. S. 'Entrepreneurial Development', S Chand & Company Ltd. New Delhi
4. Badhai, B 'Entrepreneurship for Engineers', Dhanpat Rai & co. (p) Ltd.
5. Desai, Vasant, 'Project Management and Entrepreneurship', Himalayan Publishing House, Mumbai, 2002.
6. Gupta and Srinivasan, 'Entrepreneurial Development', S. Chand & Sons, New Delhi.

SPPUQuestionPapers.com

Savitribai Phule Pune University, Pune
Third Year of Mechanical, Mechanical Sandwich & Automobile
(2015 Course)

Course Code: 302054 **Course Name : Audit Course III - Intellectual Property Right**

Teaching Scheme:	**Credits**	**Examination Scheme:** Audit (P/F) Written and MCQ
PR:	**Th/Tut:--**	**TH In-Sem: --** **End-Sem: --**
Tut:	**TW:**	**PR: --**
		OR: --

Objective:

Intellectual property refers to the rights which are attached to the creation of the mind and which take the form of a property. Though intangible in nature, intellectual property has become the driving force of many companies today. Fortune 500+ companies undoubtedly are the best examples of what a company can achieve through the proper understanding and management of IPR.

Thus the study of intellectual property rights is inevitable for managers, considering the fact that India is fast emerging as an economy with considerable investment in cutting-edge research and development. India is also emerging as an economy where foreign companies propose to invest considerably, both technically and financially, provided proper protection is guaranteed to their intangible assets which form the cornerstone of their business.

SPPUQuestionPapers.com

Topics:

1. Introduction
    - Concepts of IPR
    - The history behind development of IPR
    - Necessity of IPR and steps to create awareness of IPR

2. IP Management
    - Concept of IP Management
    - Intellectual Property and Marketing
    - IP asset valuation

3. Patent Law
    - Introduction to Patents
    - Procedure for obtaining a Patent
    - Licensing and Assignment of Patents
        Software Licensing
        General public Licensing
        Compulsory Licensing
    - Infringement of Patents
    - Software patent US and Indian scenario

4. Copyrights
    - Concept of Copyright Right
    - Assignment of Copyrights
    - Registration procedure of Copyrights
    - Infringement (piracy) of Copyrights and Remedies
    - Copyrights over software and hardware

5. Designs
    - Concept of Industrial Designs
    - Registration of Designs
    - Piracy of registered designs and remedies

6. Trademark Law
    - Concept of trademarks
    - Importance of brands and the generation of "goodwill"
    - Trademark registration procedure
    - Infringement of trademarks and Remedies available
    - Assignment and Licensing of Trademarks

SPPUQuestionPapers.com

Case Study & Group Work:

• Identify the projects (products or processes) carried out by your institution or an organization in your vicinity, which have been patented.

• A case study on significance of patents for a developing nation like India.

• Group discussion on creative / novel ideas and the feasibility of converting the idea into product or process.

• Discussion on Correlation between IPR and Entrepreneurship in the backdrop of Make in India Initiative.

References:

1. Ganguli Prabuddha, 'Intellectual Property Rights: Unleashing the knowledge economy', Tata McGraw Hill, New Delhi

2. Wadehra R. L., 'Law Relating to patents, trademarks, copyrights, designs and geographical indicators – 2nd', Universal Law Publishing.

3. Narayan P. S. 'Intellectual Property Law in India', Asia Law House Hyderabad.

SPPUQuestionPapers.com

Savitribai Phule Pune University, Pune
Third Year of Mechanical, Mechanical Sandwich & Automobile
(2015 Course)

Course Code: 302054 **Course Name : Audit Course IV - Lean Management**

Teaching Scheme:	**Credits**	**Examination Scheme:** Audit (P/F) Written and MCQ
PR:	**Th/Tut:--**	**TH In-Sem: --**
		End-Sem: --
Tut:	**TW:**	**PR: --**
		OR: --

Course Objective:
- To learn Lean Thinking and its applications
- To get knowledge of Tools & Techniques used in Lean Management
- To understand Business Impact of Lean Management

Course Outcome: Students
- Will be able to do practice Lean Management at the workplace
- Will be able to contribute in Continuous Improvement program of the Organization

Course Contents:

- Brief History of Lean Thinking
- Toyota Production System
- Five Steps to Lean
- Seven Types of MUDA – Waste in Manufacturing
- MURA – Unevenness / Fluctuation
- MURI – Overburden, Physical Strain
- Lean Tools & Techniques
- Value Stream Mapping
- Five 'S'
- Visual Management
- Plan-Do-Check-Act (PDCA)
- Kanban
- Lean Distribution
- Various Lean Management Systems
- Just In Time Production
- Total Quality Management (TQM)
- Total Productive Maintenance (TPM)
- Problem Solving Techniques
- A3 Reporting Technique

SPPUQuestionPapers.com

Books:
References: 1. Lean Thinking: Banish Waste and Create Wealth in Your Corporation, Second Edition James P. Womack and Daniel T. Jones, Free Press, June 2003, ISBN: 0743249275 2. Learning to See: Value Stream Mapping to Create Value and Eliminate Muda Mike Rother and John Shook, Lean Enterprise Institute, June 2003, ISBN: 0966784308 3.Lean Production Simplified: A Plain-Language Guide to the World's Most Powerful Production System, Second Edition Pascal Dennis, Productivity Press Inc, September 2007, ISBN: 9781563273568 4. Gemba Kaizen: A Commonsense, Low-Cost Approach to Management Masaaki Imai, McGraw-Hill, March 1997, ISBN: 0070314462 5. World of Kaizen : By Shyam Talawadekar Paperback Publisher: Kaizen Publisher; 4 th edition (2016) ISBN-10: 819326780X ISBN-13: 978-8193267806

SPPUQuestionPapers.com

Savitribai Phule Pune University, Pune
Third Year of Mechanical, Mechanical Sandwich & Automobile
(2015 Course)

Course Code: 302054		**Course Name : Audit Course V - Smart Manufacturing**
Teaching Scheme:	**Credits**	**Examination Scheme:** Audit(P/F) Written and MCQ
PR:	**Th/Tut:--**	**TH In-Sem: --** **End-Sem: --**
Tut:	**TW:**	**PR: --** **OR: --**

Description:

Smart Manufacturing is an amalgamation of Information Technology, Cloud Computing & traditional Mechanical, Production Engineering towards achieving excellence in manufacturing. Maximum results with minimum resources being used. The course will introduce the concepts of Smart Manufacturing, how various technologies can be leveraged to achieve minimum breakdowns, First Time Right Production, 100% Delivery on Time with minimum turnaround time. Nine Pillars of Smart Manufacturing will be explained to the Students.

The course will make the students aware of developments in Technology those are going to alter the Traditional Manufacturing scenario. The following topics may be broadly covered in the classroom. The practical will be in the form of Group Discussion based on Case Study.

Course Objective:

- To know more about Smart Manufacturing & Industry 4.0
- To get knowledge of various converging Technologies
- To prepare ourselves for the ever changing Manufacturing Techniques

Course Outcome: The students will be

- Comfortable with terminology and practices in Smart Manufacturing
- Able to face the challenges in Industry & also contribute towards advancement.
- Active part of Industry 4.0 (Fourth Industrial Revolution)

SPPUQuestionPapers.com

Course Contents:

- Introduction to Industry 4.0
- Historical Background
- Nine Pillars of Smart Manufacturing
- Big Data & analytics
- Autonomous Robots
- Simulation
- Universal System Integration
- IIOT – Industrial Internet of Things
- 3 D Printing – Additive Manufacturing
- Cloud Computing
- Augmented Reality
- Convergence of Nine Pillars
- Business Propositions delivered with Smart Manufacturing
- Adding Smartness to Manufacturing – Adoption & Scaling
- Economic Aspects
- Ecosystem Required for Smart Manufacturing
- Skill set Required for Smart Manufacturing
- Effects on 4 M- Man, Machine, Materials & Methods in Smart Manufacturing

References:

1. Smart Manufacturing by Shoukat Ali; Publisher: LAP LAMBERT Academic Publishing (10 August 2016)Language: EnglishISBN-10: 3659933554ISBN-13: 978-3659933554

2. Industry 4.0: The Industrial Internet of Things 2016by Alasdair Gilchrist (Author)
Publisher: Apress; 1st ed. edition (30 July 2016)
Language: English
ISBN-10: 1484220463
ISBN-13: 978-1484220467

3. Industry 4.0 Data Analytics31 July 2016 by Rajesh Agnihotri and Samuel New
Publisher: CreateSpace Independent Publishing Platform (31 July 2016)
Language: English
ISBN-10: 1534778284
ISBN-13: 978-1534778283

4. 3D Printing: The Next Industrial Revolution4 May 2013by Christopher Barnatt
Publisher: Createspace Independent Publishing Platform (4 May 2013)
Language: English
ISBN-10: 148418176X
ISBN-13: 978-1484181768

5. Augmented Reality: Principles and Practice by Dieter Schmalstieg and Tobias Hollerer
Publisher: Pearson Education; First edition (5 October 2016)
Language: English
ISBN-10: 9332578494
ISBN-13: 978-9332578494

SPPUQuestionPapers.com

LIST OF EXPERIMENTS / CASE STUDIES

Case Study & Group Work:

- Identification of areas where Smart Manufacturing can flourish
- Business Goals achieved through Smart Manufacturing
- Compilation of Results & Presentation

SPPUQuestionPapers.com

Savitribai Phule Pune University

Structure and Syllabus

FOR

B.E. Mechanical Engineering
2012 Course

UNDER FACULTY OF ENGINEERING

EFFECTIVE FROM June 2015

B. E. (Mechanical) Semester – I

(w. e. f. Academic year 2015 - 16)

Code	Subject	Teaching Scheme (Weekly Load in hrs)			Examination Scheme(Marks)					
		Lect.	Tut	Practical	In-Sem	End-Sem	TW	PR+	OR+	Total
402041	Refrigeration and Air Conditioning	3	--	2	30	70	25	--	50	175
402042	CAD/ CAM Automation	3	--	2	30	70	--	50	--	150
402043	Dynamics of Machinery	4	--	2	30	70	25	--	50	175
402044	Elective – I	3	--	--	30	70	--	--	--	100
402045	Elective –II	3	--	--	30	70	--	--	--	100
402046	Project –I	--	2	--	--	--	50*	--	--	50
Total of Semester – I		16	2	6	150	350	100	50	100	750

B. E. (Mechanical) Semester – II

Code	Subject	Teaching Scheme (Weekly Load in hrs)			Examination Scheme(Marks)					
		Lect.	Tut	Practical	In-Sem	End-Sem	TW	PR+	OR+	Total
402047	Power Plant Engineering	4	--	2	30	70	25	--	50	175
402048	Mechanical System Design	4	--	2	30	70	--	--	50	150
402049	Elective-III	4	--	--	30	70	--	--	--	100
402050	Elective- IV	4	--	2	30	70	25	--	--	125
402051	Project – II	--	6	--	--	--	150	--	50	200
Total of Semester – II		16	6	6	120	280	200	--	150	750

\+ For all Oral/Practical heads: Examination will be based on term work and Theory Subject

* Assessment should be carried out by panel of examiners from same Institute

	Elective-I		Elective-II
Code	**Subject**	**Code**	**Subject**
402044 A	Energy Audit Management	**402045 A**	Gas Turbine Propulsion
402044 B	Tribology	**402045 B**	Product Design and Development
402044 C	Reliability Engineering	**402045 C**	Operation Research
402044 D	Machine Tool Design	**402045 D**	Advanced Manufacturing Processes
	Elective-III		**Elective-IV**
Code	**Subject**	**Code**	**Subject**
402049 A	Refrigeration and Air Conditioning Equipment Design	**402050 A**	Computational Fluid Dynamics
402049 B	Robotics	**402050 B**	Finite Element Analysis
402049 C	Industrial Engineering	**402050 C**	Design of Pumps, Blowers and Compressors
402049 D	Open Elective **		

: Open Elective – Board of studies (BoS) - Mechanical will declare the list of subjects which can be taken under open electives **OR any other Electives that are being taught in the respective current semester, to the same level, as Elective – III under engineering faculty OR individual college and Industry can define new elective with proper syllabus using defined framework of Elective III and GET IT APPROVED FROM BOARD OF STUDIES AND OTHER NECESSARY STATUTORY SYSTEMS IN THE SAVITRIBAI PHULE PUNE UNIVERSITY BEFORE DEAD LINE GIVEN BY SPPU (SAY 30th NOVEMBER). Without approval from University statutory system, no one can introduce the open elective in curriculum.

(402041) Refrigeration and Air Conditioning

Code	Subject	Teaching Scheme (Weekly Load in hrs)			Examination Scheme (Marks)					
		Lect.	Tut.	Pract.	Theory		TW	PR	OR	Total
					In Sem.	End Sem.				
402041	Refrigeration and Air Conditioning	3	---	2	30 (1 hr)	70 (2 ½ hrs)	25	---	50	175

Prerequisite: Basic Thermodynamics- Laws of thermodynamics, Ideal gas processes, Thermodynamic cycles, Properties of pure substance, Mollier Charts, Fluid properties, Fluid dynamics, Modes of heat transfer, Governing Equations in Heat Transfer, Extended Surfaces, Condensation and Boiling, Heat Exchangers.

Course Objectives

- Learning the fundamental principles and different methods of refrigeration and air conditioning.
- Study of various refrigeration cycles and evaluate performance using Mollier charts and/ or refrigerant property tables.
- Comparative study of different refrigerants with respect to properties, applications and environmental issues.
- Understand the basic air conditioning processes on psychometric charts, calculate cooling load for its applications in comfort and industrial air conditioning.
- Study of the various equipment-operating principles, operating and safety controls employed in refrigeration air conditioning systems

Course Outcomes: At the end of this course the students should be able to

- Illustrate the fundamental principles and applications of refrigeration and air conditioning system
- Obtain cooling capacity and coefficient of performance by conducting test on vapor compression refrigeration systems
- Present the properties, applications and environmental issues of different refrigerants
- Calculate cooling load for air conditioning systems used for various applications
- Operate and analyze the refrigeration and air conditioning systems.
-

Unit 1: Fundamentals and Applications of Refrigeration and Air Conditioning 8 hrs

Fundamentals

Reverse Carnot cycle, block diagram of refrigerator & heat pump (numerical), modified reverse Carnot cycle (Bell Coleman cycle)

Applications

Domestic Refrigerator, Domestic Air Conditioners, Automotive Air Conditioners, Evaporative coolers, water coolers, Commercial Refrigeration- Dairy, Cold storage, Ice plant, Commercial Air Conditioning-Multiplex, Hospitals.

Unit 2: Refrigerants and Vapour Compression Cycle 8 hrs

Refrigerants

Classification of refrigerants, Desirable properties of refrigerants, environmental issues, Ozone depletion and global warming, ODP, GWP & LCCP, selection of environment friendly refrigerants, secondary refrigerants, anti-freeze solutions, Zeotropes and Azeotropes, refrigerant: recovery reclaims, recycle and recharge.

Vapour Compression Cycle

Working of simple vapour compression system, representation of vapour compression cycle (VCC) on T-s and P-h diagram, COP, EER, SEER, IPLV, NPLV, effect of operating parameters on performance of

VCC, actual VCC, methods of improving COP using flash chamber, sub-cooling, liquid vapour heat exchanger, comparison of VCC with Reverse Carnot cycle,.

Unit 3: Refrigeration Systems 8 hrs

Vapour compression systems

Single stage, two stage and cascade VCC systems using single and multi evaporators

Vapour absorption systems

Introduction, Working of simple vapour absorption system (VAS), desirable properties of binary mixture (aqua-ammonia), performance evaluation of simple VAS (simple numerical treatment), actual VAS, Li-Br absorption system, three fluid system (Electrolux refrigeration), applications of VAS, comparison between VCC and VAC.

Unit 4: Psychometric and Air conditioning 8 hrs

Introduction to air conditioning, psychometric, psychometric properties and terms, psychometric relations, Psychometric processes and its representation on psychometric chart, BPF of coil, ADP, adiabatic mixing of two air streams, SHF, RSHF, GSHF, ESHF.

Thermodynamics of human body, comfort and comfort chart, factors affecting human comfort, concept of infiltration and ventilation, indoor air quality requirements, factors contributing to cooling load.

Unit 5 Air Conditioning Systems 8 hrs

Working of summer, winter and all year round AC systems, all air system, all water system, air water system, variable refrigerant flow and variable air volume systems, unitary and central air conditioning.

Components of refrigeration and air conditioning systems

Working of reciprocating, screw and scroll compressors, working of air cooled, water cooled and evaporative condensers, Working of DX, Flooded, Forced feed evaporators, Expansion devices – Capillary tube, TXV, EXV, operating and safety controls.

Unit 6: Air Distribution Systems 8 hrs

Air handling unit, Classification of ducts, duct material, pressure in ducts, flow through duct, pressure losses in duct (friction losses, dynamic losses), air flow through simple duct system, equivalent diameter, methods of duct system design: equal friction, velocity reduction, static regain method (numerical on duct system design)

Fan coil unit, types of fans used air conditioning applications, fan laws, filters, supply and return grills, sensors (humidity, temperature, smoke).

Term work:

The term work shall consist of minimum eight experiments out of the following:

1) Test on Domestic Refrigerator for evaluation of EER
2) Test on vapour compression test rig
3) Test on air conditioning test rig
4) Test on ice plant test rig
5) Visit to Vapour absorption refrigeration plant
6) Estimation of cooling load of simple air conditioning system (case study)
7) Case study on cold storage
8) Visit to any air conditioning plant
9) Thermal analysis of refrigeration cycle using suitable software
10) Installation and servicing of split air conditioner

Text Books

1. Arora C. P., Refrigeration and Air Conditioning, Tata McGraw-Hill
2. Manohar Prasad, Refrigeration and Air Conditioning, Willey Eastern Ltd, 1983
3. McQuiston, “ Heating Ventilating and air Conditioning: Analysis and Design” 6th Edition, Wiley India
4. Arora and Domkundwar, Refrigeration & Air Conditioning, Dhanpatrai & Company, New Delhi

5. Khurmi R.S. and Gupta J.K., Refrigeration and Air conditioning, Eurasia Publishing House Pvt. Ltd, New Delhi,1994.
6. Ballaney P.L., Refrigeration and Air conditioning, Khanna Publishers, New Delhi, 1992

Reference books

1. Dossat Ray J, Principles of refrigeration, S.I. version, Willey Eastern Ltd, 2000
2. Stockers W.F and Jones J.W., Refrigeration and Air conditioning, McGraw Hill International editions 1982.
3. Threlkeld J.L, Thermal Environmental Engineering, Prentice Hall Inc., New Delhi
4. Aanatnarayan, Basics of refrigeration and Air Conditioning, Tata McGraw Hill Publications
5. Roger Legg, Air Conditioning System Design, Commissioning and Maintenance
6. ASHRAE & ISHRAE handbook

(402042) CAD/CAM and Automation

Code	Subject	Teaching Scheme (Weekly Load in hrs)			Examination Scheme (Marks)					
		Lect.	Tut.	Pract.	Theory		TW	PR	OR	Total
					In Sem.	End Sem.				
402042	CAD /CAM and Automation	3	---	2	30 (1 hr)	70 (2 ½ hrs)	---	50	---	150

Pre-requisite: Engineering Graphics, Machine drawing, Manufacturing processes, SOM.

Course Objectives: To teach students

- Basics of modeling.
- Discuss various geometries.
- Discretization of the solid model.
- Apply Boundary Conditions similar to real world.
- Generate solution to ensure design can sustain the applied load conditions.
- Discuss latest manufacturing methods.

Course Outcomes: After completion of the course students would be able to,

- Analyze and design real world components
- Suggest whether the given solid is safe for the load applied.
- Select suitable manufacturing method for complex components.

Unit 1: Computer Graphics 8 hrs

Computer Graphics Module, Transformations-Introduction, Formulation, Translation, Rotation, Scaling and Reflection. Homogenous Representation, Concatenated Transformation, Mapping of Geometric Models, Inverse Transformations. Projections: Orthographic and Isometric.

Unit 2: Modelling 8 hrs

Curves-Introduction, Analytic Curves - Line, Circle, Ellipse, Parabola, Hyperbola. Synthetic Curves - Hermite Cubic Spline, Bezier Curve, B-Spline Curve. Numericals on Line, Circle, Ellipse and Hermite Cubic Spline

Surfaces-Introduction, Surface Representation, Analytic Surfaces, Synthetic Surfaces, Hermite bicubic Surface, Bezier surfaces, B-spline Surfaces, Coons Surface [No analytical treatment].

Solids: Introduction, Geometry and Topology, Solid Representation, Boundary Representation, Euler's equation, Constructive Solid Geometry, Boolean operation for CSG, Hybrid Modeling, Feature Based Modeling, Parametric Modeling, Constraint Based Modeling, Mass, area, volume calculation.

Unit 3: Finite Element Analysis 10 hrs

Introduction, Stress and Equilibrium, Boundary Condition, Strain – Displacement Relations, Stress-Strain Relation, Potential Energy and Equilibrium: - Rayleigh-Ritz Method, Galerkin’s Method.

One Dimensional Problem: Finite Element Modelling, Coordinate and Shape function, Potential Energy Approach, Galerkin Approach, Assembly of Global Stiffness Matrix and Load Vector, Properties of Stiffness Matrix, Finite Element Equations, Quadratic Shape Function, Temperature Effects .

Trusses: Introduction, 2D Trusses, Assembly of Global Stiffness Matrix.

Unit 4: Computer Aided Manufacturing 8 hrs

Introduction to Computer Aided Manufacturing.CNC Programming-CNC part programming adaptable to FANUC controller. Steps in developing CNC part program.CNC part programming for Lathe Machine – Threading & Grooving cycle(Canned cycle). CNC part programming for Milling Machine - Linear & circular interpolation, milling cutter, tool length compensation & cutter radius compensation. Pocketing, contouring & drilling, subroutine and Do loop using canned cycle.

Unit 5: Advanced Manufacturing Method – Rapid Prototyping 8 hrs

Introduction to Rapid Prototyping, classification of RP Processes, Working principle, models & specification process, application, advantages & disadvantages & case study of

- Stereo Lithography Apparatus (SLA)
- Laminated Object Manufacturing (LOM)
- Selective Laser Sintering (SLS)
- 3D Printing.
- Fused Deposition Modeling [FDM]

Rapid Tolling and STL format.

Unit 6: Robotics & Automation 8 hrs

Structure of Robotic System - Point to point & continuous path robotic systems, Joints, End Effectors, Grippers - Mechanical, Magnetic and Pneumatic. Drives, Controllers, Industrial Applications.

Types of Automation - Automation strategies, Group Technology & Coding Methods, Flexible Manufacturing System – Types, Advantages, Limitations. Computer Integrated Manufacturing and Computer Aided Process Planning.

Term Work: The term work shall consist of record of ten assignments based on the following topics with two on CAD based, three on CAE based, three on CAM based and two on robot and R. P.

1. Developing CAD model of mechanical sub assembly consisting 8- 10 components.
2. Developing component/ assembly using CAD features of Hybrid Modeling, Feature Based Modeling, Parametric Modeling and Constraint Based Modeling.
3. Program on concatenated Transformation involving Three steps.
4. Stress and deflection analysis of 2D truss.
5. Stress and deflection analysis of Beam.
6. Stress and deflection analysis of plate 2D/3D.[Mechanical Component].
7. Tool path generation for Turning- Grooving and Threading.
8. Tool path generation for milling- Facing, Pocketing, Contouring and Drilling.
9. Tool path generation of Turn Mill.
10. Tool path generation for Multi Axis Machining.
11. Robot simulation/Robot Gripper Design.
12. Case study on R.P.

Reference Books

1. Ibrahim Zeid and R. Sivasubramanian - CAD/CAM - Theory and Practice Tata McGraw Hill Publishing Co. 2009
2. Ibraim Zeid, “Mastering CAD/CAM” – Tata McGraw Hill Publishing Co. 2000
3. Chandrupatla T.R. and Belegunda A.D. -Introduction to Finite Elements in Engineering” - Prentice Hall India.
4. Segerling L.J. - Applied Finite Elements Analysis” John Wiley and Sons.
5. Rao P.N., Introduction to CAD/CAM Tata McGraw Hill Publishing Co.
6. Groover M.P.-Automation, production systems and computer integrated manufacturing’ - Prentice Hall of India
7. YoramKoren - Robotics McGraw Hill Publishing Co.
8. James G. Keramas, Robot Technology Fundamentals, Delmar Publishers.
9. S.R.Deb, Robotics Technology and Flexible Automation, Tata McGraw Hill.
10. Lakshiminarayana H. V. Finite Element Analysis (Procedures in Engineering), University Press, 2004.
11. Chandrupatla T. R., Finite Element Analysis for Engineering and Technology, University Press, 2009.
12. Seshu P. Text book of Finite Element Analysis, PHI Learning Private Ltd. New Delhi, 2010.
13. Ian Gibson, David W. Rosen, and Brent Stucker, Additive Manufacturing Technologies: Rapid Prototyping to Direct Digital Manufacturing, Springer.

(402043) Dynamics of Machinery

Code	Subject	Teaching Scheme (Weekly Load in hrs)			Examination Scheme (Marks)					
		Lect.	Tut.	Pract.	Theory		TW	PR	OR	Total
					In Sem.	End Sem.				
402043	**Dynamics of Machinery**	**4**	**---**	**2**	**30 (1 hr)**	**70 (2 ½ hrs)**	**25**	**--**	**50**	**175**

Prerequisites: Engg. Mechanics, TOM- I and TOM-II

Course Objectives

- To conversant with balancing problems of machines.
- To make the student conversant with fundamentals of vibration and noise.
- To develop competency in understanding of vibration and noise in Industry.
- To develop analytical competency in solving vibration problems.
- To make the student conversant with natural frequencies, Eigen values & Eigen vectors.
- To understand the various techniques of measurement and control of vibration and noise.

Course Outcomes

- Solutions to balancing problems of machines.
- Ability to understand the fundamentals of vibration and Noise.
- Ability to develop analytical competency in solving vibration problems.
- Ability to understand measurement and control of vibration and noise.
- Ability to calculate natural frequencies, Eigen values & Eigen vectors.
- Ability to measure vibrations, vibration characteristics and understand various methods for vibration control for real life problem.

Unit 1 : Balancing 8 hrs

Static and dynamic balancing, balancing of rotating masses in single and several planes, primary and secondary balancing of reciprocating masses, balancing in single cylinder engines, balancing in multi-cylinder in-line engines, direct and reverse cranks method -radial and V engines.

Unit 2: Single Degree of Freedom Systems – Free Vibration 10 hrs

Fundamentals of Vibration: Elements of a vibratory system, vector representation of S.H.M., degrees of freedom, types of vibration, natural frequency, equivalent springs, modeling of a system, formulation of equation of motion by equilibrium and energy methods.

Undamped free vibrations: Natural frequency for longitudinal, transverse and torsional vibratory systems.

Damped free vibrations: Different types of damping, free vibrations with viscous damping - over damped, critically damped and under damped systems, initial conditions, logarithmic decrement, introduction to equivalent viscous damping, dry friction or coulomb damping - frequency and rate of decay of oscillations.

Unit 3: Single Degree of Freedom Systems - Forced Vibrations 8 hrs

Forced vibrations of longitudinal and torsional systems, Frequency Response to harmonic excitation, excitation due to reciprocating and rotating unbalance, base excitation, magnification factor, resonance phenomenon and phase difference, Quality Factor. Critical speed of shaft having single rotor of undamped systems.

Unit 4: Two Degree of Freedom Systems - Undamped Vibrations 8 hrs

Free vibration of spring coupled systems – longitudinal and tensional, natural frequency and mode shapes, Eigen value and Eigen vector by Matrix method, Geared systems. Introduction to Physical and Mathematical modeling: Bicycle, Motor bike and Quarter Car.

Unit 5: Measurement and Control of Vibration 8 hrs

Force and Motion transmissibility, Vibration Measuring devices, Accelerometers, Impact hammer, Vibration shaker-Construction, principles of operation and uses, Vibration Analyzer, Analysis of Vibration Spectrum, Standards related to measurement of vibration and accepted levels of vibration Introduction to control of vibration, vibration control methods, passive and active vibration control, reduction of excitation at the source, control of natural frequency, Vibration isolators, Tunned Dynamic Vibration Absorbers, Introduction to Torsional Damper

Unit 6: Introduction to Noise 8 hrs

Fundamentals of noise Sound concepts, Decibel Level, , white noise, weighted sound pressure level, Logarithmic addition, subtraction and averaging, sound intensity, noise measurement, sound fields, octave band, sound reflection, absorption and transmission, pass-by-noise, Reverberation chamber, Anechoic Chamber, Human Exposure to Noise and Noise standards.

List of Experiments:

The Term Work shall consist of *Eight Experiments and Two Assignments* of following list.

A] Compulsory Experiments (Sr. No. 1 to 5)

1. Balancing of wheel / rotor on computerized balancing machine OR Demonstration of wheel balancing during a visit to industry / workshop.
2. To determine the natural frequency of damped vibration of single degree freedom system and to find it's damping coefficient.
3. To obtain frequency response curves of single degree freedom system of vibration for different amount of damping.
4. To determine natural frequency of transverse vibration of beam using vibration analyzer.
5. Noise measurement and analysis using vibration Analyzer.

B] Any Three Experiments from the following-

1. To determine critical speed of shaft with single rotor.
2. To verify natural frequency of torsional vibration of two rotor system and position of node .
3. Experimental verification of principle of dynamic vibration absorber.
4. Experiment on shock absorbers and to plot its characteristic curve.
5. Analysis of machine vibration signature, using any analysis software package.

C] Compulsory Assignments

1. Determination of free response of SDOF damped system to demonstrate different damping conditions using suitable software.
2. Determination of total response of SDOF damped system to harmonic excitation using suitable software

Text Books

1. Rao S. S. "Mechanical Vibrations", Pearson Education Inc. New Delhi.
2. Grover G. K. "Mechanical Vibrations", New Chand and Bros.,Roorkee
3. Wiiliam J Palm III, "Mechanical Vibration" Wiley India Pvt. Ltd, New Delhi
4. Uicker J.John, Jr, Pennock Gordon R, Shigley Joseph E."Theory of Machines and Mechanisms" International Version, OXFORD University Press, New Delhi.
5. M L Munjal, " Noise and Vibration Control" Cambridge University Press India

Reference Books

1. Weaver, " Vibration Problems in engineering" 5th Edition Wiley India Pvt. Ltd, New Delhi.
2. Bell, L. H. and Bell, D. H., "Industrial Noise Control – Fundamentals and Applications", Marcel Dekker Inc.

3. Alok Sinha, “ Vibration of Mechanical System”, Cambridge university Press , India
4. Dr Debabrata Nag, “ Mechanical Vibrations”, Wiley India Pvt. Ltd, New Delhi.
5. Kelly S. G. “Mechanical Vibrations“, Schaum‘s outlines, Tata McGraw Hill Publishing Co. Ltd., New Delhi.
6. Meirovitch, “Elements of Mechanical Vibrations”, McGraw Hill
7. Ver, “ Noise and Vibration Control Engineering”, Wiley India Pvt. Ltd, New Delhi.
8. Bies, D. and Hansen, C. “Engineering Noise Control - Theory and Practice”, Taylor and Francis
9. Shrikant Bhave, Mechanical Vibrations Theory and Practice, Pearson, NewDelhi.

(402044A) Energy Audit and Management (Elective I)

Code	Subject	Teaching Scheme (Weekly Load in hrs)			Examination Scheme (Marks)					
		Lect.	Tut.	Pract.	Theory		TW	PR	OR	Total
					In Sem.	End Sem.				
402044 A	Energy Audit and Management	3	---	--	30 (1 hr)	70 (2 ½ hrs)	--	--	--	100

Pre-Requisites: Economics, Basic Thermodynamics.

Course Objectives: Following concepts to be taught to the students,
- Importance of Energy Management.
- How to carry out Energy Audit.
- Methods to reduce consumption of energy and save cost.
- How to improve energy efficiency of overall system.
- Significance of Waste heat recovery and Cogeneration.

Course Outcomes: After successful completion of the course student would be able to,
- Carry out Energy Audit of there residence / society / college where they are studying.
- Carry out electrical tariff calculation and accurately predict the electricity bill required for the installation.
- Suggest various methods to reduce energy consumption of the equipment / office / premises.
-

Unit 1: General Aspects of Energy Management 8 hrs

Current energy scenario - India and World, Current energy consumption pattern in global and Indian industry, Principles of Energy management, Energy policy, Energy action planning, Energy security and reliability, Energy and environment, Need of Renewable and energy efficiency.

Unit 2: Energy Auditing 10hrs

Need of Energy Audit, Types of energy audit, Components of energy audit, Energy audit methodology, Instruments, equipment used in energy audit, Analysis and recommendations of energy audit - examples for different applications, Energy audit reporting, Energy audit software. Energy conservation opportunities in Boiler and steam system, Furnace, DG sets, HVAC system, pumping system, Cooling tower and Compressed air system.

Unit 3: Energy Economics 8 hrs

Costing of Utilities- Determination of cost of steam, natural gas, compressed air and electricity. Financial Analysis Techniques - Simple payback, Time value of money, Net Present Value (NPV), Return on Investment (ROI), Internal Rate of Return (IRR), Risk and Sensitivity analysis.

Unit 4: Energy Efficiency in Thermal Utilities 10 hrs

Energy performance assessment and efficiency improvement of Boilers, Furnaces, Heat exchangers, Fans and blowers, pumps, Compressors and HVAC systems. Steam distribution, Assessment of steam distribution losses, Steam leakages, Steam trapping, Condensate and flash steam recovery system.

Unit 5: Electrical Energy Management and Lighting 8 hrs

Electricity billing, Electrical load management and maximum demand control, Power factor improvement and its benefit, Selection and location of capacitors, Distribution and transformer losses.

Electrical motors- types, efficiency and selection. Speed control, Energy efficient motors. Electricity Act 2003. Lighting - Lamp types and their features, recommended illumination levels, lighting system energy efficiency.

Unit 6: Cogeneration and Waste Heat Recovery 8 hrs

Cogeneration- Need, applications, advantages, classification, the cogeneration design process. Waste heat recovery- Classification and application, Potential for waste-heat recovery in Industry, Commercial WHR devices, saving potential. CDM projects and carbon credit calculations.

Reference Books:

1. Handbook of Energy Audit, Albert Thumann P.E. CEM, William J. Younger CEM, The Fairmont Press Inc., 7th Edition.
2. Energy Management Handbook, Wayne C. Turner, The Fairmont Press Inc., 5th Edition, Georgia.
3. Handbook on Energy Audit and Environment management, Abbi Y. A., Jain Shashank, TERI, Press, New Delhi, 2006
4. Energy Performance assessment for equipment and Utility Systems.-Vol. 2,3.4 BEE Govt. of India
5. Boiler Operator’s Guide Fourth Edition, Anthony L Kohan, McGraw Hill
6. Energy Hand book, Second edition, Von Nostrand Reinhold Company - Robert L.Loftness. 7. www.enrgymanagertraining.com
7. http://www.bee-india.nic.in

(402044B) Tribology (Elective I)

Code	Subject	Teaching Scheme (Weekly Load in hrs)			Examination Scheme (Marks)					
		Lect.	Tut.	Pract.	Theory		TW	PR	OR	Total
					In Sem.	End Sem.				
402044 B	Tribology	3	---	--	30 (1 hr)	70 (2 ½ hrs)	--	--	--	100

Pre-Requisites: TOM-I, TOM-II and Machine design.

Course Objectives: After successful completion of this course, students will be able-

- To know about properties of lubricants, modes of lubrication, additives etc.
- To Select suitable/proper grade lubricant for specific application.
- To select suitable material combination for tribological contact.
- To Apply the basic theories of friction, wear and lubrications about frictional behavior commonly encountered sliding surfaces.
- To suggest an explanation to the cause of tribological failures.
- To design bearing, friction, wear test rig for laboratory purposes.

Course Outcomes

- For these simplified course contents, student develops confidence in him/her to fulfill course objectives.
- Term work includes simple case study/assignment/seminar/visit and in-semester theory examination as a part of learning process encourages students.
- He/she proves himself/herself to be excellent practical engineer in any tribological industry.
-

Unit 1: Introduction 8 hrs

1. Tribology definition.
2. Tribology in design- bearing material its properties and construction Tribological design of oil seals and gasket.
3. Tribology in industry (Maintenance).
4. Lubrication-Definition, basic modes of lubrication, properties of lubricants, additives, EP lubricants, Recycling of used oil, oil conservation, oil emulsion.
5. Bearing Terminology-Types of Sliding contact, rolling contact bearings.
6. Comparison between sliding and rolling contact bearing. (Theoretical treatment only)

Unit 2: Friction and wear 8 hrs

1. Friction- Introduction, laws of friction, Friction classification, causes of friction.
2. Theories of dry friction.
3. Friction measurement.
4. Stick-slip motion and friction instabilities.
5. Wear-classification, wear between solids, wear between solid and liquids, factors affecting wear.
6. Theories of wear.
7. Wear measurement.
8. Approaches to friction control and wear prevention. (Numerical)

Unit 3: Hydrodynamic lubrication 10 hrs

1. Theory of hydrodynamic lubrication, mechanism of pressure development in oil film.
2. Two dimensional Reynold's equation and its limitations, Petroff`s equation.
3. Infinitely long journal bearing, infinitely short journal bearing and finite bearing, designing journal bearing using Raimondi and Boyd approach.
4. Hydrodynamic thrust bearing-Introduction, types.

5. Flat plate thrust bearing-Pressure equation, load, centre of pressure, frictional force equation.
6. Tilting pad thrust bearing- bearing-Pressure equation, load, centre of pressure, frictional force equation. (Numericals on Raimondi and Boyd approach and thrust bearing only)

Unit 4: Hydrostatic lubrication 8 hrs

1. Hydrostatic lubrication-Basic concept, advantages, limitations, viscous flow through rectangular slot, load carrying capacity, flow requirement of hydrostatic step bearing, energy losses, optimum design of stepped bearing, compensators and their actions.
2. Squeeze film lubrication- Basic concept, circular and rectangular plate approaching a plane (Numericals on hydrostatic bearing, Squeeze film lubrication).

Unit 5: Elasto-hydrodynamic lubrication and Gas (air) lubrication 8 hrs

1. Elasto-hydrodynamic lubrication-Principle and applications, pressure viscosity term in Reynold's equation, Hertz theory, Ertel-Grubin equation, lubrication of spheres.
2. Gas(air) lubricated bearings-Introduction, advantages, disadvantages, applications of tilting pad bearing, hydrostatic and hydrodynamic bearing with air lubrication, Active and passive magnetic bearings(working principle, types and advantages over conventional bearing). (Theoretical treatment only)

Unit 6: Tribological Aspects 10 hrs

1. Lubrication in rolling, forging, drawing and extrusion.
2. Mechanics of tyre road interaction, road grip, wheel on rail road.
3. Surface engineering for wear and corrosion resistance-diffusion, plating and coating methods, selection of coatings, properties and parameters of coatings.
4. Other bearings-porous bearing, foil bearing, Lobe, hybrid bearing. (Theoretical treatment only)

Reference Books

1. Cameron A., "Basic Lubrication Theory", Wiley Eastern Ltd.
2. Bharat Bhushan, "Principles and Applications of Tribology" 2nd Edition, Wiley India
3. Mujumdar B. C., "Introduction to Tribology and Bearings", S. Chand and Company Ltd. New Delhi.
4. Fuller D. D., "Theory and Practice of Lubrication for Engineers", John Wiley and Sons.
5. Halling J., "Principles of Tribology", McMillan Press Ltd.
6. Bhushan B. and Gupta B. K., " Handbook of Tribology: Material, Coatings and Surface Treatments", McGraw Hill Ltd.
7. Davis J., "Surface Engineering for Corrosion and Wear Resistance", Woodhead Publishing, 2001.
8. Tadausz Burakowski, "Surface Engineering of Metals: Principles, Equipments and Technologies", Taylor and Francis.

(402044C) Reliability Engineering (Elective I)

Code	Subject	Teaching Scheme (Weekly Load in hrs)			Examination Scheme (Marks)					
		Lect.	Tut.	Pract.	Theory		TW	PR	OR	Total
					In Sem.	End Sem.				
402044 C	Reliability Engineering	3	---	--	30 (1 hr)	70 (2 ½ hrs)	--	--	--	100

Pre-Requisites: Engineering Mathematics, Probability, Statistics.

Course Objectives: To teach students,

- Understanding of basic principles of Reliability for ensuring sustainable product design.
- Application to system requirements, design, manufacturing and testing, with real-world examples.
- Understand in detail Asset Management, Maintenance, Quality and Productiveness,

Course Outcomes: After completion of the course students would be able to,

- Understand and analyze different methods of failure.
- Calculate MTTF, MTBF, failure rate and hazard rate.
- Different probability methods applied to Reliability.
- Optimize Cost & reliability.
- Perform FEMA, FMECA, DOE, Taguchi method.
- Different methods to test reliability.
-

Unit 1: Fundamental concepts of Reliability 8 hrs

Reliability terminologies, Role of the reliability function in the organization, Interrelationship of safety, quality and reliability, life characteristic phases, Product liability-Significance, importance of reliability, Introduction to maintainability, availability.

Concepts of Failure, failure density, failure Rate, hazard rate, pdf, cdf. Modes of failure, Mean Time To Failure (MTTF), Mean Time Between Failure (MTBF), Numericals based on calculation of failure rate, hazard rate.

Warranty Management and Life cycle cost.

Unit 2: Probability Concepts and System Reliability 10 hrs

Basic probability concepts, Laws of probability, Introduction to independence, mutually exclusive, conditional probability, Discrete and continuous probability distributions, Comparison of probability distributions -binomial, normal, lognormal, Poisson, Weibull, exponential,

Standard deviation, variance, mean, mode and Central Limit Theorem.

Analysis of series, parallel, mixed configurationsystems ,Concept of k- out of n structure, Conditional probability method, delta-star method for conditional probability analysis, Tie-set and Cut Set method (Concepts and Numericals).

Unit 3: System reliability Analysis 8 hrs

Reliability Improvement- Redundancy, element redundancy, unit redundancy, standby redundancy-types of stand by redundancy, parallel components single redundancy, multiple redundancies (Numericals).

Introduction to Reliability allocation or apportionment, reliability apportionment techniques - equal apportionment, AGREE, ARINC, Minimum effort method (Numericals).

Unit 4: Reliability Management 8 hrs

Objectives of maintenance, types of maintenance, Maintainability, factors affecting maintainability, system down time, availability - inherent, achieved and operational availability (Numerical treatment).

Introduction to Reliability Centered Maintenance.

Design for maintainability and its considerations, Reliability and costs, Costs of Unreliability, Standards for Reliability-MIL Handbook 217F & Carderock Model. Technology aspects in Reliability Management, BIT (Built in testing).

Unit 5: Reliability in Design & Development 8 hrs

Reliability techniques- Failure mode, effects analysis (FMEA),Failure mode, effects and criticality analysis (FMECA)-Case Studies, Basic symbols, Fault Tree construction and analysis, Monte Carlo Simulation.
Introduction to Design of Experiments (DOE) and Taguchi Method.
Human factors in design and design principles.

Unit 6: Reliability Testing 8 hrs

Introduction to reliability testing, Stress strength interaction, Introduction to Markov model
Testing for Reliability and Durability- Accelerated Life Testing and Highly Accelerated Life Testing (HALT), highly accelerated stress Screening (HASS).
Reliability in manufacturing- Production FRACAS.
Reliability Data- Acquisition &graphical analysis.

Reference Books

1. Kapur, " Reliability in engineering Design", Wiley india
2. Chandrupatla, " Quality and Reliability in Engineering" Cambridge Uni. Press, India
3. S S. Rao, Reliability Based Design, McGraw Hill Inc. 1992
4. L.S.Srinath, Reliability Engineering, EWP , 4th Edition 2011
5. Bryan Dodson, Dennis Nolan, Reliability Engineering Handbook, Marcel Dekker Inc, 2002
6. Basu S.K, Bhaduri , Terotechnology and Reliability Engineering, Asian Books Publication
7. Alessandro Birolini, Reliability Engineering Theory and Practice, Springer
8. R.M. Parkhi, Market Leadership by Quality and Reliability, Vidyanand Publications 2012
9. V.N.A. Naikan, Reliability Engineering and Life Testing, PHI Learning 2010
10. Charles E. Ebeling, Reliability and Maintainability Engineering, TMH 2009
11. Dr. Robert B. Abernathy, The New Weibull Handbook.

(402044D) Machine Tool Design (Elective I)

Code	Subject	Teaching Scheme (Weekly Load in hrs)			Examination Scheme (Marks)					
		Lect.	Tut.	Pract.	Theory		TW	PR	OR	Total
					In Sem.	End Sem.				
402044 D	Machine Tool Design	3	---	--	30 (1 hr)	70 (2 ½ hrs)	--	--	--	100

Pre-requisite: Manufacturing Processes, TOM, Machine Design.

Course Objectives: It expected to teach following concepts to the students,

- Selection of suitable drive to run the system.
- Design of machine tools structures, guide-ways.
- Design of Spindle, power screws.
- Dynamics of machine tools.
- Special features of machine tool design.

Course Outcome: After completion of the course student will be able to,

- Design gear box.
- Design different machine tools considering static and dynamic loads.
- Understand effect of vibrations on life of machine tools.
- Understand design considerations for Special features in Machine tools.
-

Unit 1: Drives **10 hrs**

Design considerations for drives based on continuous and intermittent requirement of power, Types and selection of motor for the drive, Regulation and range of speed based on preferred number series, geometric progression. Design of speed gear box for spindle drive and feed gear box.

Unit 2: Design of Machine Tool Structure **8 hrs**

Analysis of forces on machine tool structure, static and dynamic stiffness. Design of beds, columns, housings, bases and tables.

Unit 3: Design of Guide-ways **8 hrs**

Functions and types of guide-ways, design criteria and calculation for slide-ways, design of hydrodynamic, hydrostatic and aerostatic slide-ways, Stick-Slip motion in slide-ways.

Unit 4: Design of Spindles, Spindle Supports and Power Screws **10 hrs**

Design of spindle and spindle support using deflection and rigidity analysis, analysis of antifriction bearings, preloading of antifriction bearing. Design of power screws: Distribution of load and rigidity analysis.

Unit 5: Dynamics of Machine Tools **8 hrs**

Dynamic characteristic of the cutting process, Stability analysis, vibrations of machine tools. Control Systems, Mechanical and Electrical, Adaptive Control System, relays, push button control, electrical brakes, drum control.

Unit 6: Special features in Machine Tool Design **8 hrs**

Design considerations for SPM, NC/CNC, and micro machining, Retrofitting, Recent trends in machine tools, Design Layout of machine tool using matrices. Step-less drives Design considerations of Step-less drives, electromechanical system of regulation, friction, and ball aviators, PIV drive, Epicyclic drive, principle of self locking,

Text Books

1. N.K. Mehta, “Machine Tool Design“, Tata McGraw Hill, ISBN 0-07-451775-9.
2. Bhattacharya and S. G. Sen., “Principles of Machine Tool“, New central book agency Calcutta, ISBN 81-7381-1555.
3. D. K Pal, S. K. Basu, “Design of Machine Tool“, 4th Edition. Oxford IBH 2005, ISBN 81- 204-0968

Reference Books

1. N. S. Acherkan, “Machine Tool“, Vol. I, II, III and IV, MIR publications.
2. F. Koenigsberger, “Design Principles of Metal Cutting Machine Tools“, The Macmillan Company New York 1964

(402045A) Gas Turbine and Propulsion (Elective II)

Code	Subject	Teaching Scheme (Weekly Load in hrs)			Examination Scheme (Marks)					
		Lect.	Tut.	Pract.	Theory		TW	PR	OR	Total
					In Sem.	End Sem.				
402045 A	Gas Turbine and Propulsion	3	---	--	30 (1 hr)	70 (2 ½ hrs)	--	--	--	100

Pre-requisites: Basic Thermodynamics, Fluid Mechanics, Turbo Machinery

Course Objectives

- Understand the thermodynamics of each component of a turbine engine which include inlets, fans, compressors, burners, turbines, afterburners and nozzles
- Know what the design variables are for each component
- Understand the linked system performance of all components in the engine and performance trends for each component
- Understand the basis for off-design performance

Course Outcome: At the end of this course the students should be able to

- Demonstrate the gas turbine power plant
- Illustrate the jet propulsion system
- Analyze the performance of gas turbine engine
- Present the technical details of compressors used in gas power systems

Unit 1: Introduction to Gas Turbine **8 hrs**

Basic Mechanics, Simple Gas Turbine, Open cycle, closed cycles, single-shaft and twin-shaft arrangements, Combined and cogeneration cycle, Introduction to Aircraft propulsion and Rocket Propulsion(Principle, propellant and its properties), gas turbine design procedure, Environmental Issues, Industrial applications

Unit 2: Analysis of Shaft Power Cycles **10hrs**

Idea Cycle: Assumption in ideal cycle, Simple Gas Turbine Cycle (Efficiency & Specific work), Heat Exchange Cycle, Reheat cycle, reheat Cycle with heat exchanger, intercooled compression Cycle with heat exchanger,

Practical Cycles: Methods of accounting for component losses—Stagnation properties, Compressor and Turbine Efficiencies, Polytrophic efficiency, Pressure Losses, Heat exchanger Effectiveness, Combustion efficiency Mechanical Losses, Variation of Specific Heat—Numerical on ideal cycle and considering all losses

Unit 3: Analysis of Propulsion Cycles **8hrs**

Introduction to aircraft propulsion, Aircraft Intake, Nozzle and diffuser(Losses), criteria for performance, Thermodynamic analysis of turbojet engine, Thermodynamic analysis of turbofan engine, Thermodynamic analysis of turbo-prop engine, Parameter affecting the flight performance, thrust augmentation.

Unit 4: Axial Flow Turbine **8hrs**

Concept of turbine - Cascade of Blade – Blade material, analysis of turbine stage - velocity triangles and characterization of blades and stages, utilization factor, Design of axial flow turbine - Performance analysis of turbines.

Unit 5: Axial Flow Compressor **8hrs**

Basic operation (diffusion process), Cascade of Blade (Blade loading, Flow coefficient, blade and stage efficiency), compressor stage, Velocity triangle, Degree of reaction, work done factor, Factor affecting pressure ratio (losses),

Unit 6: Combustion System and Performance of Gas Turbine Engine 8hrs

Combustion system

Types of Combustion system, requirement of Combustion chamber, Combustion process in gas turbine, Factor effecting combustion chamber performance (pressure loss, combustion efficiency, outlet temperature distribution, stability limits and combustion intensity), Mixing and dilution.

Performance of gas turbine engine

Component characteristics of compressor and turbine, off design characteristics, Equilibrium point and procedure to find it, Equilibrium running of gas turbine generator, matching of gas generator with free turbine, part load performance

Text Books

1. H.I.H. Saravanamuttoo, G.F.C. Rogers, H. Cohen, “Gas Turbine Theory”, 6th ed.
2. Jack D. Mattingly, “Elements of Gas Turbine Propulsion”
3. V Ganesan, “Gas Turbines”, 3rd ed., Tata McGraw-Hill Education
4. Sutton, “ Rocket Propulsion elements”, 7th edition Wiley, India
5. Flack R., “ Fundamentals of Jet Propulsion with Applications”, Cambridge Uni. Press, India
6. J.D. Anderson, “Introduction to Flight”, 5th ed., Tata McGraw Hill

(402045B) Product Design and Development (Elective II)

Code	Subject	Teaching Scheme (Weekly Load in hrs)			Examination Scheme (Marks)					
		Lect.	Tut.	Pract.	Theory		TW	PR	OR	Total
					In Sem.	End Sem.				
402045 B	Product Design and Development	3	---	--	30 (1 hr)	70 (2 ½ hrs)	--	--	--	100

Pre-Requisites: Nil

Course Objectives: To explain students significance of,

- Product design and development.
- Hurdles in commercialization of product.
- Importance of reverse engineering.
- Focus of designing a product.
- Design validation plan.
- PLM and PDM

Course Outcome: After successful completion of the course students would be able to

- Design a sustainable product.
- Develop commercial Product
- Master in new techniques PLM and PDM

Unit 1: Introduction to Product Design and development 7 hrs

Definition of product design, Essential Factors for product design, Product design phases, Modern approaches to product design, standardization, simplification and specialization in product design product development, product development versus product design, product development team and product development planning, modern product development process with reference to ISO standard, product testing, product validation, Product verification and production validation

Unit 2: Product Development –Technical and Business Concerns 8 hrs

Mission Statement and Technical Questioning, Technology Forecasting and S Curve, Customer Needs and Satisfaction, Customer Needs - Types and Models, tools for Gathering Customer Needs , Analysis of Gathered Information, Customer Population and Market Segmentation, Economic Analysis of Product (Numerical).

Unit 3: Product Development from Concept to Product Function 8 hrs

Product information gathering, brainstorming and lateral thinking, morphological analysis of product, Generating concepts, concept selection - design evaluation, estimation of technical feasibility, concept selection process, Pugh’s concept, selection charts, (numerical)concept scoring, process of concept embodiment, system modeling, functional modeling and decomposition, fast method, subtract and operate procedure

Unit 4: Reverse Engineering 8 hrs

Product Teardown Process, Tear Down Methods, Force Flow Diagrams, Measurement and Experimentation, Applications of Product Teardown, Benchmarking Approach and Detailed Procedure, Tools Used In Benchmarking -Indented Assembly Cost Analysis , Function -Form Diagrams, Trend Analysis, Setting Product Specifications, Introduction to Product Portfolio and Architecture

Unit 5: Design for X 8hrs

Design for manufacture, Design for assembly, Design for robustness, Design for safety , Design for reliability, Design for environment, Design for piece part production, manufacturing cost analysis. Local, Regional and Global issues, basic life cycle assessment - basic method, weighed sum assessment method (Numerical)

Unit 6: Product Life Cycle Management and Product Data Management 7 hrs

Introduction ,Concept of Product Life Cycle management, Components/Elements of PLM, Customer Involvement, Product Data and Product Workflow, The Link Between Product Data and Product Workflow, Different Phases of Product Life Cycle and corresponding technology.
Case study based for design and development of any mechanical product.

Reference Books

1. A. K. Chitale; R.C. Gupta, Product Design and Manufacturing, Prentice Hall India.
2. Dieter George E., Engineering Design McGraw Hill Pub. Company, 2000.
3. Kevin Otto and Kristin Wood, Product Design : Techniques in Reverse Engineering and New Product Development ,Pearson Education Inc.
4. Grieves, Michael, Product Lifecycle Management McGraw Hill
5. Bralla, James G., Handbook of Product Design for Manufacturing, McGraw Hill Pub.
6. Karl Ulrich, product design and development, TMH.

402045C Operation Research (ELECTIVE II)

Code	Subject	Teaching Scheme (Weekly Load in hrs)			Examination Scheme (Marks)					
		Lect.	Tut.	Pract.	Theory		TW	PR	OR	Total
					In Sem.	End Sem.				
402045 C	Operation Research	3	---	--	30 (1 hr)	70 (2 ½ hrs)	--	--	--	100

Pre-Requisites: Engineering Mathematics, Theory of probability, Statistics.

Course Objectives

- To familiarize the students with the use of practice oriented mathematical applications for optimization functions in an organization.
- To familiarize the students with various tools of optimization, probability, statistics and simulation, as applicable in particular scenarios in industry for better management of various resources.

Course Outcomes: Learner will be able to.....

- Illustrate the need to optimally utilize the resources in various types of industries.
- Apply and analyze mathematical optimization functions to various applications.
- Demonstrate cost effective strategies in various applications in industry.

Unit 1: Introduction: Operation Research 8 hrs

Introduction: Definition, Evolution and Classification of Quantitative Methods and Operations Research Techniques, Methodology, Advantages and Limitations.

Linear Programming: Introduction, Formulation, Simplex Method (Big – M and Two Phase Methods), Dual Simplex Method (Conversion of primal to dual)

Introduction to Sensitivity Analysis.

Decision Theory: Meaning and Steps in Decision Making, Types of Management Decisions, Decision under Certainty, under Risk, under Uncertainty, Decision Trees.

Unit 2: Transportation Model 8 hrs

Introduction, Formulation, Basic Method of Solving Transportation Problem, Optimization Methods like UV and Stepping Stone Method, Concept of Trans-shipment Methods as an Extension of Transportation.

Assignment Problem- Hungarian Method to solve Assignment Problem, Travelling Salesman as an Extension of Assignment Problem.

Unit 3: Theory of Games and Investment Analysis 8 hrs

Theory of Games : Introduction, Minimax and Maximin Principle, Solution of Game with Saddle Point, Solution by Dominance, Solution by Graphical Method, m x n size Game Problem, Iterative method, Introduction to formulation of games using Linear Programming.

Investment Analysis: Break-Even Analysis, Payback Period Method, A (A) R Method, DCF Method, IRR Method, Introduction to Probabilistic Models.

Unit 4: Inventory Control and Replacement Analysis 8 hrs

Inventory Control - Deterministic Models- Shortage, without shortage; Probabilistic Inventory Models, Introduction to Concept of Service level.

Replacement Analysis - Replacement of Items that Deteriorate, Replacement of Items that Fail Suddenly.

Unit 5: Queuing Theory and Sequencing models 8 hrs

Queuing Theory - Introduction, Basis Structure, Terminology (Kendal's Notations) and Applications. Queuing Model M/M/1: /FIFO, M/M/c.

Sequencing models: Solution of sequencing Problem - Processing of n jobs through two machines, Processing of n jobs through three machines, Processing of two jobs through m Machines, Processing of n jobs through m Machines

Unit 6: Network Models **8 hrs**

Network Models: Fulkerson's rule, concept and types of floats, CPM and PERT, Introduction to crashing.

Simulation: Introduction, Monte-Carlo Simulation method, Simulation of Inventory and Queuing Problems.

Introduction to Multi Object Decision Making: Goal Programming Formulation.

Text Books

1. N. D. Vora, Quantitative Techniques.
2. Prem Kumar Gupta, D. S. Hira, Problems in Operations Research: Principles and Solutions, S. Chand, 1991
3. J. K. Sharma, Operations Research : Theory And Application, Laxmi pub. India.
4. Operations Research, S. D. Sharma, Kedar Nath Ram Nath-Meerut.

Reference Books

1. Belegundu, " Optimization Concepts and Applications in engineering, Cambridge Uni. Press, India
2. Hillier F.S., and Lieberman G.J., Operations Research, Eight Edition, Mc. Tata McGraw Hill, India
3. Ravindran, "Engineering optimization Methods and Appliations", 2nd edition, Wiley, India
4. Ravindran, Phillips and Solberg, Operations Research Principles and Practice, Second Edition, Mc. WSE Willey,
5. Operations Research - An introduction, Hamdy A Taha, Pearson Education.

(402045D) Advanced Manufacturing Processes (Elective II)

Code	Subject	Teaching Scheme (Weekly Load in hrs)			Examination Scheme (Marks)					
		Lect.	Tut.	Pract.	Theory		TW	PR	OR	Total
					In Sem.	End Sem.				
402045 D	Advanced Manufacturing Processes	3	---	--	30 (1 hr)	70 (2 ½ hrs)	--	--	--	100

Prerequisite: Student must have knowledge of basic engineering sciences viz, Fluid Mechanics, Heat transfer

Course Objectives

1. To Introduce the students with Advanced Manufacturing Processes
2. To Introduce the student with Measurement techniques for micro machining
3. To Introduce the student

Course Outcomes

1. Selection of appropriate manufacturing process for advance components
2. Characterization of work pieces

Unit I: Metal Forming **8 hrs**

Roll forming, High velocity hydro forming, High velocity Mechanical Forming, Electromagnetic forming, High Energy Rate forming (HERF), Spinning, Flow forming, Shear Spinning

Unit II: Advanced Welding, casting and forging processes **8 hrs**

Friction Stir Welding – Introduction, Tooling, Temperature distribution and resulting melt flow
Advanced Die Casting - Vacuum Die casting, Squeeze Casting

Unit III: Advanced techniques for Material Processing **8 hrs**

STEM: Shape tube Electrolytic machining, EJT: Electro Jet Machining, ELID: Electrolytic Inprocess Dressing, ECG: Electrochemical Grinding, ECH: Elctro-chemical Etching
Laser based Heat Treatment

Unit IV: Micro Machining Processes **8 hrs**

Diamond micro machining, ultrasonic micro machining, micro electro discharge machining

Unit V: Additive Manufacturing Processes **8 hrs**

Introduction and principles, Development of additive manufacturing Technologies, general additive manufacturing processes, powder based fusion process, extrusion based system, sheet lamination process, direct write technologies

Unit VI: Measurement Techniques in Micro machining **8 hrs**

Introduction, Classification of measuring System, Microscopes : Optical Microscope, Electron Microscopes, Laser based System, Interference Microscopes and comparators, Surface profiler, Scanning Tunneling Microscope, Atomic force micro scope, Applications.

Reference Books

1. Principles of Modern Manufacturing -- Groover, WILEY, India
2. Technology of Metal Forming processes -- Surender Kumar PHI Publication
3. Sheet metal forming: Processes and Applications -- Tayalan Atlan ASM International USA
4. Friction Stir welding and Processing -- Rajiv S.Mishra ASM International
5. High Integrity Die casting Processes -- Edward J vinarcik John Wiley and Sons
6. Advanced Methods of Machining -- J.A. Mcgeough Chapman & Hall
7. Electro Chemical Machining --A.E. De Barr and D.A Oliver Mac Donald and company Publisher Ltd.
8. Micro machining of Engineering Materials -- Joseph Mcgeough Marcel Dekker, Inc.
9. Additive Manufacturing Techniques -- Ian Gibson Springer

(402046) PROJECT STAGE I*

Code	Subject	Teaching Scheme (Weekly Load in hrs)			Examination Scheme (Marks)					
		Lect.	Tut.	Pract.	Theory		TW	PR	OR	Total
					In Sem.	End Sem.				
402046	Project Stage I	--	2	--	---	----	50*	--	--	50

*** Assessment should be carried out by panel of examiners from same Institute**

INSTRUCTIONS FOR DISSERTATION WRITING (Project Stage I)
It is important that the procedures listed below be carefully followed by all the students of B.E. (Mechanical Engineering).

1. Prepare **Three Spiral Bound Copies** of your manuscript.

2. Limit your Project Stage I to **25– 30** pages (preferably)

3. The footer must include the following:

Institute Name, B.E. (Mechanical) Times New Roman 10 pt. and centrally aligned.

4. Page number as second line of footer, Times New Roman 10 Pt, centrally aligned.

5. Print the manuscript using a. Letter quality computer printing.
b. The main part of manuscript should be Times New Roman 12 pt. with alignment - justified.
c. Use 1.5 line spacing.
d. Entire report shall be of 5- 7 chapters.

6. Use the paper size 8.5’’ × 11’’ or A4 (210 × 197 mm). Please follow the margins given below.

Margin Location	Paper 8.5’’ × 11’’	Paper A4 (210 × 197 mm)
Top	1’’	25.4 mm
Left	1.5’’	37 mm
Bottom	1.25’’	32 mm
Right	1’’	25.4 mm

7. All paragraphs will be 1.5 line spaced with a one blank line between each paragraph. Each paragraph will begin with without any indentation.

8. Section titles should be bold with 14 pt typed in all capital letters and should be left aligned.

9. Sub-Section headings should be aligning at the left with 12 pt, bold and Title Case (the first letter of each word is to be capitalized).

10. Illustrations (charts, drawings, photographs, figures) are to be in the text. Use only illustrations really pertinent to the text. Illustrations must be sharp, clear, black and white. Illustrations downloaded from internet are not acceptable. a. Illustrations should not be more than two per page. One could be ideal
b. Figure No. and Title at bottom with 12 pt
c. Legends below the title in 10 pt
d. Leave proper margin in all sides
e. Illustrations as far as possible should not be photo copied.

11. Photographs if any should be of glossy prints

12. Please use SI system of units only.

13. Please number the pages on the front side, centrally below the footer

14. References should be either in order as they appear in the thesis or in alphabetical order by last name of first author

15. Symbols and notations if any should be included in nomenclature section only

16. Following will be the order of report
i. Cover page and Front page as per the specimen on separate sheet
ii. Certificate from the Institute as per the specimen on separate sheet
iii. Acknowledgements
iv. List of Figures
v. List of Tables
vi. Nomenclature
vii. Contents
viii. Abstract (A brief abstract of the report not more than 150 words. The heading of abstract i.e. word "Abstract" should be bold, Times New Roman, 12 pt and should be typed at the centre. The contents of abstract should be typed on new line without space between heading and contents. Try to include one or two sentences each on motive, method, key-results and conclusions in Abstract
1 Introduction (2-3 pages) (TNR – 14 Bold)
1.1 Problem statement (TNR – 12)
1.2 Objectives
1.3 Scope
1.4 Methodology
1.5 Organization of Dissertation

2 Literature Review (20-30 pages)

Discuss the work done so far by researchers in the domain area and their significant conclusions. No derivations, figures, tables, graphs are expected.

3 This chapter shall be based on your own simulation work (Analytical/ Numerical/FEM/CFD) (15- 20 pages)

4 Experimental Validation - This chapter shall be based on your own experimental work (15-20 pages)

5 Concluding Remarks and Scope for the Future Work (2-3 pages)

(IF above Chapters 3,4, 5 not completed please mention the plan for the same and time period for completion and detail activity chart).

References ANNEXURE (if any) (Put all mathematical derivations, Simulation program as Annexure)

17. All section headings and subheadings should be numbered. For sections use numbers 1, 2, 3, …. and for subheadings 1.1, 1.2, …. etc and section subheadings 2.1.1, 2.1.2, …. etc.

18. References should be given in the body of the text and well spread. No verbatim copy or excessive text from only one or two references. If figures and tables are taken from any reference then indicate source of it. Please follow the following procedure for references

Reference Books
Collier, G. J. and Thome, J. R., Convective boiling and condensation, 3rd ed., Oxford University Press,

UK, 1996, pp. 110 – 112.

Papers from Journal or Transactions Jung, D. S. and Radermacher, R., Transport properties and surface tension of pure and mixed refrigerants, *ASHRAE Trans*, 1991, 97 (1), pp. 90 – 98.

Bansal, P. K., Rupasinghe, A. S. and Jain, A. S., An empirical correction for sizing capillary tubes, *Int. Journal of Refrigeration*, 1996, 19 (8), pp.497 – 505.

Papers from Conference Proceedings
Colbourne, D. and Ritter, T. J., *Quantitative assessment of flammable refrigerants in room air conditioners*, Proc. of the Sixteenth International Compressor Engineering Conference and Ninth International Refrigeration and Air Conditioning Conference, Purdue University, West Lafayette, Indiana, USA, 2002, pp. 34 – 40.

Reports, Handbooks etc.

United Nations Environmental Programme, Report of the Refrigeration, Air Conditioning and Heat Pumps, Technical Option Committee, 2002, Assessment - 2002.

ASHRAE Handbook: Refrigeration, 1994 (Chapter 44)

Patent
Patent no, Country (in parenthesis), date of application, title, year.

Internet
www.(Site) [Give full length URL]

A Project Stage-I Report on
(TNR, 16pt, centrally aligned)

Title of the thesis
(TNR, 27pt, Bold, Centrally Aligned, Title Case)

By (TNR, 16pt, Centrally Aligned)

Mr. Student's Name
(TNR, 16pt, Centrally Aligned)

Guide: *Guide's Name*
(TNR, 16pt, Centrally Aligned)

Institute Logo

Department of Mechanical Engineering
Name of the Institute [2015-16]
(TNR, 22pt, Title Case Centrally Aligned)

Name of the Institute

Institute Logo

C E R T I F I C A T E

This is to certify that *Mr. Mandar Kulkarni M.* has successfully completed the Project Stage – I entitled “Performance analysis of……..” under my supervision, in the partial fulfillment of Bachelor of Engineering - Mechanical Engineering of University of Pune.

Date :

Place :

Guide’s Name ____________________
Guide

Internal Examiner ____________________

Head Department ____________________
and Institute Name

Principal, ____________________
Institute Name

Seal

SEMESTER II

(402047) Power Plant Engineering

Code	Subject	Teaching Scheme (Weekly Load in hrs)			Examination Scheme (Marks)					
		Lect.	Tut.	Pract.	Theory		TW	PR	OR	Total
					In Sem.	End Sem.				
402047	Power Plant Engineering	4	---	2	30 (1 hr)	70 (2 ½ hrs)	2	--	50	175

Prerequisites

Thermodynamics, Basic Mechanical Engineering, Turbo Machine, and Internal Combustion Engine

Course Objectives

- To develop an ability to apply knowledge of mathematics, science, and engineering.
- To develop an ability to design a system, component, or process to meet desired needs within realistic constraints.
- To develop an ability to identify, formulate, and solve engineering problems.
- To develop an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

Course Outcomes

- Ability to have adequacy with Design, erection and development of energy conversion plants.
- Optimization of Energy Conversion plant with respect to the available resources.
- Scope of alternative erection of optimized, suitable plant at the location depending upon geographical conditions.

Unit 1: Introduction **8 hrs**

A) Power Generation: Global Scenario, Present status of power generation in India, in Maharashtra, Role of private and governmental organizations, Load shedding, Carbon credits, Pitfalls in power reforms, concept of cascade efficiency.

B) Economics of Power Generation: Introduction, Cost of electric energy, Fixed and operating cost, (with numerical treatment), Selection and Type of generation, Selection of generation equipment, Performance and operation characteristics of power plants and Tariff methods.

Unit 2: Thermal Power Plant **10 hrs**

A)Introduction: General layout of modern power plant with different circuits, working of thermal power plant, coal classification, coal, ash and dust handling, selection of coal for Thermal Power Plant, FBC boilers, high pressure boiler, Rankine cycle with reheat and regeneration, cogeneration power plant (with numerical)

B)Steam Condenser: Necessity of steam condenser, Classification, Cooling water requirements, Condenser efficiency, Vacuum efficiency, Cooling towers, air Leakage, Effects of Air Leakage on condenser performance, (Numerical Treatment)

Unit 3: Hydroelectric and Nuclear power plant **8 hrs**

A)Hydroelectric Power Plant: Introduction, Site Selection, Advantages and Disadvantages of HEPP, Hydrograph , Flow duration curve ,Mass Curve, Classification of HEPP with layout.

B) Nuclear Power Plants: Elements of NPP, Nuclear reactor & its types, fuels moderators, coolants, control rod, classification of NPP, N-waste disposal

Unit 4: Diesel & Gas Turbine Power plant 8 hrs

A) Diesel Engine Power Plants: Plant Layout, Diesel Engine Power Plant Performance Analysis, application, selection of engine size, advantages & disadvantages of diesel power plant.

B) Gas Turbine Power Plant : Introduction, fuels, materials selection for GTPP, Brayton Cycle analysis, Thermal Efficiency, Work ratio, maximum & optimum pressure ratio, Actual cycle effect of operating variables on thermal efficiency, inter-cooling reheating, & regeneration cycle, Open, Closed & Semi Closed cycles Gas Turbine Plant , combined cycle plant (Numerical Treatment).

Unit 5: Non-Conventional Power Plants 8 hrs

Wind Power plant : Introduction, wind availability measurement, types of wind machines, site selection, and wind power generation.

Solar Power Plant : Introduction, components ,Types of Collectors & Solar Ponds, Low & High Temperature Solar Power Plant. Photovoltaic Power System, Heliostat

Tidal, OTEC, geothermal, magneto hydrodynamics, fuel cell, hybrid power plants, Challenges in commercialization of Non-Conventional Power Plants.

Unit 6: Instrumentation and Environmental Impact 8 hrs

A) Power Plant Instrumentation

Layout of electrical equipment, generator, exciter, short circuits & limiting methods, switch gear, circuit breaker, power transformers, methods of earthling, protective devices & Control system used in power plants, Control Room.

B) Environmental impact due to power plants.

Environmental aspects, introduction, constituents of atmosphere, different pollutants due to thermal power plants and their effects of human health, Environmental control of different pollutant such as particulate matter, Oxides of sulphur, nitrogen, global warming & green house effect, thermal pollution of water & its control. Noise pollution by power plants.

Term Work: Any Eight experiments of the following-

1) Visit to thermal Power plant /Co-generation Power plant or explain working of power plant by using suitable software.
2) Visit to HEPP/GTPP/Non-Conventional Power Plants.
3) Study of FBC system.
4) Study of High Pressure boilers.
5) Trial on steam power plant.
6) Trial on Diesel Power Plant.
7) Study of power plant instruments.
8) Study of Nuclear Power Plants.
9) Study of Environmental Impact of Power Plants.

Reference Books

1. E.I.Wakil, "Power Plant Engineering", McGraw Hill Publications New Delhi
2. P.K.Nag, "Power Plant Engineering", McGraw Hill Publications New Delhi.
3. K K Ramalingam ," Power Plant Engineering, SCITECH Publications Pvt Ltd.
4. Domkundwar & Arora, "Power Plant Engineering", Dhanpat Rai & Sons, New Delhi.
5. R.K.Rajput, "Power Plant Engineering", Laxmi Publications New Delhi.
6. R.Yadav , "Steam and Gas Turbines" ,Central Publishing House, Allahabad.
7. D.K.Chavan & G.K.Phatak, "Power Plant Engineering" , Standard Book House, New Delhi.
8. G.D.Rai, " Non-Conventional Energy Sources" Khanna Publishers,Delhi
9. S.P.Sukhatme, "Solar Energy" Tata McGraw-Hill Publications, New Delhi

(402048) Mechanical System Design

Code	Subject	Teaching Scheme (Weekly Load in hrs)			Examination Scheme (Marks)					
		Lect.	Tut.	Pract.	Theory		TW	PR	OR	Total
					In Sem.	End Sem.				
402048	Mechanical System Design	4	---	2	30 (1 hr)	70 (2 ½ hrs)	--	--	50	150

Pre-requisite: Manufacturing Process, Machine design, Engineering Mathematics, TOM, IC Engines.

Course Objectives
- To develop competency for system visualization and design.
- To enable student to design cylinders and pressure vessels and to use IS code.
- To enable student select materials and to design internal engine components.
- To introduce student to optimum design and use optimization methods to design mechanical components.
- To enable student to design machine tool gearbox.
- To enable student to design material handling systems.
- Ability to apply the statistical considerations in design and analyze the defects and failure modes in components.

Course Outcomes
- The student will understand the difference between component level design and system level design.
- Ability to design various mechanical systems like pressure vessels, machine tool gear boxes, material handling systems, etc. for the specifications stated/formulated.
- Ability to learn optimum design principles and apply it to mechanical components.
- Ability to to handle system level projects from concept to product.

Unit 1: Design of Machine Tool Gearbox 8 hrs

Introduction to machine tool gearboxes, design and its applications, basic considerations in design of drives, determination of variable speed range, graphical representation of speed and structure diagram, ray diagram, selection of optimum ray diagram, deviation diagram, difference between numbers of teeth of successive gears in a change gear box.

Unit 2: Statistical considerations in design 6 hrs

Frequency distribution-Histogram and frequency polygon, normal distribution - units of of central tendency and dispersion- standard deviation - population combinations - design for natural tolerances - design for assembly - statistical analysis of tolerances, mechanical reliability and factor of safety.

Unit 3: Design of Belt conveyer system for material handling 8 hrs

System concept, basic principles, objectives of material handling system, unit load and containerization. Belt conveyors, Flat belt and troughed belt conveyors, capacity of conveyor, rubber covered and fabric ply belts, belt tensions, conveyor pulleys, belt idlers, tension take-up systems, power requirement of horizontal belt conveyors for frictional resistance of idler and pulleys.

Unit 4: Design of Cylinders and Pressure vessels 10 hrs

Design of Cylinders:

Thin and thick cylinders, Lame's equation, Clavarino„s and Bernie's equations, design of hydraulic and pneumatic cylinders, auto-frettage and compound cylinders,(No Derivation) gasketed joints in cylindrical vessels (No derivation).

Design of Pressure vessel:
Modes of failures in pressure vessels, unfired pressure vessels, classification of pressure vessels as per I. S. 2825 - categories and types of welded joints, weld joint efficiency, stresses induced in pressure vessels, materials for pressure vessel, thickness of cylindrical shells and design of end closures as per code, nozzles and openings in pressure vessels, reinforcement of openings in shell and end closures - area compensation method, types of vessel supports (theoretical treatment only).

Unit 5: Design of I. C. Engine components 8 hrs

Introduction to selection of material for I. C. engine components, Design of cylinder and cylinder head, construction of cylinder liners, design of piston and piston-pins, piston rings, design of connecting rod. Design of crank-shaft and crank-pin, (Theoretical treatment only).

Unit 6: Optimum Design and DFMA 8 hrs

Optimum Design

Objectives of optimum design, adequate and optimum design, Johnson's Method of optimum design, primary design equations, subsidiary design equations and limit equations, optimum design with normal specifications of simple machine elements- tension bar, transmission shaft and helical spring, Pressure vessel Introduction to redundant specifications (Theoretical treatment).

Design for manufacture, assembly and safety

General principles of design for manufacture and assembly (DFM and DMFA), principles of design of castings and forgings, design for machining, design for safety.

Term work: Term work shall consists of

1. One design project

The design project shall consist of two imperial size sheets (Preferably drawn with 3D/2D CAD software) - one involving assembly drawing with a part list and overall dimensions and the other sheet involving drawings of individual components, manufacturing tolerances, surface finish symbols and geometric tolerances must be specified so as to make it working drawing. A design report giving all necessary calculations of the design of components and assembly should be submitted. Projects shall be in the form of design of mechanical systems including pressure vessel, conveyor system, multi speed gear box, I.C engine, etc.

2. Assignments

The assignment shall be internally presented in the form of power point presentation by a group of two or three students. A report of assignment (Max 8 to 10 pages) along with print out of PPT is to be submitted.

Each student shall complete any two of the following:

1. Design review of any product/ system for strength and rigidity considerations.
2. Design review of any product/system for manufacturing, assembly and cost considerations.
3. Design review of any product/system for aesthetic and ergonomic considerations.
4. Analysis of any product/system using reverse engineering.
5. Case study of one patent from the product design point of view.
6. Failure mode and effect analysis of one product/component.
7. Design of Experiments (DOE)
8. Selection of gear box for various mechanical system like epicyclic gear trains , differential gear boxes , speed reducer etc
9. Design of Human Powered system.
10. Application of composite material for different mechanical components.
11. Design of material handling system for specific / various applications such as chain and screw conveyors
12. Concurrent engineering

Text Book

1. Bhandari V.B. "Design of Machine Elements", Tata McGraw Hill Pub. Co. Ltd.
2. Juvinal R.C, Fundamentals of Machine Components Design, Wiley, India

Reference Books

1. Shigley J. E. and Mischke C.R., “Mechanical Engineering Design”, McGraw Hill Pub. Co
2. M. F. Spotts, “Mechanical Design Analysis”, Prentice Hall Inc.
3. Black P.H. and O. Eugene Adams, “Machine Design” McGraw Hill Book Co. Inc.
4. Johnson R.C., “Mechanical Design Synthesis with Optimization Applications”, Von Nostrand Reynold Pub.
5. S.K. Basu and D. K. Pal, “Design of Machine Tools,,, Oxford and IBH Pub Co.
6. Rudenko,”Material Handling Equipment”, M.I.R. publishers, Moscow
7. P. Kannaiah ,”Design of Transmission systems”, SCIETCH Publications Pvt Ltd.
8. Pandy, N. C. and Shah, C. S., “Elements of Machine Design“, Charotar Publishing House.
9. Mulani, I. G., “Belt Conveyors”
10. Singiresu S. Rao, Engineering Optimization: Theory and Practice, , John Wiley & Sons.
11. M.V. Joshi, Process Equipment Design, Mc-Millan.
12. Design Data“, P.S.G. College of Technology, Coimbatore.
13. Bhandari, V. B. Machine Design data book, Tata McGraw Hill Publication Co. Ltd.
14. I.S. 2825: Code for unfired pressure vessels.

(402049A) Refrigeration and Air Conditioning Equipment Design (Elective III)

Code	Subject	Teaching Scheme (Weekly Load in hrs)			Examination Scheme (Marks)					
		Lect.	Tut.	Pract.	Theory		TW	PR	OR	Total
					In Sem.	End Sem.				
402049 A	Refrigeration and Air Conditioning Equipment Design	4	---	--	30 (1 hr)	70 (2 ½ hrs)	--	--	--	100

Pre-requisite

Refrigeration and Air Conditioning, Engineering Thermodynamics,

Course Objectives

- Study of refrigeration cycles i.e. trans-critical cycle, cascade cycle, etc.
- Understanding of materials and designs of refrigeration and air conditioning equipment like controls, evaporators, condensers, cooling towers
- Learning of low temperature systems and heat pipe

Course Outcomes: At the end of this course the students should be able to

- Select the different components of refrigeration system i.e. condensers, evaporators, controls etc. for given applications
- Demonstrate the concepts of design of evaporators and condensers for unitary systems
- Analyses the performance of cooling tower and heap pipe.
- Illustrate the methods for production of ultralow temperature

Unit 1: Advanced Vapour Compression Cycles **8 hrs**

Review of vapour compression cycle, Transcritical cycle and their types, presentation of cycle on P-h and T-s chart, Multi evaporator and multi compression systems, ammonia-CO_2 cascade cycle.
Compressor: classifications, applications, Characteristic curves & capacity controls for reciprocating & centrifugal compressors, sizing of reciprocating compressor.

Unit 2: Safety Controls **8 hrs**

HP/LP and Oil pressure failure control, Thermal overload protection for hermetic motors, reduced voltage protection, motor over current protection, adjustable speed drives, variable frequency drives, flow failure switches, safety valves, purge valves, level controller
Operating Control **-** Solenoid valve, regulating valves

Defrost methods for sub-zero applications

Methods of defrosting: manual and auto, water, electric, hot gas, re-evaporator coils, defrosting: multiple evaporator systems, reverse cycle defrosting, vapor defrosting

Unit 3: Introduction to Cryogenics **8 hrs**

Introduction, Figure of Merit, Limitations of VCS for the production of low temperatures, Joule-Thompson effect, Linde and Claude system, Liquefaction of gases such as N2 and He. Properties of cryogenic fluid,
Insulation: Types and materials

Unit 4: Condensers and Evaporators **8 hrs**

Condensers

Types, thermal design and operational considerations: Shell and tube condensers - horizontal & vertical types,

Evaporators

Ttypes, rating & selections, and design considerations, Standards for evaporators & condensers

Unit 5: Cooling Towers 8 hrs

Types - basic relation - heat balance and heat transfer - characteristics, effects of - packing - geometry, design of cooling towers, spray design, cooling tower thermal performance, cooling tower theory, tower efficiency.

Unit 6: Heat Pipes 8 hrs

Structures - applications - basic relations - performance characteristics - effects of working fluid and operating temperature, wick - selection of material - pore size (basic concepts only)

Non-Conventional Refrigeration systems: vortex tube, pulse tube, thermoelectric refrigeration, magnetic refrigeration, steam-jet refrigeration.

Text Books

1. Arora R.C., Refrigeration and Air Conditioning, PHI, India
2. Dossat Ray J., Principal of Refrigeration, Pearson, India
3. Arora C P, Refrigeration and Air Conditioning, Tata McGraw Hill
4. Manohar Prasad, Refrigeration and Air-conditioning, Wiley Eastern Limited, 1983

Reference Books

1. Threlkeld J.L., Thermal Environmental Engineering, Prentice Hall Inc. New Delhi
2. ASHRAE Handbook (HVAC Equipments)
3. Stocker W.F. and Jones J.W., Refrigeration and Air-conditioning, McGraw Hill International editions 1982.
4. Roger Legg, Air conditioning systems: Design, Commissioning and maintenance
5. Shan Wang, Handbook of Refrigeration and Air Conditioning, McGrawHill Publications
6. Wilbert Stocker, Industrial Refrigeration, McGrawHill Publications
7. Keith Harold, Absorption chillers and Heat Pumps, McGrawHill publications
8. ASHRAE, Air Conditioning System Design Manual, IInd edition, ASHRAE

(402049B) Robotics (Elective III)

Code	Subject	Teaching Scheme (Weekly Load in hrs)			Examination Scheme (Marks)					
		Lect.	Tut.	Pract.	Theory		TW	PR	OR	Total
					In Sem.	End Sem.				
402049 B	Robotics	4	---	--	30 (1 hr)	70 (2 ½ hrs)	--	--	--	100

Pre-Requisite: Engineering Mechanics, TOM, Mechatronics, Basics of Electrical Engineering, Control system.

Course Objective: To teach students,
1. Basics of robotics (Links, Actuators, Sensors etc).
2. Statistics & Kinematics of robots.
3. Desired motion of robot.
4. Control system necessary for accurate operation of the robot.

Course Outcomes: After completion of the course student would be able to,
1. Understand the complete design procedure of the robot.
2. Select correct mechanism for operation of the robot.
3. Select necessary actuators, sensors, control for satisfactory performance of the robot.

Unit 1: Introduction **8 hrs**

Robots: Introduction, Structure, Classification and Application.
Joints & Links: Position and orientation of a rigid body, Homogeneous transformations, Representation of joints, link representation using Denavit-Hartenberg parameters.
Actuators: Brushless DC Motor (construction, working and selection)
Sensors: GPS, IMU, Vision, PVDF Tactile (construction, working and selection)
Grippers: Hydraulic and Servo (construction, working and selection)

Unit 2: Kinematics and Kinematics of Robot **10 hrs**

Kinematics of serial robots: Direct and inverse kinematics problems, workspace of a serial robot, Inverse kinematics of constrained and redundant robots, Inverse kinematics solution for the general 6R serial manipulator.
Kinematics of parallel robots: Degrees-of-freedom of parallel mechanisms and manipulators, Active and passive joints, Constraint and loop-closure equations, Direct kinematics problem, Mobility of parallel manipulators, Closed-from and numerical solution, Inverse kinematics of parallel manipulators

Unit 3: Statics of Robot Manipulators **10 hrs**

Statics of robot manipulators: Linear and angular velocity of links, Velocity propagation, Manipulator Jacobians for serial and parallel manipulators, Velocity ellipse and ellipsoids, Singularity analysis for serial and parallel manipulators, Loss and gain of degree of freedom, Statics of serial and parallel manipulators, Singularity analysis and statics.

Unit 4: Dynamics of Robot **8 hrs**

Dynamics of serial and parallel robots: Mass and inertia of links, Lagrangian formulation for equations of motion for serial and parallel manipulators, Generation of symbolic equations of motion using a computer, Simulation (direct and inverse) of dynamic equations of motion, Examples of a planar 2R and four-bar mechanism, Recursive dynamics.

Unit 5: Motion Planning and Control **8 hrs**

Motion planning and control: Joint and Cartesian space trajectory planning and generation, potential field method for motion planning, independent joint PID control (parallel form) and its tuning (ZN step response method), Control of a multi-link manipulator, Control of constrained manipulators, Force control and hybrid position/force control

Unit 6: Artificial Intelligence and Image Processing **10 hrs**

Linear Kalman Filter: Algorithm, Application
Artificial Intelligence: Introduction, Need and Application, Problem solving through forward and backward search.
Image Processing: Introduction, Need, Image acquisition, Masking, Sampling and quantization, Image Processing Technique-edge detection, noise reduction; Image Segmentation.

Text Books:

1. S B Niku, *Introduction to Robotics, Analysis, Control, Applications*, 2nd Edition, Wiley Publication, 2015.
2. John Craig, *Introduction to Robotics, Mechanics and Control*, 3rd Edition, Pearson Education, 2009
3. Mathia, *Robotics for Electronics Manufacturing*, Cambridge Uni. Press, India
4. A Ghosal, *Robotics: Fundamental Concepts and Analysis*, Oxford University Press, 2013.
5. R K Mittal & I J Nagrath, *Robotics and Control*, McGraw Hill Publication, 2015.
6. K Astrom & T Hagglund, *PID Controllers: Theory, Design and Tuning*, 2nd Edition, The Instrumentation, Systems, and Automation Society, 1995.
7. Asfahl, *Robots and Manufacturing Automation*, Wiley, India, 2012

(402049C) Industrial Engineering (Elective III)

Code	Subject	Teaching Scheme (Weekly Load in hrs)			Examination Scheme (Marks)					
		Lect.	Tut.	Pract.	Theory		TW	PR	OR	Total
					In Sem.	End Sem.				
402049 C	Industrial Engineering	4	---	--	30 (1 hr)	70 (2 ½ hrs)	--	--	--	100

Pre-requisite: Manufacturing Process, Engineering Mathematics.

Course Objectives
- To introduce the concepts, principles and framework of contents of Industrial Engineering
- To acquaint the students with various productivity enhancement techniques.
- To acquaint the students with different aspects of Production Planning and Control and Facility Design.
- To introduce the concepts of various cost accounting and financial management practices as applied in industries.
- To acquaint the students with different aspects of Human Resource activities and Industrial Safety rules.

Course Outcomes: Learner will be able to.....
- Apply the Industrial Engineering concept in the industrial environment.
- Manage and implement different concepts involved in methods study and understanding of work content in different situations.
- Undertake project work based on the course content.
- Describe different aspects of work system design and facilities design pertinent to manufacturing industries.
- Identify various cost accounting and financial management practices widely applied in industries.
- Develop capability in integrating knowledge of design along with other aspects of value addition in the conceptualization and manufacturing stage of various products.

Unit 1: Introduction to Industrial Engineering and Productivity 7 hrs

Introduction: Definition and Role of Industrial Engineering, Contribution of Taylor and Gilbreth, Organisation : Concept of organisation, characteristics of organisation, elements of organisation, organisational structure, organisation charts; Types of organisation- formal line, military organisation, functional organization, line & staff organisation; Introduction to management principles, authority and responsibility, span of control, delegation of authority.

Productivity : Definition of productivity, Productivity of materials, land, building, machine and power. Measurement of productivity: factors affecting the productivity, Productivity Models and Index (Numerical), productivity improvement programmers.

Unit 2: Method Study 7 hrs

Work Study : Definition, objective and scope of work-study. Human factors in work-study.

Method Study : Definition, objective and scope of method study, activity recording and exam aids, Charts to record moments in shop - operation process charts, flow process charts, travel chart, two handed chart and multiple activity charts. Charts to record movement at work place - principles of motion economy, classification of moments, SIMO chart, and micro motion study.

Definition and installation of the improved method, brief concept about synthetic motion studies.(Numerical); Introduction to Value Engineering and Value Analysis;

Unit 3: Work Measurements 7 hrs

Work Measurements: Definition, objectives and uses; Work measurement techniques.

Work sampling - need, confidence levels, sample size determinations, random observation, conducting study with the simple problems.

Time study: Definition, time study equipment, selection of job, steps in time study. Breaking jobs into elements, recording information. Rating and standard rating, standard performance, scales of rating, factors affecting rate of working, allowances and standard time determination; Introduction to PMTS and MTM. (Numerical), Introduction to MOST.

Unit 4: Production Planning and Control **7 hrs**

Introduction: Types of production systems, Need and functions of PPC, Aggregate production planning, Capacity Planning, ERP: Modules, Master Production Schedule; MRP and MRP-II;
Forecasting techniques: Causal and time series models, moving average, exponential smoothing, trend and seasonality; (Numerical)
Supply Chain Management: Concept, Strategies, Supply Chain Network, Push and Pull Systems, Logistics, Distribution; Order Control strategies: MTO, MTA, MTS.

Unit 5: Facility Design **7 hrs**

Facility Location Factors and Evaluation of Alternate Locations; Types of Plant Layout; Computer Aided Layout Design Techniques; Assembly Line Balancing (Numerical);
Material Handling: Principles, Types of Material Handling Devices; Stores Management
Inventory Control: Functions, costs, classifications- deterministic and probabilistic inventory models, Concept of EOQ, purchase model without shortages (Numerical); ABC and VED Analysis.

Unit 6: Engineering Economy, Human Resource and Industrial Safety **7 hrs**

Engineering Economy and Costing: Elementary Cost Accounting and Methods of Depreciation; Break-Even Analysis (Numerical); Introduction to Debit and Credit Note, Financial Statements (Profit and Loss Account and Balance Sheet), Techniques for Evaluation of Capital Investments.
Human Resource Development: Functions: Manpower Planning, Recruitment, Selection, Training; Concept of KRA (Key Result Areas); Performance Appraisal (Self, Superior, Peer, 360^0).
Industrial Safety: Safety Organisation, Safety Programme, General Safety Rules.

Text Books

1. M Mahajan, Industrial Engineering and Production Management, Dhanpat Rai and Co.
2. O. P. Khanna, Industrial engineering and management, Dhanpat Rai publication
3. Martend Telsang, Industrial Engineering , S. Chand Publication.
4. Banga and Sharma, Industrial Organisation & Engineering Economics, Khanna publication.

Reference Books

1. Introduction to Work Study by ILO, ISBN 978-81-204-1718-2, Oxford & IBH Publishing Company, New Delhi, Second Indian Adaptation, 2008.
2. H.B. Maynard, K Jell, Maynard's Industrial Engineering Hand Book, McGraw Hill Education.
3. Askin, Design and Analysis of Lean Production System, Wiley, India
4. Zandin K.B., Most Work Measurement Systems, ISBN 0824709535, CRC Press,2002
5. Martin Murry, SAP ERP: Functionality and Technical Configuration, SAP Press; 3rd New edition (2010).
6. Barnes, Motion and time Study design and Measurement of Work, Wiley India

(402050 A) Computational Fluid Dynamics (Elective IV)

Code	Subject	Teaching Scheme (Weekly Load in hrs)			Examination Scheme (Marks)					
		Lect.	Tut.	Pract.	Theory		TW	PR	OR	Total
					In Sem.	End Sem.				
402050 A	Computational Fluid Dynamics	4	---	2	30 (1 hr)	70 (2 ½ hrs)	25	--	--	125

Pre-Requisites

Fluid Mechanics, Heat transfer, Numerical methods, Programming Languages.

Course Objectives

- Students should be able to model fluid / heat transfer problems and apply fundamental conservation principles.
- Students should be able to discretize the governing differential equations and domain by Finite Difference Method.
- Students should be able to solve basic convection and diffusion equations and understands the role in fluid flow and heat transfer.
- To prepare the students for career in industry in CAE through use of software tools.
- To prepare the students for research leading to higher studies.

Course Outcomes:

- Ability to analyze and model fluid flow and heat transfer problems.
- Ability to generate high quality grids and interpret the correctness of numerical results with physics.
- Ability to use a CFD tool effectively for practical problems and research.
- Ability to conceptualize the programming skills.

Unit 1: Introduction to CFD **8 hrs**

CFD – a research and design tool, CFD as third dimension of engineering supplementing theory and experiment, Steps in CFD solution procedure, strengths and weakness of CFD, Flow modeling using control volume - finite and infinitesimal control volumes, Concept of substantial derivative, divergence of velocity, Basic governing equations in integral and differential forms – conservation of mass, momentum and energy (No derivations), Physical interpretation of governing equations, Navier-Stoke's model and Euler's model of equations.

Unit 2: Basic Discretization Techniques **10 hrs**

Introduction to grid generation (Types of grids such as structured, unstructured, hybrid, multiblock, Cartesian, body fitted and polyhedral etc.), Need to discretize the domain and governing equations, Finite difference approximation using Taylor series, for first order (Forward Difference Approximation, Backward Difference Approximation, Central difference Approximation) and second order (based on 3 node, 4 node and 5 node points),explicit and Implicit approaches applied to 1D transient conduction equation, Couette flow equation ($\frac{\partial p}{\partial x} = 0$) using FTCS and Crank Nicholson's Method, Stability Criteria concept and physical interpretation, Thomas Tri-diagonal matrix solver.

Unit 3: Two Dimensional Steady and unsteady heat conduction **8 hrs**

Solution of two dimensional steady and unsteady heat conduction equation with Dirichlet, Neumann, robbins and mixed boundary condition – solution by Explicit and Alternating Direction Implicit method (ADI Method), Approach for irregular boundary for 2D heat conduction problems.

Unit 4: Application of Numerical Methods to Convection – Diffusion System **10 hrs**

<u>Convection:</u> first order wave equation solution with upwind, Lax–Wendroff, Mac Cormack scheme, Stability Criteria concept and physical interpretation

<u>Convection –Diffusion:</u> 1D and 2D steady Convection Diffusion system – Central difference approach, Peclet Number, stability criteria, upwind difference approach, 1 D transient convection-diffusion system

Unit 5: Incompressible Fluid Flow **8 hrs**

Solution of Navier-Stoke's equation for incompressible flow using SIMPLE algorithms and its variation (SIMPLER), Application to flow through pipe, Introduction to finite volume method.

Unit 6: CFD as Practical Approach **8 hrs**

Introduction to any CFD tool, steps in pre-processing, geometry creation, mesh generation, selection of physics and material properties, specifying boundary condition, Physical Boundary condition types such as no slip, free slip, rotating wall, symmetry and periodic, wall roughness, initialising and solution control for the solver, Residuals, analysing the plots of various parameters (Scalar and Vector contours such as streamlines, velocity vector plots and animation). Introduction to turbulence models. Reynolds Averaged Navier-Stokes equations (RANS), k-ϵ , k-ω. Simple problems like flow inside a 2-D square lid driven cavity flow through the nozzle.

Term Work: Practicals to be performed: Any 8 in the given list below (from 1-9) should be performed with mini project (Sr.No.10) compulsory.

1 Generation of different meshes

a. Structured mesh
b. Unstructured mesh,
c. Multiblock, etc.

2. Program on 1D transient heat conduction by FTCS OR Crank Nicholson scheme
3. Program on 1-D (first order)wave equation by Upwind scheme and study the impact of CFL number on the stability and solution .
4. Program on 2D Transient Conduction equation / 2D Convection-Diffusion Equation
5. Numerical simulation and analysis of boundary layer over a flat plate (Blausius Equation) are using any CFD software or computer programming.
6. Numerical simulation and analysis of boundary layer for a a). Developing flow through a) Pipe b) Fully developed flow through a pipe.
7. Numerical simulation and analysis of 2D square lid driven cavity using any CFD software. Effect of Reynolds number on the vorticity patterns.
8. CFD Analysis of external flow: Circular Cylinder or Aerofoil (NACA 0012)
9. CFD analysis of heat transfer in pin fin.
10. Mini project on any practical application. Students should take a problem of their choice and verify the CFD solution with experimental data / research paper.

Reference Books

1. John D Anderson: Computational Fluid Dynamics- The Basics with Applications, McGraw-Hill
2. J. Tu, G.-H. Yeoh and C. Liu: Computational Fluid Dynamics: A practical approach, Elsevier.
3. A. W. Date: Introduction to Computational Fluid Dynamics, Cambridge University Press, India
4. P. S. Ghoshdastidar: Computer Simulation of Fluid flow and heat transfer, Tata McGraw-Hill.
5. Bates, Computational Fluid Dynamics, Wiley India
6. C. Hirsch: Numerical Simulation of internal and external flows Vol. 1, John Wiley
7. Tannehill, Anderson, and Pletcher: Computational Fluid Mechanics and Heat transfer, CRC Press.
8. J. H. Ferziger and M. Peric: Computational Methods for Fluid Dynamics, 3rd Edition, Springer
9. Zikanov, Essential Computational Fluid Dynamics, Wiley India
10. Batchelor, An Introduction to fluid Dymanics, Cambridge Uni. Press, india

(402050B) Finite Element Analysis (Elective IV)

Code	Subject	Teaching Scheme (Weekly Load in hrs)			Examination Scheme (Marks)					
		Lect.	Tut.	Pract.	Theory		TW	PR	OR	Total
					In Sem.	End Sem.				
402050 B	Finite Element Analysis	4	---	2	30 (1 hr)	70 (2 ½ hrs)	25	--	--	125

Pre-Requisites:
- Mechanics of materials
- DME I and DME II (Static and dynamic failure theories)
- Engineering Graphics
- Fundamentals of Programming Language

Course Objectives
- To familiarize students with the displacement-based finite element method for displacement and stress analysis and to introduce related analytical and computer tools.
- It provides a bridge between hand calculations based on mechanics of materials and machine design and numerical solutions for more complex geometries and loading states.
- To study approximate nature of the finite element method and convergence of results are examined.
- It provides some experience with a commercial FEM code and some practical modeling exercises.

Course Outcomes
Upon completion of this course, the student will be able to:
- Derive and use 1-D and 2-D element stiffness matrices and load vectors from various methods to solve for displacements and stresses.
- Apply mechanics of materials and machine design topics to provide preliminary results used for testing the reasonableness of finite element results.
- Explain the inner workings of a finite element code for linear stress, displacement, temperature and modal analysis.
- Interpret the results of finite element analyses and make an assessment of the results in terms of modeling (physics assumptions) errors, discretization (mesh density and refinement toward convergence) errors, and numerical (round-off) errors.

Unit 1: Fundamentals Concepts of FEA 10hrs
Introduction– Brief History of FEM, Finite Element Terminology (nodes, elements, domain, continuum, Degrees of freedom, loads & constraints) General FEM procedure, Applications of FEM in various fields, P & h formulation, Advantages and disadvantages of FEM. Consistent units system.
Review of Solid Mechanics Stress equilibrium equations, Strain-Displacement equations, Stress-Strain-Temperature Relations, Plane stress, plane strain and axi-symmetric problems, Strain energy, Total potential energy. Essential and natural boundary conditions
Review of Matrix Algebra (Vectors, Matrices, Symmetric banded matrix, Determinants, Inverses), banded skyline solutions. Introduction to solvers (Sparse solver, iterative solver, PCG, block Lanczos).
Introduction to different approaches used in FEA such as direct approach, Variational approach, weighted residual, energy approach, Galerkin and Raleigh Ritz approach.

Unit 2: 1D Elements 8hrs
Types of 1D elements. Displacement function, Global and local coordinate systems, Order of element, primary and secondary variables, shape functions and its properties.
Formulation of elemental stiffness matrix and load vector for spring, bar, beam, truss and Plane frame.
Transformation matrix for truss and plane frame, Assembly of global stiffness matrix and load vector, Properties of stiffness matrix, half bandwidth, Boundary conditions elimination method and penalty approach, Symmetric boundary conditions, Stress calculations.

Unit 3: 2D Elements **10 hrs**

Types of 2D elements, Formulation of elemental stiffness matrix and load vector for Plane stress/strain such as Linear Strain Rectangle (LSR), Constant Strain Triangles (CST), Pascal's triangle , primary and secondary variables, properties of shape functions. Assembly of global stiffness matrix and load vector, Boundary conditions, solving for primary variables (displacement), Overview of axi-symmetric elements

Unit 4: Isoparametric Elements **10 hrs**

Concept of isoparametric elements, Terms Isoparametric, super parametric and subparametric. Isoparmetric formulation of bar element.

Coordinate mapping - Natural coordinates, Area coordinates (for triangular elements), higher order elements (Lagrangean and serendipity elements). Convergence requirements- patch test, Uniqueness of mapping - Jacobian matrix. Numerical integration – 2 and 3 point Gauss Quadrature, full and reduced integration. Sub-modeling, substructuring.

Unit 5: 1D Steady State Heat Transfer Problems **8 hrs**

Introduction, Governing differential equation, steady-state heat transfer formulation of 1D element for conduction and convection problem, boundary conditions and solving for temperature distribution.

Unit 5: Dynamic Analysis **8 hrs**

Types of dynamic analysis, General dynamic equation of motion, point and distributed mass, lumped and Consistent mass, Mass matrices formulation of bar and beam element.

Undamped-free vibration- Eigenvalue problem, Evaluation of eigenvalues and eigenvectors (natural frequencies and mode shapes).

Term Work: The term work shall consist of record of any three from 1 to 4* and any three from 5 to 8** assignments of the problems based on following topic-

1. Computer program for stress analysis 2-D truss subjected to plane forces
2. Computer program for modal analysis 1-D beam (simply supported or cantilever beams)
3. Computer program for frames subjected to transverse forces and moments
4. Computer program for 1-D temperature analysis
5. Static stress concentration factor calculation for a plate with center hole subjected to axial loading in tension using FEA software.
6. 2D Forced convection problem using FEA software.
7. Modal analysis of any machine component using FEA software.
8. Stress and deflection analysis of any machine component consisting of 3-D elements using FEA software.

*1 Students can write the program in any of the programming language such as FORTRAN, C, C++, MATLAB, Python, VB.
2. Minimum number of elements considered should be 10 or more.
3. Validate results of the program with analytical method or FEA software such as Abaqus, ANSYS, Msc-Nastran, Optistruct/Radioss, Comsol-Multiphysics

** 1. Students should do convergence study for all assignment problems.
2. Use different element types from element library
3. If possible use submodel/symmetry option.

Text Books

1. A First Course in the Finite Element Method, Daryl L. Logan
2. Concepts and Applications of Finite Element Analysis, R. D. Cook, et al. Wiley, India

Reference Books

1. Chandrupatla T. R. and Belegunda A. D., "Introduction to Finite Elements in Engineering", Prentice Hall India.

2. Seshu P., “Text book of Finite Element Analysis”, PHI Learning Private Ltd. New Delhi, 2010.
3. Bathe K. J., “Finite Element Procedures”, Prentice-Hall of India (P) Ltd., New Delhi.
4. Fagan M. J., “Finite Element Analysis, Theory and Practice”, Pearson Education Limited
5. Kwon Y. W., Bang H., “Finite Element Method using MATLAB”, CRC Press, 1997
6. S. Moaveni, “Finite element analysis, theory and application with Ansys”,
7. Fundamental of Finite Element Analysis, David V. Hutton, Tata McGraw-Hill
8. Gokhale N. S., Deshpande S. S., Bedekar S. V. and Thite A. N., “Practical Finite Element Analysis”, Finite to Infinite, Pune

(402050C) Design of Pumps, Blowers and Compressors (Elective IV)

Code	Subject	Teaching Scheme (Weekly Load in hrs)			Examination Scheme (Marks)					
		Lect.	Tut.	Pract.	Theory		TW	PR	OR	Total
					In Sem.	End Sem.				
402050C	Design of Pumps, Blowers and Compressors	4	---	2	30 (1 hr)	70 (2 ½ hrs)	25	--	--	125

Pre-Requisite: Turbo Machines, Engineering Thermodynamics,

Course Objectives: To teach students.
- Different applications of Pumps, Fans, blowers & Compressors.
- Different types of Pumps, Fans, blowers & Compressors.
- How to design Pumps, Pumps, Fans, blowers & Compressors..

Course Outcomes: After completion of the course students would be able to
- Select suitable Pump, Blower, fan or compressor for a given application.
- Design Pump, Blower, fan or compressor for a given application

Unit 1: Fundamentals of Fluid Machinery 8 hrs

Introduction to pumps, Introduction to blowers and compressors, Basic equations of energy transfer between fluid and rotor, Performance characteristics, Dimensionless parameters, Specific speed, stage velocity triangles, work and efficiency.

Unit 2: Reciprocating Pumps 8hrs

Introduction: Types, Component and Working of Reciprocating pump, Discharge, Work done and power required to drive for single acting and double acting, Coefficient of discharge, slip, Effect of acceleration of piston on velocity and pressure, indicator diagram, Air Vessel, Operating characteristics.

Unit 3: Design of Pumps 10 hrs

Design procedure and design optimization of Pumps, selection of pumps, Thermal design- Selection of materials for high temperature and corrosive fluids. Hydraulic design- Selection of impeller and casing dimension using industrial manuals.

Unit 4: Theory of Fans and Blowers 8 hrs

Classification of blowers, Basics of stationary and moving air, Eulers characteristics, velocity triangles and operating pressure conditions, Equations for blowers, Losses and hydraulic efficiency, flow through impeller casing, inlet nozzle, Volute, diffusers, leakage, mechanical losses, surge and stall, Applications of blowers and fans.

Unit 5: Design of Fans and Blowers 10 hrs

Rotor design airfoil theory, vortex theory, cascade effects, degree of reaction, Design procedure for selection and optimization of Blowers. Stage pressure rise, stage parameters and design parameters. Design of impeller and casing dimension in aerodynamic design.

Unit 6: Design of Compressors 8 hrs

Basic theory, classification and application, Working with enthalpy-entropy diagram, construction and approximate calculation of centrifugal compressors, impeller flow losses, slip factor, diffuser analysis, performance curves of centrifugal compressors, Basic design features of axial flow compressors; velocity triangles, enthalpy-entropy diagrams, stage losses and efficiency, work done factor, simple stage of axial flow compressors.

Term Work

Assignments:

A. Assignments using suitable software on any one of following
   1. Computer programs for iterative and interactive design of pumps.
   2. Computer programs for iterative and interactive design of fan / blower.

B. Any four Assignments

C. Industrial visit or case study

Textbooks

1. Turbine, “Compressors and Fans“ S.M.Yahya, Tata Mc-Graw Hill Publishing Company, 1996R. K. Rajput, “Fluid Mechanics and Hydraulic Machines” S. Chand
2. R. K. Bansal, “Fluid Mechanics and Hydraulic Machines”, Laxmi Publication
3. V. Ganeshan “Gas Turbines” II edition, Tata Mc-Graw Hill Publishing Company
4. R.. Yadav”Steam and Gas Turbine” Central Publishing House, Allahabad

Reference Books

1. Shepherd, D.G., “Principles of Turbomachinery“, Macmillan, 1969.
2. John Tuzson, “Centrifugal Pump Design,“ John Wiley
3. Stepanff, A.J., "Blowers and Pumps ", John Wiley and Sons Inc., 196
4. Austin H. Chruch, “Centrifugal pumps and blowers“, John Wiley and Sons, 1980.
5. Val S.Labanoff and Robert Ross, “Centrifugal Pumps Design and Applications“ Jaico P House.
6. Igori Karassik, “Pump Hand Book,“ McGraw-Hill International Edition.
7. G.K.Sahu “Pumps“ New age international publishers.

(402051) PROJECT STAGE II

Code	Subject	Teaching Scheme (Weekly Load in hrs)			Examination Scheme (Marks)					
		Lect.	Tut.	Pract.	Theory		TW	PR	OR	Total
					In Sem.	End Sem.				
402051	Project Stage II	--	6	--	--	--	150	--	50	200

INSTRUCTIONS FOR DISSERTATION WRITING It is important that the procedures listed below be carefully followed by all the students of B.E. (Mechanical Engineering).

1. Prepare **Three Hard Bound Copies** of your manuscript.

2. Limit your Dissertation report to 80 – 120 pages (preferably)

3. The footer must include the following:

Institute Name, B.E. (Mechanical) Times New Roman 10 pt. and centrally aligned.

4. Page number as second line of footer, Times New Roman 10 Pt, centrally aligned.

5. Print the manuscript using a. Letter quality computer printing.
b. The main part of manuscript should be Times New Roman 12 pt. with alignment - justified.
c. Use 1.5 line spacing.
d. Entire report shall be of 5- 7 chapters.

6. Use the paper size 8.5’’ × 11’’ or A4 (210 × 197 mm). Please follow the margins given below.

Margin Location	Paper 8.5’’ × 11’’	Paper A4 (210 × 197 mm)
Top	1’’	25.4 mm
Left	1.5’’	37 mm
Bottom	1.25’’	32 mm
Right	1’’	25.4 mm

7. All paragraphs will be 1.5 line spaced with a one blank line between each paragraph. Each paragraph will begin with without any indentation.

8. Section titles should be bold with 14 pt typed in all capital letters and should be left aligned.

9. Sub-Section headings should be aligning at the left with 12 pt, bold and Title Case (the first letter of each word is to be capitalized).

10. Illustrations (charts, drawings, photographs, figures) are to be in the text. Use only illustrations really pertinent to the text. Illustrations must be sharp, clear, black and white. Illustrations downloaded from internet are not acceptable. a. Illustrations should not be more than two per page. One could be ideal
b. Figure No. and Title at bottom with 12 pt
c. Legends below the title in 10 pt
d. Leave proper margin in all sides
e. Illustrations as far as possible should not be photo copied.

11. Photographs if any should of glossy prints

12. Please use SI system of units only.

13. Please number the pages on the front side, centrally below the footer

14. References should be either in order as they appear in the thesis or in alphabetical order by last name of first author

15. Symbols and notations if any should be included in nomenclature section only

16. Following will be the order of report
i. Cover page and Front page as per the specimen on separate sheet
ii. Certificate from the Institute as per the specimen on separate sheet
iii. Acknowledgements
iv. List of Figures
v. List of Tables
vi. Nomenclature
vii. Contents
viii. Abstract (A brief abstract of the report not more than 150 words. The heading of abstract i.e. word "Abstract" should be bold, Times New Roman, 12 pt and should be typed at the centre. The contents of abstract should be typed on new line without space between heading and contents. Try to include one or two sentences each on motive, method, key-results and conclusions in Abstract
1 Introduction (2-3 pages) (TNR – 14 Bold)
1.1 Problem statement (TNR – 12)
1.2 Objectives
1.3 Scope
1.4 Methodology
1.5 Organization of Dissertation

2 Literature Review (20-30 pages)

Discuss the work done so far by researchers in the domain area and their significant conclusions. No derivations, figures, tables, graphs are expected.

3 This chapter shall be based on your own simulation work (Analytical/ Numerical/FEM/CFD) (15- 20 pages)

4 Experimental Validation - This chapter shall be based on your own experimental work (15-20 pages)

5 Concluding Remarks and Scope for the Future Work (2-3 pages)

References ANNEXURE (if any) (Put all mathematical derivations, Simulation program as Annexure)

17. All section headings and subheadings should be numbered. For sections use numbers 1, 2, 3, …. and for subheadings 1.1, 1.2, …. etc and section subheadings 2.1.1, 2.1.2, …. etc.

18. References should be given in the body of the text and well spread. No verbatim copy or excessive text from only one or two references. If figures and tables are taken from any reference then indicate source of it. Please follow the following procedure for references

Reference Books

Collier, G. J. and Thome, J. R., Convective boiling and condensation, 3rd ed., Oxford University Press, UK, 1996, pp. 110 – 112.

Papers from Journal or Transactions Jung, D. S. and Radermacher, R., Transport properties and surface

tension of pure and mixed refrigerants, *ASHRAE Trans*, 1991, 97 (1), pp. 90 – 98.

Bansal, P. K., Rupasinghe, A. S. and Jain, A. S., An empirical correction for sizing capillary tubes, *Int. Journal of Refrigeration*, 1996, 19 (8), pp.497 – 505.

Papers from Conference Proceedings

Colbourne, D. and Ritter, T. J., *Quantitative assessment of flammable refrigerants in room air conditioners*, Proc. of the Sixteenth International Compressor Engineering Conference and Ninth International Refrigeration and Air Conditioning Conference, Purdue University, West Lafayette, Indiana, USA, 2002, pp. 34 – 40.

Reports, Handbooks etc.

United Nations Environmental Programme, Report of the Refrigeration, Air Conditioning and Heat Pumps, Technical Option Committee, 2002, Assessment - 2002.

ASHRAE Handbook: Refrigeration, 1994 (Chapter 44)

Patent

Patent no, Country (in parenthesis), date of application, title, year.

Internet

www.(Site) [Give full length URL]

A Dissertation on
(TNR, 16pt, centrally aligned)

Title
(TNR, 27pt, Bold, Centrally Aligned, Title Case)

By
(TNR, 16pt, Centrally Aligned)

Mr. Student's Name
(TNR, 16pt, Centrally Aligned)

Guide Guide's Name
(TNR, 16pt, Centrally Aligned)

Institute Logo

Department of Mechanical Engineering Name of the Institute [2015-16]
(TNR, 22pt, Title Case Centrally Aligned)

Name of the Institute

Institute Logo

C E R T I F I C A T E

This is to certify that *Mr. Mandar Kulkarni M.* , has successfully completed the Dissertation entitled “Performance analysis of…….” under my supervision, in the partial fulfillment of Bachelor of Engineering - Mechanical Engineering of University of Pune.

Date:

Place:

Guide’s Name ___________________
Guide

External Examiner ___________________

Head Department ___________________
and Institute Name

Principal, ___________________
Institute Name

G.H. Raisoni College of Engineering and Management, Wagholi, Pune – 412 207

(An Autonomous Institute Affiliated to SPPU, Pune)

M. TECH-MECHANICAL

(HEAT POWER AND COMPUTER AIDED DESIGN, MANUFACTURING AND ENGINEERING)

Course Book

Department of Mechanical Engineering

2016-17

Prepared by

Mr. D. S. Patil
(PG Coordinator)

Dr. R. R. Arakerimath
(Academic Dean & HOD Mech.)

Dr. Jaywant B. Sankpal
(Director)

INDEX

DEPARTMENT OF MECHANICAL ENGINEERING

VISION:

To produce excellent Mechanical Engineering graduates to cater the needs of Indian industries to face Research challenges.

MISSION : Our efforts are dedicated towards

1. To imparting quality education through strengthening teaching learning process.
2. Creating competency in core Mechanical Engineering and Computer Aided Engineering.
3. To prepare students for accepting industrial and research challenges through project based learning.
4. To prepare professional engineers having lifelong learning ability and ethical values towards society and environment.

QUALITY POLICY

To pursue global standards of excellence in all our endeavors namely, teaching, research, consultancy and continuing education and to remain accountable in our core and support functions through processes of self-evaluation and continuous improvement.

1. INTRODUCTION

GHRCEM, Pune is nationally acclaimed Institute that aims at creating professionals who will be driven by a firm commitment to excellence, yet rooted in the rich cultural heritage of our nation. GHRCEM, Pune is accredited by National Assessment and Accreditation Council (NAAC), Government of India. This Institute has also been granted autonomy by UGC. GHRCEM, Pune is fast emerging as a pioneering Research cum Teaching Institution molding a new generation of engineers, managers, scientists and entrepreneurs of caliber and character.

The Department of Mechanical Engineering was established in year 2006. Presently the department has well equipped laboratories, including state of art equipment's like CNC Trainer machine, CAD/CAM/CAE software etc. The department organizes Guest Lectures to students, Training services. Faculty of mechanical department organizes and participates in national/international conferences, workshops and seminars. The department has SAE, MESA, ISTE Chapters for professional growth and activities. The students of Mechanical Engineering have been recruited by renowned companies like Engineers India Limited, Infosys, NTPC, Tata Motors etc. They have also brought laurels to the department by winning various competitions of national level (BAJA SAE, SUPRA) co-curricular and extracurricular activities like paper presentations, projects, quizzes, sports etc. The department has organized National and International conference during NCRDME 2012-13, ICRAME 2014-15, NCRDME 2016-17. Department has approved Ph.D. research Centre w.e.f. 2014 under UOP Pune. The Institute offers a fulltime programme of 4-years in Mechanical Engineering and the Programme offered list is given below:

Program Offered

Sr.	**Programme**	**Name of**	**Course Type**	**Medium of**	**Course**	**Sanctioned**
1	UG B. Tech	1st year	Regular Shift	English	2006-2007	120
		Direct 2nd	Regular Shift	English	2007-2008	60
2	PG M. Tech	Heat Power	Regular Shift	English	2011-2012	18
		CADME	Regular Shift	English	2014-2015	24
3	Ph. D	Mechanical	Regular Shift	English	2014-2015	-

2. PROGRAM OUTCOMES

Engineering Graduates will be able to:

1. **Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals and an engineering specialization to the solution of complex engineering problems.

2. **Problem analysis:** Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

3. **Design/development of solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

4. **Conduct investigations of complex problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

5. **Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

6. **The engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

7. **Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

8. **Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

9. **Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

10. **Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

11. Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

12. Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

3. LIST OF PROGRAM SPECIFIC OUTCOMES (PSOs) AND COURSE OF STUDY

3.1 List of Program Specific Outcomes (PSOs)

At the end of graduation:

1. Able to grasp comprehensive and apply the knowledge of mechanical engineering acquired through core courses of engineering.
2. Will be able to apply design, develop and manufactures skills to solve the real life problems associated with industries.
3. Able to use knowledge of soft skills like software tools and multidisciplinary skills to modify and develop new products.

3.2 Course of Study

The following specializations are offered at present for the M.Tech Course of study.

1. Heat Power Engineering

2. Computer Aided Design, Manufacturing and Engineering

1. **LIST OF COURSE CODE OF HEAT POWER ENGINEERING (HPE) AND COMPUTER AIDED DESIGN, MANUFACTURING AND ENGINEERING (CAMDE)**

4.1 Course Code of Heat Power Engineering (HPE)

S.N	CODE	Course Name	SEM	SUB	ELEC	OFFER
1	MHPL501	Advanced Mathematics and Numerical Methods	I	THEORY	NO	YES
2	MHPL502	Advanced Thermodynamics and Combustion Technology	I	THEORY	NO	YES
3	MHPL503	Advanced Fluid Mechanics	I	THEORY	NO	YES
4	MHPL504	Research Methodology	I	THEORY	NO	YES
5	MHPL505	Elective I	I	THEORY	YES	YES
6	MHPP506	Lab Practice I	I	LAB	NO	YES
7	MSDP501	Advance Skill Development	I	THEORY	NO	YES
8	MHPL507	Advanced Heat Transfer	II	THEORY	NO	YES
9	MHPL508	Air Conditioning Technology	II	THEORY	NO	YES
10	MHPL509	Computational Fluid Dynamics	II	THEORY	NO	YES
11	MHPL510	Elective II	II	THEORY	YES	YES
12	MHPL511	Elective III	II	THEORY	YES	YES
13	MHPP512	Lab Practice II	II	LAB	NO	YES
14	MHPP601	Technical Writing	III	LAB	NO	YES
15	MHPP602	Seminar I	III	SEMINAR	NO	YES
16	MHPP603	Dissertation Phase-I	III	PROJECT	NO	YES
17	MHPP604	Seminar II	IV	SEMINAR	NO	YES
18	MHPP605	Dissertation Phase-II	IV	PROJECT	NO	YES

4.2 COURSE CODE OF COMPUTER AIDED DESIGN AND MANUFACTURING ENGINEERING (CAMDE)

S.N	CODE	Course Name	SEM	SUB	ELEC	OFFER
1	MCDL501	Advanced Mathematics	I	THEORY	NO	YES
2	MCDL502	Advanced Machine Design	I	THEORY	NO	YES
3	MCDL503	Computer Aided Design	I	THEORY	NO	YES
4	MCDL504	Research Methodology	I	THEORY	NO	YES
5	MCDL505	Elective I	I	THEORY	YES	YES
6	MCDP506	Modelling and Analysis Lab-I	I	LAB	NO	YES
7	MSDP501	Advance Skill Development	I	LAB	NO	YES
8	MCDL507	Computer Integrated Manufacturing	II	THEORY	NO	YES
9	MCDL508	Finite Element Analysis	II	THEORY	NO	YES
10	MCDL509	Automated Manufacturing System Modelling	II	THEORY	NO	YES
11	MCDL510	Elective II	II	THEORY	YES	YES
12	MCDL511	Elective III	II	THEORY	YES	YES
13	MCDP512	Simulation Lab-II	II	LAB	NO	YES
14	MCDP601	Technical Writing	III	LAB	NO	YES
15	MCDP602	Seminar I	III	SEMINAR	NO	YES
16	MCDP603	Dissertation Phase-I	III	PROJECT	NO	YES
17	MCDP604	Seminar II	IV	SEMINAR	NO	YES
18	MCDP605	Dissertation Phase-II	IV	PROJECT	NO	YES

2. STRUCTURE OF M.TECH. IN HEAT POWER ENGINEERING

Semester-I

Scheme of Examination for M. Tech. - Mechanical Engineering													
Heat Power Engineering													
Semester- I													
Course code	**Subject Name**	**Teaching Scheme (Weekly Load in hrs.)**				**Credits**	**Evaluation Scheme**						**ESE Duration (Hrs.)**
							Theory			**Practical**		**Total**	
		Lecture	**Tutorial**	**Practical**	**Total**		**TAE 20%**	**CAE 20%**	**ESE 60%**	**Cont. Ass.**	**Ext. Ass.**		
MHPL501	Advanced Mathematics and Numerical Methods	3	1	--	4	4	20	20	60	--	--	100	3
MHPL502	Advanced Thermodynamics and Combustion Technology	3	1	--	4	4	20	20	60	--	--	100	3
MHPL503	Advanced Fluid Mechanics	3	1	--	4	4	20	20	60	--	--	100	3
MHPL504	Research Methodology	3	1	--	4	4	20	20	60	--	--	100	3
MHPL505	Elective I	2	--	--	2	2	20	20	60	--	--	100	3
MHPP506	Lab Practice I	--	--	4	4	2	--	--	--	50	50	100	--
MSDP501	Advance Skill Development	--	--	2	2	AU	--	--	--	--		--	--
	Total	14	4	6	24	**20**	100	100	300	50	50	**600**	--

MHPL505: Elective-I			
Modules of 2 Credits (Select any One)			
Code No.	**Course**	**Code No.**	**Course**
MHPL505A	Energy Audit and Management	MHPL505G	Operation Management
MHPL505B	Financial Management	MHPL505H	Engineering Economics
MHPL505C	Financial Costing	MHPL505I	Technology Forecasting
MHPL505D	Project Management	MHPL505J	Technology Transfer
MHPL505E	Energy Efficient Technologies in Electrical Systems	MHPL505K	Human Rights
MHPL505F	Environmental Pollution and Control	MHPL505L	Intellectual property Rights

Semester- II

Scheme of Examination for M. Tech. - Mechanical Engineering													
Heat Power Engineering													
Semester- II													
Course code	Course Name	Teaching Scheme (Weekly Load in hrs)				Credits	Evaluation Scheme						ESE Duration (Hrs)
							Theory			Practical		Total	
		Lecture	Tutorial	Practical	Total		TAE 20%	CAE 20%	ESE 60%	Cont. Ass.	Ext. Ass.		
MHPL507	Advanced Heat Transfer	3	1	-	4	4	20	20	60	--	--	100	3
MHPL508	Air Conditioning Technology	3	1	-	4	4	20	20	60	--	--	100	3
MHPL509	Computational Fluid Dynamics	3	1	-	4	4	20	20	60	--	--	100	3
MHPL510	Elective II	3	-	-	3	3	20	20	60	--	--	100	3
MHPL511	Elective III	3	-	-	3	3	20	20	60	--	--	100	3
MHPP512	Lab Practice II	-	-	4	4	2	--	--	--	50	50	100	-
	Total	15	3	4	22	**20**	100	100	300	50	50	**600**	-

.

MHPL502: Elective-II			
Modules of 2 Credits (Select any One)			
Course Code	**Course Name**	**Code No.**	**Title**
MHPL510A	Thermal System Design	MHPL510J	Jet Propulsion
MHPL510B	Aerodynamics	MHPL510K	Incompressible Flow Turbo machines
MHPL510C	Introduction to flight	MHPL510L	Cryogenic Engineering Gas Liquefaction
MHPL510D	Vacuum Technology	MHPL510M	Fuel Burning Devices
MHPL510E	Gas Dynamics	MHPL510N	Adsorption Technology
MHPL510F	Turbomachinery	MHPL510O	Industrial Hydraulics
MHPL510G	Gas Turbine	MHPL510P	Turbulent Jets
Modules of 1 Credits (Select any One)			
MHPL510a	Selection of Fans, Pumps and blowers	MHPL510d	Clean-room Technology
MHPL510b	Biomass Technology	MHPL510e	Pneumatics
MHPL510c	Nano-materials	MHPL510f	Insulating Materials and Refractories

.

MHPL511: Elective-III			
Modules of 3 Credits (Select any One)			
Course Code	**Corse Name**	**Course Code**	**Course Name**
MHPL511A	Open Elective	MHPL511D	Cryogenics
MHPL511B	Thermal Storage Systems	MHPL511E	Measurements and Controls
MHPL511C	Design of Heat Exchangers	MHPL511F	Optimization Technique

Semester- III

Scheme of Examination for M. Tech. - Mechanical Engineering													
Heat Power Engineering													
Semester- III													
Course Code	**Course Name**	**Teaching Scheme (Weekly Load in hrs)**				**Credits**	**Evaluation Scheme**						**ESE Duration (Hrs)**
							Theory			**Practical**		**Total**	
		Lecture	**Tutorial**	**Practical**	**Total**		**TAE 20%**	**CAE 20%**	**ESE 60%**	**Cont. Ass.**	**Ext. Ass.**		
MHPP601	Technical Writing	--	--	3	3	3	--	--	--	50	50	100	--
MHPP602	Seminar I	--	--	4	4	4	--	--	--	50	50	100	--
MHPP603	Dissertation Phase-I	--	--	8	8	8	--	--	--	100	100	200	--
	Total	--	--	15	15	**15**	--	--	--	200	200	**400**	--

Semester- IV

Scheme of Examination for M. Tech. - Mechanical Engineering													
Heat Power Engineering													
Semester- IV													
Course Code	**Course Name**	**Teaching Scheme (Weekly Load in hrs)**				**Credits**	**Evaluation Scheme**						**ESE Duration (Hrs.)**
							Theory			**Practical**		**Total**	
		Lecture	**Tutorial**	**Practical**	**Total**		**TAE 20%**	**CAE 20%**	**ESE 60%**	**Cont. Ass.**	**Ext. Ass.**		
MHPP604	Seminar II	--	--	4	4	4	--	--	--	50	50	100	--
MHPP605	Dissertation Phase-II	--	--	16	16	16	--	--	--	200	100	300	--
	Total	--	--	20	20	**20**	--	--	--	250	150	**400**	--

3. SYLLABUS OF M.TECH. HEAT POWER ENGINEERING

MHPL501: ADVANCED MATHEMATICS AND NUMERICAL METHODS

Teaching Scheme:	Examination Scheme (Theory)	Examination Scheme (Laboratory)
Lectures: 03 hrs.	**Teacher Assessment Examination:** 20 Marks	**Internal(TW):** NIL
Tutorials: 01 hr.	**Class Assessment Examination:** 20 Marks	**External(OR)**: NIL
Practical: NIL	**End Semester Examination:** 60Marks	**External(PR)** : NIL
Credits	**04**	

Prerequisite (If any):

1. Engineering Mathematics I, II & III
2. Numerical Methods & Optimization

Course Objective:

1. The students will have a thorough knowledge of the mathematical methods to be applied to problems in Mechanical Engineering.

Course Outcome:

1. Formulate and solve algebraic equations, Eigen value problems.
2. Demonstrate understanding of common numerical methods and how they are used to obtain approximate solutions to otherwise intractable mathematical problems.
3. Apply numerical methods to obtain approximate solutions to mathematical problems.
4. Apply optimization, numerical methods, statistical methods to solve engineering problems.

Course Contents: **Hrs.**

Unit – I : Linear Algebraic Equations: 6

Gauss – Elimination, Gauss – Seidel, LU Decomposition, Solution of algebraic and transcendental equations : - Bisection Method, False position method, Newton – Raphson Method, Muller's method, Bairstow's Method, Convergence and stability

Unit – II : Regression Analysis: 6

i) Linear regression, multiple linear regressions, polynomial regression. ii) Nonlinear regression – Gauss – Newton method, multiple nonlinear regression. Interpolation: Newton's Divided Difference, Lagrange's Inverse, Spline, Hermite Interpolation, Extrapolation technique of Richardson's Gaunt

Unit – III : Differentiation & Integration: 6

Divided difference formulae, Romberg integration, Gauss quadrature for double & triple integration.

Unit – IV : Eigen Values & Eigen Vectors of Matrices 6

Faddeev- Laeverrier's method, Power Method, Householder & Given's method

Unit – V : Ordinary differential equations: 6

Euler's method, Heun's method, Mid – point method, Runge – Kutta methods, Multi step Methods - explicit Adams – Bash forth technique & Implicit Adams – Moulton Technique, Adaptive RK method, Embedded RK method, step size control. Higher order ODE – Shooting method. Nonlinear ODE – Collocation technique.

Unit – VI : Partial Differential Equations: 6

Solution of Parabolic and Hyperbolic equations –Implicit & Explicit Schemes, ADI methods, Nonlinear parabolic equations-Iteration method. Solution of elliptic equation – Jacobi method, Gauss – Seidel & SOR method. Richardson method.

Text Books: (Book Title, Name of the author, name of the Publisher, edition, year of publication)

1. Numerical Methods for Engineers, Steven C Chapra & Raymond P Canale, TMH, Fifth Edition
2. Applied Numerical Methods, Alkis Constantinides, McGraw Hill
3. Applied Numerical Methods with MATLAB, Steven Chapra, McGraw Hill
4. Numerical Solution of Differential Equations, M.K. Jain, 2nd Edition, Wiley Eastern.

Reference Books:

1. Numerical methods for scientific and engineering computation, Jain, Iyangar Jain, New Age International Publishers
2. Numerical methods in Engineering and Science, Dr. B.S. Grewal, Khanna Publishers

MHPL502: ADVANCED THERMODYNAMICS AND COMBUSTION TECHNOLOGY		
Teaching Scheme: **Lectures:** 03 hrs. **Tutorials:** 01 hrs. **Practical:** NIL	**Examination Scheme (Theory)** **Teacher Assessment Examination:** 20-Marks **Class Assessment Examination:** 20-Marks **End Semester Examination:** 60-Marks	**Examination Scheme (Laboratory)** **Internal(TW):** NIL **External(OR)**: NIL **External(PR)** : NIL
Credits :	**04**	

Prerequisite (If any):

1. Thermodynamics
2. Engineering Chemistry

Course Objective:

1. Students will obtain knowledge of advance thermodynamic analysis to be applied for practical problems
2. To study deeply and research the relations of enthalpy entropy and internal energy and their derivations
3. To gain knowledge about mass and heat balance equations by solving practical problems

Course Outcome:

1. Students will apply basic concepts, the laws of thermodynamics and estimate the physical properties of pure substance.
2. Students should be able to describe the concepts entropy and exergy and their use in analyses of thermal energy systems.
3. Provide the theoretical and practical background in the use of fuels via a physico-chemical approach to combustion.
4. Students should be able to understand alternative fuel and combustion technologies

Course Contents **Hrs**

Unit – I : Equation of State 7

State postulate for Simple System and equation of state, Ideal gas equation, Deviation from ideal gas, Equation of state for real gases, generalized Compressibility chart, Law of corresponding states.

Unit – II : Properties of Pure Substances 7

Phase change process of pure substances, PVT surface, P-v &P- T diagrams, Use of steam tables and charts in common use, Simple numericals.

Unit – III : Laws of thermodynamics 7

2nd law Analysis for Engg. Systems, Entropy flow & entropy generation, Increase of entropy principle, entropy change of pure sub, T-ds relations, entropy generation, thermo electricity, Onsager equation. Exergy analysis of thermal systems, decrease of Exergy principle and Exergy destruction, Third law of thermodynamics, Nerst heat theorem and thermal death of universe, Simple numericals.

Unit – IV : Thermodynamic Property Relations 7

Partial Differentials, Maxwell relations, Clapeyron equation, general relations for du, dh, ds, and Cv and Cp, Joule Thomson Coefficient, Δh, Δu, Δs of real gases, Simple numericals.

Unit – V : Combustion Technology 7

Chemical reaction - Fuels and combustion, Enthalpy of formation and enthalpy of combustion, First law analysis of reacting systems, adiabatic flame temperature Chemical and Phase equilibrium - Criterion for chemical equilibrium, equilibrium constant for ideal gas mixtures, some remarks about Kp of Ideal-gas mixtures, fugacity and activity, Simultaneous relations, Variation of Kp with Temperature, Phase equilibrium, Gibb's phase rule, Gas Mixtures – Mass & mole fractions, Dalton's law of partial pressure, Amagat's law, Kay's rule.

Unit – VI : Advanced fuels and combustion technologies 7

Alternative fuels- Bio-diesels (edible and non-edibles), Mixed and hybrid fuels. Advanced combustion chambers and injection Systems. Advanced combustion Methods.

List of Practical (Compete Any Three) (Frame the practical list as per curriculum structure) **Hrs.**

1. Computer aided energy analysis of steady flow cyclic system. 2
2. Study of mixture of gases, gas and vapour, estimation of properties and preparation of charts. 2
3. Study of different I C Engine combustion chambers and injection systems 2
4. Study of behavior of pure substance with change in pressure and temperature 2
5. Preparation of computer program to study the effect of percentage of theoretical on adiabatic flame temperature and equilibrium composition for a hydrocarbon fuel. (Program to be run for variable input data.) 2

Text Books: (Book Title, Name of the author, name of the Publisher, edition, year of publication)

1. Thermodynamics – An Engineering Approach, Yunus Cengel and Michael Boles,7th Ed., Tata McGraw Hill

Reference Books:

2. Modern Engineering Thermodynamics, Robert Balmer, Elseveir.
3. Advanced Thermodynamics for Engineers, Winterbone, John Wiley
4. Advanced Thermodynamics for Engineers, Kenneth Wark, McGraw Hill
5. Thermodynamics for Engineers, Mathur, Gupta, Metropolitan Book Co. Pvt. Ltd.
6. Fundamentals of Engineering Thermodynamics, Michael Moran, Howard Shapiro, John

MHPL503:ADVANCED FLUID MECHANICS

Teaching Scheme:	**Examination Scheme (Theory)**	**Examination Scheme (Laboratory)**
Lectures: 03 hrs.	**Teacher Assessment Examination :** 20 Marks	**Internal(TW):** NIL
Tutorials: 01 hr.	**Class Assessment Examination :** 20 Marks	**External(OR):** NIL
Practical: NIL	**End Semester Examination:** 60 Marks	**External(PR) :** NIL
Credits:	**04**	

Prerequisite (If any):

1. Advanced Mathematics
2. Thermodynamics and Fluid Mechanics
3. Heat Transfer

Course Objective:

1. Study of the flow of fluids
2. General equations, including continuous equation, momentum equation and energy equation are derived.
3. Model a vast range of physical phenomena and plays a vital role in science and engineering.

Course Outcome:

1. Apply the concept of fluid flow for the formation of various mathematical models of fluid flow
2. Formulate the basic equations of continuity and momentum to apply them in practical applications
3. Evaluate the problem on boundary layer and apply them on various objects like airplane and jet
4. Ability to derive the equation for viscous flow, including laminar flow and turbulent flow
5. Ability to address fluid flow problems in engineering like in pipes and ducts with the help of Semi-empirical theories and similarity hypothesis.

Course Contents	**Hrs**
Unit – I : Fluid Flow Concepts	6
Euler's equation of motion, Continuity equation, Stream function, potential function, flow nets, rotational and irrotational flow, Circulation Vortices.	
Unit – II : Navier-Stock's equations	6
Fundamental equation of motion and continuity applied to fluid flow, General stress in a deformable body, rate at which the fluid element strained in a flow; relation between stress and rate deformation, Stoke's hypothesis. Navier-Stoke's equation, Exact solutions of Navier-Stoke's equations.Reynold's principle of similarity.	

Unit – III : Laminar Boundary Layer 6

Boundary Layer equations for flow along flat plate, separation of boundary layer, Momentum-Integral equation of the Boundary Layer. Exact solution of Boundary Layer equations to flow past a cylinder, two-dimensional jet. Boundary Layer control and its applications, Drag; Pressure, form and skin friction.

Unit – IV : Turbulent Flow **6**

The origin of turbulence, Reynolds modification of Navier-Stokes equation for Turbulent flow. Mean values and fluctuations, Semi-empirical theories of similarity hypothesis, Turbulent flow in pipes, Turbulent boundary layer.

Unit – V : Introduction to Boundary layer 6

Introduction to Boundary layer for compressible fluid. Advance topic on subject.

Unit-VI: Advance applications in fluid Mechanics 4

Flow analysis using composites, Nano fluids. Applications in aerodynamic modeling,

Lab Experiments / Assignments (Any Three):	**Hrs.**
1. Flow over a cylinder/sphere at different Re. Pressure variation over the body and drag Estimation.	2
2. Flow past an aerofoil: Pressure measurements, calculation of lift.	2
3. Flow through a converging-diverging nozzle: subsonic and supersonic flows.	2
4. Friction factor determination: incompressible flow through pipes/ducts of variable cross section.	2
5. Laminar/Turbulent boundary layer over a flat plate.	2

Reference Books:

1. Fluid Mechanics Yuan, S.W Prentice Hall, 1970
2. Fluid Mechanics White, F.M Tata McGraw Hill , 1986
3. Elementary Fluid Mechanics Vennard J.K. and Street R.L John Wiley 1982 6th edition
4. Fundamental Mechanics of Fluids Currie, LG CRC Press 2002 3rd edition

MHPL504: RESEARCH METHODOLOGY		
Teaching Scheme: **Lectures:** 03hrs. **Tutorials:** 01 hr. **Practical:** NIL	**Examination Scheme (Theory)** **Teacher Assessment Examination:** 20-Marks **Class Assessment Examination:** 20-Marks **End Semester Examination:** 60-Marks	**Examination Scheme (Laboratory)** **Internal(TW):** NIL **External(OR)**: NIL **External(PR)** : NIL
Credits	**04**	

Course Objective:

1. To develop understanding of the basic framework of research process
2. To develop an understanding of various research designs and techniques
3. To identify various sources of information for literature review and data collection
4. To develop an understanding of the ethical dimensions of conducting applied research
5. Appreciate the components of scholarly writing and evaluate its quality

Course Outcome:

1. Ability to think like a researcher – Understanding Concepts, scope and objective of research problem.
2. Students should be able to distinguish a static and dynamic characteristics of instrument used in experimental setup.
3. Students should be able to develop Research Proposal.

Course Contents **Hrs**

Unit – I : Research Problem 6

Meaning of research problem, Sources of research problem, Criteria / Characteristics of a good research problem, Errors in selecting a research problem, Scope and objectives of research problem

Unit – II : Basic instrumentation 6

Instrumentation schemes, Static and dynamic characteristics of instruments used in experimental set up, Performance under flow or motion conditions, Data collection using a digital computer system, Linear scaling for receiver and fidelity of instrument, Role of DSP in data collection in noisy environment.

Unit – III : Applied statistics 6

Regression analysis, Parameter estimation, Multivariate statistics, Principal component analysis, Moments and response curve methods, State vector machines and uncertainty analysis, Probable errors in the research, Error analysis, simple numerical.

Unit – IV : Research Modelling 6

Types of modeling, Tools used, Setting up a computing model to predict performance of experimental system, Multi-scale modelling and verifying performance of process system, simple numerical.

Unit – V : Prediction of performance 6

Nonlinear analysis of system and asymptotic analysis, Verifying if assumptions hold true for a given apparatus setup, Plotting family of performance curves to study trends and tendencies, Sensitivity theory and applications, simple numerical.

Unit – VI : Developing a Research Proposal 6

Format of research proposal, Individual research proposal, Institutional proposal, Proposal of a student – a presentation and assessment by a review committee consisting of Guide and external expert only, Other faculty members may attend and give suggestions relevant to topic of research.

Text Books: (Book Title, Name of the author, name of the Publisher, edition, year of publication)

1. Research Methodology: Methods and Trends, by Dr. C. R. Kothari

Reference Books:

1. Research methodology: an Introduction for Science & Engineering students, by Stuart Melville and Wayne Goddard
2. Research Methodology: An Introduction by Wayne Goddard and Stuart Melville 4. 5.
3. Research Methodology: A Step by Step Guide for Beginners, by Ranjit Kumar, 2nd Edition
4. Operational Research by Dr. S.D. Sharma, Kedar Nath Ram Nath & Co.

MHPL505: ELECTIVE-I		
Teaching Scheme: **Lectures:** 02hrs. **Tutorials:** NIL **Practical:** NIL	**Examination Scheme (Theory)** **Teacher Assessment Examination:** 20-Marks **Class Assessment Examination:** 20-Marks **End Semester Examination:** 60-Marks	**Examination Scheme (Laboratory)** **Internal(TW):** NIL **External(OR)**: NIL **External(PR)** : NIL
Credits	**02**	

MHPL505: Elective-I			
Modules of 2 Credits (Select any One)			
Code No.	**Title**	**Code No.**	**Title**
MHPL505A	Energy Audit and Management	MHPL505G	Operation Management
MHPL505B	Financial Management	MHPL505H	Engineering Economics
MHPL505C	Financial Costing	MHPL505I	Technology Forecasting
MHPL505D	Project Management	MHPL505J	Technology Transfer
MHPL505E	Energy Efficient Technologies in Electrical Systems	MHPL505K	Human Rights
MHPL505F	Environmental Pollution and Control	MHPL505L	Intellectual property Rights

MHPL505A: Energy Audit and Management

Definition, Energy audit- need, Types of energy audit, Energy management (audit) approach-understanding energy costs, Bench marking, Energy performance, Matching energy use to requirement, Maximizing system efficiencies, Optimizing the input energy requirements, Fuel and energy substitution, Energy audit instruments

Reference Books: 1. Guide Books, Bureau of Energy Efficiency

MEHPL505B: Financial Management

Investment-need, Appraisal and criteria, Financial analysis techniques- Simple payback period, Return on investment, Net present value, Internal rate of return, Cash flows, Risk and sensitivity analysis, Financing options, Energy performance contracting and role of Energy Service Companies (ESCOS).

Reference Books: 1. Guide Books, Bureau of Energy Efficiency

MHPL505C: Financial Costing

Significance, Traditional absorption costing, Marginal costing, Contract costing, Activity based costing, Process costing**.**

Reference Books: Cost Accounting, N K Prasad, Book Syndicate Pvt. Ltd.

MHPL505D: Project Management

Definition and scope of project, Technical design, Financing, Contracting, Implementation and performance monitoring. Implementation plan for top management, Planning Budget, Procurement Procedures, Construction, Measurement & Verification.

MHPL505E: Energy Efficient Technologies in Electrical Systems

Maximum demand controllers, Automatic power factor controllers, Energy efficient motors, Soft starters with energy saver, Variable speed drives, Energy efficient transformers, Electronic ballast, Occupancy sensors, Energy efficient lighting controls.

Reference Books: Guide Books, Bureau of Energy Efficiency

MHPL505G: Operation Management

Introduction, Importance, Operating systems models, key decisions, Planning and controlling, Strategic approach, Processes and systems, supply chain or network approach, Technology and knowledge management, Quality Management, Operations - Challenges, Opportunities, Excellence, risk management and sustainability, Case studies

Reference Books: 1. Operations Management - An Integrated Approach, Danny Samson and Prakash J. Singh, Cambridge, Universal Press. 2. Modern production/Operations Management, 8th Edition, E.S. Buffa and R. K. Sarin, John Wiley & Sons

MHPL505H: Engineering Economics

Fundamentals, Markets and Government in a Modern economy, Basic Elements of Supply and Demand, Demand and Consumer Behaviour, Analysis of Perfectly Competitive Markets, Unemployment, Inflation and Economic policy

Reference Books: Economics, Samuelson Nordhaus, Tata McGraw Hill

MHPL505I: Technology Forecasting

Approaches, Technology Performance Parameters, Use of Experts in Technology Forecasting, Planning, Technology Progress. Morphological Analysis of a Technology System.

Reference Books: 1) Gerard H. Gaynor, Hand Book of Technology Management, Mc Graw Hill.

MMEHPL1105J: Technology Transfer

Definition, Source of Technology Transfer [TT], Model of TT with Public and Private Enterprises, Success and Failure Factors in Technology Transfer. The concepts of Invention and Innovation, Definition and classifications of Research and Development, New Product Development, Challenges in Commercializing Research Results.

Reference Books: 1. Gerard H. Gaynor, Hand Book of Technology Management, Mc Graw Hill.

MHPL505K: Human Rights

Human Rights – Concept, Development, Evolution, Philosophical, Sociological and Political debates, Benchmarks of Human Rights Movement. Human Rights and the Indian Constitution Human Rights & State Mechanisms, Police & Human Rights, Judiciary & Human Rights, Prisons & Human Rights, National and State Human Rights Commissions, Human Rights of the Different Sections and contemporary issues, Citizens' Role and Civil Society, Human Rights and the international scene Primary Information with reference to Engineering Industry

Reference Books: 1)Study material on UNESCO,UNICEF web site, 2)HUMAN RIGHTS IN INDIA A MAPPING,Usha Ramanathan, 3)Introduction to International Humanitarian Law by Curtis F. J. Doebbler - CD Publishing , 2005 .This book is an introductory text on international humanitarian law (the laws of war) that provides the basics of law, including excerpts from some of the leading treaty texts. Perfect for a short course in the law -- one to five weeks, 4) Freedom of Information by Toby Mendel - UNESCO, 2008.

MHPL505F: Environmental and Pollution control

Pollution and Environmental Ethics, Air pollution, Water pollution, Soil pollution, Marine pollution, Noise pollution, Thermal pollution, Nuclear hazards Environmental impact and economic aspects, Emission standards and regulations for Automobiles.

Referance Books: 1) Environmental Pollution and Control, J. Jeffrey Peirce, P Aarne Vesilind, Ruth Weiner, Butterworth-Heinemann, 2) Environmental Pollution Control Engineering, C.S. Rao, New Age International

MHPL505L: Intellectual property Rights

Patentable and non-patentable inventions, statutory exceptions, Persons entitled to apply for patents.

Referance Books: 1) Satyawrat Ponkshe, The Management of Intellectual Property, by, Ponkshe & Bhate Publications, Pune.

MHPP506: LAB PRACTICE - I		
Teaching Scheme: **Lectures:** NIL **Tutorials:** NIL **Practical:** 04hrs.	**Examination Scheme (Theory)** **Teacher Assessment Examination:** NIL **Class Assessment Examination:** NIL **End Semester Examination:** NIL	**Examination Scheme (Laboratory)** **Continuous Assessment:** 50 Marks **External Assessment:** 50 Marks
Credits:	**04**	

Lab. work or Assignments have to be carried out at respective labs as mentioned in the syllabus of respective subjects **excluding Research Methodology and Elective.** It is to be submitted as term work at the end of semester after continuous assessment of each by respective teacher.

MSDP501: ADVANCE SKILL DEVELOPMENT		
Teaching Scheme: **Lectures:** NIL **Tutorials:** NIL **Practical:** 02hrs.	**Examination Scheme (Theory)** **Teacher Assessment Examination:** NIL **Class Assessment Examination:** NIL **End Semester Examination:** NIL	**Examination Scheme (Laboratory)** **Continuous Assessment:** NIL
Credits:	**Audit Course (AU)**	

AUDIT COURSE			
The students must complete any one (A or B) of the following audit course for 20-25 hrs. and submit the certificate			
A Certificate Course:		**B General Proficiency / Foreign Language:**	
i	Advanced CFD Tool	I	German
ii	Industrial H.E. Design	Ii	Spanish
iii	Energy audit of any process/Industry	Iii	French
Iv	Optimization Tools	Iv	Japanese
V	Mechanical CAE Simulation	V	Chinese
vi	Certification course in Quality and testing		

MHPL507: ADVANCED HEAT TRANSFER		
Teaching Scheme: **Lectures:** 03 hrs. **Tutorials:** 01 hr. **Practical:** NIL	**Examination Scheme (Theory)** **Teacher Assessment Examination:** 20 Marks **Class Assessment Examination:** 20 Marks **End Semester Examination:** 60 Marks	**Examination Scheme (Laboratory)** **Internal(TW):** NIL **External(OR)**: NIL **External(PR)** : NIL
Credit	**04**	

Prerequisite (If any):

1. Fluid Mechanics
2. Thermodynamics

Course Objective:

1. To cover the basic principles and equations of conduction, convection and radiation heat transfer.
2. To present numerous and diverse real-world engineering examples to give students a feel for how heat transfer is applied in engineering practice.
3. To develop an intuitive understanding of convection heat transfer by emphasizing the physics, and visual aids.

Course Outcome:

1. Apply heat transfer principles to suggest remedial solutions for real life problems.
2. Ability to formulate the heat transfer equations to solve engineering problems.
3. Ability to design, analyze, interpret data to enhance heat transfer effectiveness.
4. Apply Reynolds analogy to heat transfer problems.
5. Apply Numerical techniques to conduction, convection heat transfer.
6. Use data tables, charts and equations to obtain appropriate data to solve heat transfer problems.

Course Contents **Hrs.**

Unit – I : Introduction 6

Introduction to Heat Transfer – Different Modes, Governing Laws, Quasi-Linearization of the Stefan-Boltzmann Law, Applications to Heat Transfer, Simple Problems for recapitulation of the above.

General Heat Conduction Equation : General Heat Conduction Equation in (i) Cartesian, (ii) Polar and (iii) Spherical Co-ordinate Systems – Derivation of all the equations from first principles, Solution to heat conduction equation – Initial and Boundary Conditions, Different kinds of boundary conditions with examples.

6

Unit – II : Heat Conduction

Steady-state one-dimensional heat conduction problems in Cartesian System : Steady-state one-dimensional heat conduction problems (i) with and without heat generation and (ii) with and without varying thermal conductivity - in Cartesian system with various possible boundary conditions, Numerical Problems.

Steady-state radial heat conduction problems in Polar System: Steady-state radial heat conduction problems (i) with and without heat generation and (ii) with and without varying thermal conductivity - in cylindrical system with various possible boundary conditions, Numerical Problems.

Steady-state radial heat conduction problems in Spherical System: Steady-state radial heat conduction problems (i) with and without heat generation and (ii) with and without varying thermal conductivity - in Spherical system with various possible boundary conditions, Numerical Problems.

Unit – III : Extended Surfaces or Fins 6

Extended Surfaces or Fins of various geometries – Uniform Fins, like Straight Rectangular and Circular Fins, Non-Uniform Fins, like Annular Fins and Triangular Fins, Corrected fin-length concept of Harper and Brown, Fin Efficiency and Fin Effectiveness, Numerical Problems covering all the topics.

Unit – IV : Steady-Unsteady state Heat Conduction 6

Steady-state two-dimensional heat conduction problems: Steady-state two-dimensional heat conduction problems in Cartesian and Cylindrical co-ordinates, Use of Bessel's functions, Numerical Problems.

Transient [Unsteady-state] heat conduction: Transient heat conduction, Different cases - Negligible internal thermal resistance, Negligible surface resistance, Comparable internal thermal and surface resistances, Lumped body, Infinite plate of finite thickness and Semi-infinite Solid, Numerical problems, Heisler and Grober charts for Transient Conduction – Solution to (i) One-dimensional, (ii) Two-dimensional and (iii) Three-dimensional problems using the charts, Numerical problems.

Unit – V : Convection 6

Force convection: Forced Convection Flow over a flat plate, Boundary Layer Theory, Velocity and Thermal Boundary Layers, Prandtl number, Governing Equations – Continuity, Navier-Stokes and Energy equations, Boundary layer assumptions, Integral and Analytical solutions to above equations, Turbulent flow, Various empirical solutions, Numerical Problems concerning the above topics, Forced convection flow over cylinders and spheres, Internal forced convection flows – Constant wall temperature and Constant wall heat flux boundaries, laminar and turbulent flow solutions, Numerical Problems.

Free convection: Laminar and Turbulent flows, analytical and empirical solutions, Numerical Problems.

Unit – VI : Thermal Radiation 6

Prevost's theory, Theories of propagation of thermal radiation, Fundamental principles - White, Opaque, Transparent, Black and Gray bodies, Spectral and Total emissive powers, Wien's, Rayleigh-Jeans and Planck's laws, Spectral energy distribution of a black body, Stefan-Boltzmann law for the total emissive power of a black body, Emissivity – types of emissivity, Numerical Problems, View factor, View factor algebra, Summation rule, Reciprocity Theorem, Hottel's crossed-string method, Electrical resistance concept to tackle two-body enclosures, Numerical problems.

Assignments (Any Three)	**Hrs.**
1. Transient Heat Conduction using Heisler and Grober charts	4
2. Numerical method in heat conduction & convection.	4
3. Combined Natural and Forced Convection heat transfer.	4
4. Radiation Heat Transfer in Two Surface Enclosures	4
5. Heat transfer augmentation techniques.	4

Text Books: (Book Title, Name of the author, name of the Publisher, edition, year of publication)

1. Fundamentals of Heat and Mass Transfer, Incropera, Dewitt, John Wiley and sons
2. Heat and Mass Transfer, Yunus Cengel, Afshin Ghajar, Tata Mc Graw Hill.
3. Heat transfer, J.P. Holman, Mc Graw Hill

Reference Books:

1. Sadik Kakac and Yaman Yener: Heat Conduction, Hemisphere, 2nd Edition, 2001.
2. Kays, W. M. and Crawford, M. E., Convective Heat and Mass Transfer, Tata McGraw Hill, 4th Edition, 2012.
3. Siegel, R. and Howell, J. R., Thermal Radiation Heat Transfer, Taylor and Francis, 4th Edition, 2002
4. Heat transfer - A basic approach, M.N. Ozisik, Mc Graw Hill Int.
5. Convective Heat transfer, A Bejan, John Wiley and sons.

MHPL508: AIR CONDITIONING TECHNOLOGY		
Teaching Scheme: **Lectures:** 3hrs. **Tutorials:** 1 hr. **Practical:** NIL	**Examination Scheme (Theory)** **Teacher Assessment Examination:** 20 Marks **Class Assessment Examination:** 20 Marks **End Semester Examination:** 60 Marks	**Examination Scheme (Laboratory)** **Internal(TW):** NIL **External(OR)**: NIL **External(PR)** : NIL
Credits:	**04**	

Prerequisite:

1. Thermodynamics
2. Basic Refrigeration & Air conditioning
3. Engineering Mathematics

Course Objective:

1. Develop the skills to analyze the large air conditioning systems.
2. Estimate the heating/cooling load & design the system components.
3. Gain the knowledge of contemporary air conditioning systems.

Course Outcome:

1. Apply the knowledge of air conditioning system in various applications.
2. Able to design a complex air conditioning system.
3. Able to design duct and to control noise, odour and bacteria.

Course Contents	**Hrs**
Unit – I : Psychrometry	
Moist Air properties , use of Psychrometric Chart , Psychrometric Processes, Air washer, Bypass Factor, ADP, Applied Psychrometry – RSHF, GSHF and ESHF. Numerical on Applied Psychrometry.	**6**
Unit – II : Load estimation & air conditioning control	
Solar Radiation-Heat Gain through Glasses, Heat transfer through roofs and walls, Total Cooling Load Estimation. Numerical on summer and winter load calculations.	6
Unit – III : Air distribution	
Fundamentals of air flow in ducts, pressure drop calculations, sizing of ducts using equal friction method, Equal velocity method & static regain method, duct materials and properties, insulating materials, types of grills, diffusers, wall registers, etc.	6
Unit – IV : Sound Control	
Definition of various terms like level, pitch, attenuation, frequency, sources of noise in air conditioning plants, design procedure for noise prevention.	6
Fans and Blowers: Types, performance characteristics, series and parallel arrangement,	

selection

Unit – V : Direct and indirect evaporative cooling

Basic psychrometry of evaporative cooling, types of evaporative coolers, design calculations, indirect evaporative cooling for tropical countries 6

Heating: Heat loss calculations, heat pumps, heating coils, electric heating, warm air systems, hot water systems.

Unit – VI : Air conditioning equipment and controls

Cooling coils, humidifiers, dehumidifiers, various types of filters, air washers, thermostat, humidistats, cycling and sequence controls, modern controls for purity, odour and bacteria. 6

Air conditioning systems : Classification, study of central and unitary systems, typical air conditioning systems such as automobile, air planes, ships, railway coach air-conditioning systems, clean rooms (Descriptive treatment only).

Text Books:

1. Refrigeration and Air-conditioning, Stoecker W.F., and Jones J.W., McGraw - Hill, New Delhi
2. Refrigeration and Air-conditioning, Arora C.P., Tata McGraw –Hill, New Delhi
3. Air conditioning Applications and Design, Jones W. P., Edward Arnold Publishers Ltd.

Reference Books:

1. Handbook of Heating,Ventilation and Air Conditioning- Jan F.Kredier- CRC
2. Control System for Heating, Ventilation and Air conditioning, Hainer R. W., Van Nastrand Reinhold Co., New York, 1984.
3. Fundamentals of HVAC systems, Robert McDowall, Elseveir

E-Books/Web Links

1. http://ishrae.in
2. http://ashrae.org

MHPL509: COMPUTATIONAL FLUID DYNAMICS		
Teaching Scheme: **Lectures:** 3hrs. **Tutorials:** 1 hr. **Practical:** NIL	**Examination Scheme (Theory)** **Teacher Assessment Examination:** 20 Marks **Class Assessment Examination:** 20 Marks **End Semester Examination:** 60 Marks	**Examination Scheme(Lab)** **Internal(TW):** NIL **External(OR)**: NIL **External(PR)** : NIL
Credits:	**04**	

Prerequisite (If any):

1. Basics of Mathematics and matrix operations.
2. Concepts of Fluid Mechanics
3. Concepts of Heat Transfer and numerical methods.

Course Objective:

1. To have a good understanding of the algorithms used in flow solvers
2. To be able to compare different algorithms

Course Outcome:

1. Understand the stepwise procedure to completely solve a fluid dynamics problem using computational methods
2. Derive the governing equations and understand the behaviour of the equations
3. Analyze the consistency, stability and convergence of various discretization schemes for parabolic, elliptic and hyperbolic partial differential equations.
4. Analyze various methods of grid generation techniques and application of finite difference and finite volume methods to various thermal problems

Course Contents **Hrs**

Unit – I : Introduction to CFD: 6

Governing equations: the continuity equation, momentum equation and energy equations, convective forms of the equations and general description, Reynolds transport theorem. Classification of partial differential equations; physical examples of elliptic, parabolic and hyperbolic equations. Mathematical nature of the flow equations& their boundary conditions

Unit – II : Discretization: 6

Basic discretization techniques applied to model equations and systems of equations: finite difference, finite volume and finite element methods. Finite difference methods: Taylor series expansion, different means for formulating finite difference equation; accuracy of finite difference method. Finite Volume Methods: Finite volume methods; approximation of surface and volume integrals; interpolation methods; central, upwind and hybrid formulations and comparison for convection-diffusion problem.

Analysis of numerical schemes: concept of consistency, accuracy, stability and convergence; Error and stability analysis; some applications.

Unit – III : Numerical Grid Generation: 6

Introduction, Structured and Unstructured mesh generation techniques • Structured grid generation: a)Algebraic method, b) Elliptic generation systems. • Unstructured grid generation: a)Voronoi diagram and Delaunay triangulation; b) Advancing front grid generation.

Unit – IV : Solution to Eulers equations: 6

Formulations of Euler equations, Discretization methods for Euler equations. High resolution schemes and TVD.

Unit – V : Navier-Stokes Equations: 6

Governing equations, Properties of Navier-Stokes equations; Discretization of NS equations; Boundry conditions; Convergence acceleration techniques.

Unit – VI : Turbulence Modeling: 6

Introduction, Statistical representation of turbulent flows: General Properties of turbulent quantities, Closure problem: Necessity of turbulence modeling, Reynolds average Navier stokes (RANS) equation, Different types of turbulence model: Eddy viscosity models, Mixing length model, Turbulent kinetic energy and dissipation, The κ-ε model, Advantages and disadvantages of κ-ε model, Two-equation models: κ-ε model and κ-ω model, Reynolds stress equation model (RSM).

Text Books:

1. Anderson, J.D. Computational Fluid Dynamics, McGraw Hill, 1995.
2. Anderson,D.A., Tannehill,J.C. and Pletcher,R.H., Computational Fluid Dynamics and Heat Transfer, McGraw Hill, 1984.

Reference Books:

1. Hirsch,C. Numerical Computation of Internal and External Flows, Vol.I, John Wiley, 1990.
2. PradipNiyogi, S.K. Chakraborty, M.K. Laha, Introduction to Computational Fluid Dynamics, Pearson
3. Muralidhar, K., and Sundararajan, T., “Computational Fluid Flow and Heat Transfer”, Narosa Publishing House, New Delhi, 1995
4. Ghoshdasdidar, P.S., “Computer Simulation of flow and heat transfer” Tata McGraw Hill Publishing Company Ltd., 1998.

Assignment (Any Three):

1. CFD analysis of 2D problems for flow analysis.
2. Flow analysis on aerofoil like curved surface.
3. CFD analysis of flow through pipe.
4. CFD analysis of flow through channel.
5. Thermal flow analysis in composite walls.

MHPL510: ELECTIVE-II		
Teaching Scheme: **Lectures:** 3 hrs. **Tutorials:** NIL **Practical:** NIL	**Examination Scheme (Theory)** **Teacher Assessment Examination:** 20-Marks **Class Assessment Examination:** 20-Marks **End Semester Examination:** 60-Marks	**Examination Scheme (Laboratory)** **Internal(TW):** NIL **External(OR)**: NIL **External(PR)** : NIL
Credits:	**05**	

MHPL502: ELECTIVE-II			
Modules of 2 Credits (Select any One)			
Code No.	**Title**	**Code No.**	**Title**
MHPL510A	Thermal System Design	MHPL510J	Jet Propulsion
MHPL510B	Aerodynamics	MHPL510K	Incompressible Flow Turbo machines
MHPL510C	Introduction to flight	MHPL510L	Cryogenic Engineering Gas Liquefaction
MHPL510D	Vacuum Technology	MHPL510M	Fuel Burning Devices
MHPL510E	Gas Dynamics	MHPL510N	Adsorption Technology
MHPL510F	Turbomachinery	MHPL510O	Industrial Hydraulics
MHPL510G	Gas Turbine	MHPL510P	Turbulent Jets
Modules of 1 Credits (Select any One)			
MHPL510a	Selection of Fans, Pumps and blowers	MHPL510d	Clean-room Technology
MHPL510b	Biomass Technology	MHPL510e	Pneumatics
MHPL510c	Nano-materials	MHPL510f	Insulating Materials and Refractories

MHPL511A: Thermal System Design

Designing a workable system: Workable and optimum systems, Outline of sequence of tasks and decisions for a workable design. Modeling Thermal Equipment: Using physical insight, Selection Vs Simulation, Case study on modeling thermal equipment. System Simulation: Classes of simulation, Sequential and simultaneous calculations, case study on system simulation

Ref. Books: Design of Thermal Systems, W.F. Stoecker, Tata McGraw – Hill

MHPL511B: Aerodynamics

Fundamental principles and equations, Airfoils, wings and their nomenclature; lift, drag and pitching moment coefficients; centre of pressure and aerodynamic centre. Normal shock waves, Oblique shock waves, bow shock, expansion waves, Compressible flow through wind tunnels, introduction to Supersonic and hypersonic flows. Numerical techniques for nonlinear supersonic flow.

Ref. Books: 1) Fundaments of Aerodynamics, J.D. Anderson, 4th Ed. Tata McGraw Hill. 2) Introduction to Flight, J.D. Anderson, 5th Ed. Tata McGraw Hill. 3) Bertin, J. J., Aerodynamics for Engineers, Pearson Education, 2002. 4) Houghton , E. L. and Carpenter, P. W., Aerodynamics for

Engineers, Butterworth-Heinemann, 2001.

MHPL511C: Introduction to Flight

Aerodynamic Shapes- Airfoils and wings, Incompressible flow over Airfoils and wings, Compressible flow over airfoils, elements of Airplane performance, principles of stability and control, Space Flight, Theory on jet propulsion, Hypersonic Vehicles

Ref. Books:1) Introduction to Flight, J.D. Anderson, 5th Ed. Tata McGraw Hill. 2) Fundaments of Aerodynamics, J.D. Anderson, 4th Ed. Tata McGraw Hill. 3) Introduction To Aircraft Performance, Selection, And Design, Francis J. Hale, Wiley India Pvt Ltd. 2011. 4) Barnard, R.H., and Phillpott, D.R., Aircraft Flight, Longman, 2009.

MHPL511D: Vacuum Technology

Introduction ,Units for Vacuum, Vacuum Pumps, Positive Displacement Pump, Roots Pump, Diffusion Pumps, Molecular Pumps , Pumping System Design, Selection of Vacuum Pumps, Calculation of Pumping Speed ,Conductance and Pumping Speed, Baffles and Traps, Outgassing, Vacuum Pumping (Pressure–Time Relations) Calculation of Pumping Time, Measurement of Vacuum, Mechanical Gauges, Conductivity Gauges, Ionization Gauge

Ref. Book: Industrial Heating - Principles, Techniques, Materials, Applications, and Design,Yeshvant V. Deshmukh, CRC Press 2005.

MHPL511E: Gas Dynamics

Introduction, One dimensional flow basics, Normal shock waves, Flow with heat addition – Rayleigh flow, Flow with Friction – Fanno Flow, Quasi One dimensional Flows, Oblique shock waves, Prandtl Meyer Flow

Ref. Books: 1)Fundamentals of Gas Dynamics, Robert D. Zucker, Oscar Biblarz, Wiley, 2nd Edition., 2)Fundamentals of Gas Dynamics, V. Babu, Ane Books Pvt. Ltd., 3)Elements of Gas Dynamics, Liepmann H. W. and Roshko A., Dover, 2001

MHPL511F: Turbomachinery

Basics of turbo machinery, Analysis of Axial flow Compressors, Centrifugal flow compressors, Axial flow Turbines and Radial flow Turbines, Three-dimensional Flows in Axial Turbomachines.

Ref. Books: 1) Principles of Turbomachinery, R.K. Turton, Springer, 2nd Edition. 2) Turbomachinery Design and Theory, Rama S.R. Gorla and Aijas.A. Khan, CRC Press. 3) Fluid Mechanics and Thermodynamics of Turbomachinery, S.L. Dixon, Butterworth Heinemann.

MHPL511G: Gas Turbine

Basics of Compressible flow, Cycle arrangements, Turbojet Engine and Turbofan Engine, Thrust calculations, Ramjet and Scramjet Engine, Parametric cycle analysis of ideal and real engine

Ref. Books: 1)Elements of Gas Turbine Propulsion – Jack D. Mattingly , Tata Mc-Graw Hill 2) Fundamentals of Propulsion, V. Babu, Ane Books Pvt. Ltd. 3) Introduction to Flight, J.D. Anderson, 5th Ed. Tata McGraw Hill.

MHPL511J: Jet Propulsion

Ideal and Non-ideal cycle analysis, Diffusers, Nozzles, Combustors and Afterburners, Ducts and Mixers, System matching and analysis, Rocket Propellants, rocket equation, rocket staging, electric propulsion.

Ref. Books: 1)Fundamentals of Jet Propulsion with Applications, Ronald D. Flack, Cambridge University , 2) Introduction to Flight, J.D. Anderson, 5th Ed. Tata McGraw Hill.

MHPL511K: Incompressible Flow Turbomachines

Some aspects of Design, Design of impellers and runners of single and double curvature, Inlet and outlet elements, Head losses in Turbine and Pump systems, Cavitation, water hammer and Corrosion

Ref. Books: 1) Incompressible Flow Turbomachines, G. F. Round , Elsevier Publications 2) Fundamentals of Incompressible Fluid Flow, V. Babu, Ane Books Pvt. Ltd.

MHPL511L: Cryogenic Engineering Gas Liquefaction

Gas Liquefaction: Fundamentals, ideal liquefaction work, various liquefaction cycles, analysis of various cycles. Gas Separation and gas purification systems - Fundamentals of gas separation, Ideal work of gas separation, basics of gas Mixtures, distillation column, column efficiency, theoretical plate, Calculations, double columns, Plate structures, Oxygen and argon separation systems.

Ref. Books: 1) Barron R. F., Cryogenic Systems, 2nd Ed., Oxford University Press, 1985. 2) Timmerhaus K. D. and Flynn T. M., Cryogenic Process Engineering, CRC Press.

MHPL511M: Fuel Burning Devices

Combustion of Liquid Fuels, Classification of Oil Burners, High Pressure Burners, Low Pressure Burners, Burners for Distillate Fuels, Preheating of Oils, Kinetics of Combustion of Gases, Burning Properties of Gases, Classification of Gas Burners, Flame Stabilization, Ignition and Detection, Atmospheric Gas Burners, Nozzle Mixing Gas Burners, Radiant Tubes, Immersion Tubes, Dual Fuel Burners, Packaged Burners, Combustion of Solid Waste and Garbage, Burner Auxiliaries, Burner Blocks, Ignition Devices, Flame Protection Devices

Ref. Books: Industrial Heating - Principles, Techniques, Materials, Applications, and Design, Yeshvant V. Deshmukh, CRC Press 2005.

MHPL511N: Adsorption Technology

Adsorbents, Fundamentals of adsorption equilibria, rate of adsorption of gases and vapors by porous medium, processes and cycles, Design procedures and break through Curves, pressure swing adsorption processes, Thermal adsorption processes.

Ref. Books: 1) Adsorption Technology and Design, Barry Crittenden and W John Thomas, Butterworth Heinemann Publications 2)Diffusion Mass transfer in fluid systems (chapter 15), E L Cussler, Cambridge University Press.

MHPL511O: Industrial Hydraulics

Vane and piston pumps, power units, accessories, accumulators, check valves, various pressure control, directional control, flow control valves, center positions, proportional valves, cartridge valves, prefill valve, linear and rotary actuators, design considerations for cylinders, various hydraulic circuits and their applications, circuit design and analysis, selection of components, troubleshooting of hydraulic components and circuits, maintenance and safety.

Ref. Books: 1) J.J.Pipenger – 'Industrial Hydraulics', McGraw Hill, 2)A. Esposito – 'Fluid Power with application', Prentice hall

MHPL511a: Selection of Fans, Pumps and blowers

Types, Performance evaluation, efficient system operation, Flow control strategies and energy conservation opportunities and Selection of fans, pumps and blowers

Ref. Books:1) Guide Books, Bureau of Energy Efficiency, 2) Turbines, Compressors and Fans, S.M. Yahya, 3rd Ed., Tata McGraw Hill., 3)Fan Handbook, Frank P Bleier, McGraw Hill, 4) Pumps, Principles and Practice, Jaico Publishing House, Mumbai.

MHPL511b: Biomass Technology

Photosynthesis and crop yields, Biomass potential and Use, Biomass Energy Production, Environmental impact of biomass, Economics and potential of biomass.

Ref. Book: Energy Science – Principles, Technologies and Impacts, John Andrews and Nick Jelley, OXFORD University Press

MHPL511C: Nanomaterials

Nanoparticles, Carbon Nanotubes, and Semiconducting Nanowires: Physics, Synthesis, Characterization and Applications.

Ref. Books:1) Nano: The Essentials, Pradeep, T., McGraw-Hill, 2007, 2) Nanoscale Science and Technology, Kelsall, R., Hamley I. and Geoghegan, M.(Eds.) Wiley, 2005.

MHPL511f: Insulating Materials and Refractories

Need of insulation, Classification of Thermal Insulations, Properties of Thermal Insulations, Applications (Case Studies) in Refrigeration, HVAC, Cryogenic, Chemical and Process industries, Degree days and pay back periods, Refractories types and applications

Ref. Books: 1)Energy Efficiency, Estop and Croft 2) Guide Books, Bureau of Energy Efficiency, 3)Mass and Heat Transfer, T.W.Fraser Russel, Robinson,Wagner-Cambridge University Press

MHPL511P: Turbulent Jets

Free Jets, Coflowing Jets, Multiple Free Jets, Jet Flocculator, Wall Jets

Ref. Books: Turbulent Jets, Bidya Sagar Pani, Cambridge University press.

MHPL511d: Cleanroom Technology

Introduction to cleanrooms, types, classifications, cleanroom standards, testing and validation of clean rooms, design considerations, energy conservation in cleanrooms.

Ref. books: ASHRAE Handbook – HVAC Applications (Clean Spaces)

MHPL511e: Pneumatics

Different pneumatic components, different pneumatic circuits, trouble shooting in pneumatics, logic valves, building circuit for a given logic, Electro pneumatic circuits, Selection criteria of pneumatic components, Installation fault finding and maintenance of pneumatic components. Microprocessor and PLC- Applications in pneumatics, Low cost Automation, case studies.**Ref. Books:** 1) A. Esposito – ‘Fluid Power with application’, Prentice hall, 2) Majumdar S.R., “Pneumatic systems – Principles and maintenance”, Tata McGraw Hill

MHPL511: Elective-III			
Modules of 3 Credits (Select any One)			
Code No.	**Title**	**Code No.**	**Title**
MHPL511A	Open Elective	MHPL511D	Cryogenics
MHPL511B	Thermal Storage Systems	MHPL511E	Measurements and Controls
MHPL511C	Design of Heat Exchangers	MHPL511F	Optimization Technique

MHPL511A: OPEN ELECTIVE		
Teaching Scheme: **Lectures:** 03 hrs. **Tutorials:** NIL **Practical:** NIL	**Examination Scheme (Theory)** **Teacher Assessment Examination:** 20 Marks **Class Assessment Examination:** 20 Marks **End Semester Examination:** 60Marks	**Examination Scheme (Laboratory)** **Internal(TW):** NIL **External(OR)**: NIL **External(PR)** : NIL
Credits :	**03**	

Note: Student is expected to select one open elective subject (other departments). They will inform course name in begging of the semester to the respective department.

MHPL511B: THERMAL STORAGE SYSTEMS		
Teaching Scheme: **Lectures:** 03 hrs. **Tutorials:** NIL **Practical:** NIL	**Examination Scheme (Theory)** **Teacher Assessment Examination:** 20 Marks **Class Assessment Examination:** 20 Marks **End Semester Examination:** 60Marks	**Examination Scheme (Laboratory)** **Internal(TW):** NIL **External(OR)**: NIL **External(PR)** : NIL
Credits :	**03**	

Course Outcome:

1. Analyze the quantum of energy that can be retrieved and stored in a thermal system
2. Apply principles of fluid mechanics and heat transfer to model the heat storage units.
3. Understand the heat transfer enhancement configurations.
4. Understand the heat transfer enhancement configurations.

Course Contents: **Hrs**

Unit – I : Introduction: 6

Necessity of Thermal storage, Energy storage devices, types of storage system, Specific areas of application, Heat Transfer Enhancement methods.

Unit – II : Sensible Heat Storage system:: 6

Basic Concepts and modeling of heat storage units, modeling of simple water and rock bed storage system, Use of TRNSYS, pressurized water storage system for power plant applications , packed beds.

Unit – III : Regenerators: 6

Parallel flow and counter flow regenerators, Finite conductivity model, Non-linear model, Transient performance, step changes in inlet gas temperature, step changes in gas flow rate, Parameterization of transient response, Heat storage exchangers. Latent Heat Storage system, Storage materials modeling of phase change problems and solution methodologies, Enthalpy modeling, Heat transfer enhancement configuration, Parameterization of rectangular, cylindrical geometric problems.

Unit – IV : Applications: 6

Specific areas of application of energy storage, Food preservation, Waste heat recovery, solar energy storage, Green House heating, Power Plant applications, drying and heating for process industries.

Text Books: (Book Title, Name of the author, name of the Publisher, edition, year of publication)

1. Thermal Energy Storage: Systems and Applications, İbrahim Dinçer, Marc A. Rosen Second Edition, John Wiley & Sons, Ltd

2. Sustainable Thermal Storage Systems: Planning Design and Operations, Lucas B Hyman, Goss Engineering ,Mc Graw Hill Publisher,2011.

3. Reference Books:

1. Thermal storage & Regeneration, F. W. Schmidt & A. J. Willmott, Hemisphere Publishing Corporation.
2. Heat Transfer in cold climates, V. J. I. Unardini, D Van Nostrand Reinhold, New York

MHPL511C: DESIGN OF HEAT EXACHANGER		
Teaching Scheme: **Lectures:** 03 hrs. **Tutorials:** NIL **Practical:** NIL	**Examination Scheme (Theory)** **Teacher Assessment Examination:** 20 Marks **Class Assessment Examination:** 20 Marks **End Semester Examination:** 60Marks	**Examination Scheme (Lab)** **Internal(TW):** NIL **External(OR)**: NIL **External(PR)** : NIL
Credits :	**03**	

Course Objective:

1. Exposer to different kinds of heat exchanger, their working and selection for a given application.
2. To learn different techniques of heat exchanger analysis.
3. To learn construction & thermal design methodology of shell & tube, plate & compact heat exchanger.
4. To learn principle of boilers, condensers and cooling towers and their working

Course Outcome:

1. Apply LMTD and effectiveness method in the design of heat exchanger.
2. Able to design and analyze the shell and tube heat exchanger and compact heat exchanger for various applications.
3. Apply knowledge of technical feature of cooling towers in various applications.

Course Contents: **Hrs**

Unit – I : Constructional details and Heat Transfer 6

Types, Shell and Tube heat Exchangers, Regenerators, Recuperator, Industrial applications, temperature distribution and its implications, LMTD, Effectiveness.

Unit – II : Flow distribution and stress analysis 6

Effect of Turbulence, Friction factor, Pressure loss, Channel diversion, heater sheets and pressure vessels, thermal stresses, shear stresses, Types of failure.

Unit – III : Design Aspects 6

Heat transfer and Pressure loss, Flow configuration, Effects of Baffles, effects of deviation from ideality, Design of typical liquid, gas, gas -Liquid heat exchanger.

Unit – IV : Condensers and Evaporators design 6

Design of surface and evaporative condensers, Design of shell and tube, plate type evaporator, Cooling Tower

Text Books: (Book Title, Name of the author, name of the Publisher, edition, year of publication)

1. Fundamentals of Heat Exchanger Design, R. K. Shah , D.P. Sekulic, John Wiley & Sons Ltd.
2. Heat Exchanger Design, P. O. Fraas, John Wiley & Sons, 1988

Reference Books:

1. Heat Exchangers: Theory & Practices, T. Taboreck, G.F. Hewitt & N. Afgan, TMH,1980
2. Industrial Heat Exchanger: A Basic Guide, Walkar, TMH Book co,1980
3. Heat Exchangers: Basics Design Applications, Edited by Jovan Mitrovic, InTech Publisher

MHPL511D: CRYOGENIC		
Teaching Scheme: **Lectures:** 03 hrs. **Tutorials:** NIL **Practical:** NIL	**Examination Scheme (Theory)** **Teacher Assessment Examination:** 20 Marks **Class Assessment Examination:** 20 Marks **End Semester Examination:** 60Marks	**Examination Scheme (Laboratory)** **Internal(TW):** NIL **External(OR)**: NIL **External(PR)** : NIL
Credits :	**03**	

Course Outcome:

1. Ability to understand various gas liquefaction, gas separation & purification systems.
2. Ability to evaluate the performance of different cryogenic systems.
3. Ability to understand different working fluids and engineering materials in cryogenic systems.
4. Ability to analyze low temperature systems for various applications.

Course Contents: **Hrs**

Unit – I : Introduction: 6

Limitations of Carnot cycle, vapor compression cycle and air refrigeration cycle. Production of low temperature by reversible and irreversible adiabatic expansion of a gas , Joule Thomson effect; Joule Thomson co-efficient, Inversion curve.

Gas Liquefaction Systems:

Linde -Hampson, Linde dual pressure, Claude, Heylandt and Kapitza systems; Systems for liquefaction of Neon, Hydrogen and Helium; Collins and Simon systems for helium liquefaction

Unit – II : Gas Separation and Purification Systems: 6

Ideal system, Gas separation by simple condensation or evaporation, principles of rectification.

Air separation systems:

Design of surface and evaporative condensers, Design of shell and tube, plate type evaporator, Cooling Tower.

Unit – III : Gas Refrigeration Systems: 6

Joule Thomson refrigeration system, Pre cooled Joule Thomson refrigeration system, Expansion engine refrigeration system, Cold gas refrigeration system, Stirling cryocooler.

Unit – IV : Material and fluid properties: 6

Thermal and Mechanical properties of engineering materials at cryogenic temperatures, Properties of cryogens, Cryogenic insulations.

Cryogenic Applications:

Applications in space, on-ground, medical, electronic cooling, manufacturing processes, preservation and bio-technology.

Text Books: (Book Title, Name of the author, name of the Publisher, edition, year of publication)

1. Cryogenic systems, R. Barron, McGraw–Hill Company
2. Fundamentals of Cryogenics Engineering, Mamata Mukhopadhyay, PHI Learning Pvt. Ltd.
3. Cryogenic Fundamentals, G. G. Hasseldon, Academic Press
4. Advanced Cryogenics, Bailey, Plenum Press

Reference Books:

1. Industrial Refrigeration Handbook, W. F. Stoecker, McGraw-Hill Publication.
2. ASHRAE HANDBOOKS (i) Fundamentals (ii) Refrigeration

MHPL511E: MEASUREMENTS AND CONTROLS		
Teaching Scheme: **Lectures:** 3 hrs. **Tutorials:** 1 hr. **Practical:** NIL	**Examination Scheme (Theory)** **Teacher Assessment Examination:** 20-Marks **Class Assessment Examination:** 20-Marks **End Semester Examination:** 60-Marks	**Examination Scheme (Laboratory)** **Internal(TW):** NIL **External(OR)**: NIL **External(PR)** : NIL
Credits:	**04**	

Course Objective:

1. To introduce students to monitor, analyze and control any physical system.
2. To understand students how different types of meters work and their construction
3. To provide a student a knowledge to design and create novel products and solutions for real life problems
4. To introduce students a knowledge to use modern tools necessary for electrical projects

Course Outcome:

1. To use the techniques and skills for projects.
2. Design a system, component or process to meet desired needs in electrical engineering.
3. Measurement of R,L,C ,Voltage, Current, Power factor , Power, Energy
4. Ability to measure strain, displacement, Velocity, Angular Velocity, temperature, Pressure, Vacuum, and Flow

Course Contents **Hrs**

Unit – I : Instrument types and performance characteristics 7

Active and Passive instruments, Null type and deflection type instruments, Analogue and digital instruments, Indicating instruments and instruments with signal output, smart and non smart instruments. Static and Dynamic characteristics of instruments, Necessity of calibration

Unit – II : Measurement Uncertainty 10

Sources of Systematic Error, System Disturbance due to Measurement, Errors due to Environmental Inputs, Wear in Instrument Components, Accumulation of Accepted Error, Improper Functioning of Instruments, Dual Sensitivity Errors, Other Sources of Error, Minimizing Experimental Error, Statistical Analysis of Measurements subject to Random Errors, Aggregation of Measurement System Errors, Reduction of Systematic Errors, Quantification of Systematic Errors, Sources and Treatment of Random Errors, parameter estimation, regression analysis, correlations, analysis of data

Unit – III : Measurement of field quantities 7

Temperature, heat flux measurement, heat transfer coefficient, measurement of force, pressure, flow rate, velocity, humidity, noise, vibration

Unit – IV : Measurement of derived quantities 6

Force, Acceleration, Torque, power, thermo physical properties, radiation and surface properties, Miscellaneous Measurements - Time, Frequency, and Phase-Angle Measurement, Liquid Level, Chemical Composition, Current and Power Measurement

Text Books: (Book Title, Name of the author, name of the Publisher, edition, year of publication)

1. Measurement Systems-Application and Design, Doebelin E.O., McGraw Hill Publication.

Reference Books:

1. Measurement and Instrumentation – Theory and Application, Alan Morris, Reza Langari, Elseveir
2. Instrumentation for Engineering Measurements, James Dally, William riley and Kenneth McConnell, Wiley.
3. Mechanical Measurements, S.P. Venkateshan, Ane Books Pvt. Ltd.

MCDL511F-OPTIMIZATION TECHNIQUES		
Teaching Scheme: **Lectures:** 03hrs. **Tutorials:** NIL **Practical:** NIL	**Examination Scheme (Theory)** **Teacher Assessment Examination:** 20 Marks **Class Assessment Examination:** 20 Marks **End Semester Examination:** 60Marks	**Examination Scheme (Laboratory)** **Internal(TW):** NIL **External(OR)**: NIL **External(PR)** : NIL
Credit	**3**	

Course Objective:

1. The course is spent on discussing evolutionary multi-objective optimization (EMO) methods in details. Strengths and weaknesses of each method are highlighted.
2. The course also discusses a number of current research issues, besides discussing a number of interesting case studies.
3. This course where students get an exposure to both theory and numerical optimization methodologies involving classical and evolutionary methods

Course Outcome:

1. Can formulate engineering design problems as mathematical optimization problems.
2. Can apply linear programing for solving engineering problems
3. Can solve One Dimensional and multi-Dimensional engineering problems

Course Contents	**Hrs**
Unit – I : Introduction To Optimization	
Introduction to optimization, formulation of optimization problem, Classification of optimization problems, Optimum design of components like pins, beams, columns, shafts, spur gears, pressure vessels, etc queue, simulation of inventory problem.	6
Unit – II : Linear Programming	
Linear programming, simplex method and duality in linear programming, sensitivity or post-optimality analysis, Karmarkar’s method.	6
Unit – III : One Dimensional Optimization	
One dimensional minimization, optimality criterion, minimum bracketing methods like exhaustive search method, bounding phase method; optimum seeking methods like interval halving, golden section search, successive quadratic estimation, Newton Raphson, bisection, secant, cubic search method.	6
Unit – IV : Multi-Dimensional Optimization	
Multivariable unconstrained optimization, optimality criteria, direct search methods Powell’s conjugate direction method; gradient search methods like Cauchy’s method, Newton’s method, conjugate gradient method and variable metric method.	6

Text Books: (Book Title, Name of the author, name of the Publisher, edition, year of publication)

1. S. S. Rao, Engineering Optimization Theory and Practice, New age international (P) Ltd., reprint 2003
2. Kalyanmoy Deb, Optimization for Engineering Design, PHI, New Delhi, 2005
3. J. S. Arora, Introduction to Optimum Design, McGraw Hill, New York, 1989.

Reference Books:

1. S. S. Stricker, Optimizing Performance of Energy Systems, Battelle Press, New York, 1985.
2. R.C. Johnson, Optimum Design of Mechanical Elements, Willey, New York, 1980.
3. L.C.W. Dixon, Non-Linear Optimization - Theory and Algorithms, Birkhauser, Boston, 1980.
4. R.J. Duffin, E.L. Peterson and C. Zener, Geometric Programming-Theory and Applications, Willey, New York, 1967.
5. G.B. Dantzig Linear Programming and Extensions Princeton University Press, Princeton, N. J. 1963.

MHPP512: LAB PRACTICE II		
Teaching Scheme: **Lectures:** NIL **Tutorials:** NIL **Practical:** 4hrs.	**Examination Scheme (Theory)** **Teacher Assessment Examination:** NIL **Class Assessment Examination:** NIL **End Semester Examination:** NIL	**Examination Scheme (Laboratory)** **Continuous Assessment:** 50 Marks **External Assessment:** 50 Marks
Credits:	**02**	

Lab. work or Assignments have to be carried out at respective labs as mentioned in the syllabus of respective subjects **excluding Elective.** It is to be submitted as term work at the end of semester after continuous assessment of each by respective teacher.

MHPP601-TECHNICAL WRITING		
Teaching Scheme: **Lectures:** NIL **Tutorials:** NIL **Practical:** 03 hrs.	**Examination Scheme (Theory)** **Teacher Assessment Examination:-** NIL **Class Assessment Examination:** NIL **End Semester Examination:** -NIL	**Examination Scheme (Laboratory)** **Continuous Assessment:** 50 Marks **External Assessment:** 50 Marks
Credit	**03**	

Hrs.

Unit – I : Seminar Writing **7**

Selection of seminar, literature survey, outcomes and scope discussion based on literature, writing formats, summery and reference writing format. Case studies-based on the other's seminar presentation.

Unit – II : Dissertation Writing **7**

Selection of dissertation area, literature survey, outcomes and scope discussion based on literature, writing formats, summery and reference format. Case studies-based on the other's presentation. Discussion to write conclusion and appendix.

Unit – III : Assignment based on Software Tools and Techniques 8

a) Use technical writing software for seminar.
b) Use technical writing software for dissertation.
c) Use of Latex and its different capabilities.

NOTE: Journal and Report Writing,

Student is required to give the presentation based on report of a, b, and c and writing report on Research proposal and Patent drafting/filing at the end of semester.

MHPP602-SEMINAR-I		
Teaching Scheme: **Lectures:** NIL **Tutorials:** NIL **Practical:** 04 hrs.	**Examination Scheme (Theory)** **Teacher Assessment Examination:** NIL **Class Assessment Examination:** NIL **End Semester Examination:** NIL	**Examination Scheme (Laboratory)** **Continuous Assessment:** 50 Marks **External Assessment:** 50 Marks
Credit	**04**	

It is important that the procedures listed below be carefully followed by all the students of MTech. (Mechanical Engineering).

1. Prepare 3 COPIES of your manuscript.
2. Limit your project report to preferably

a) 15-20 manuscript pages for Seminar I

b) 20-25 manuscript pages for Seminar II

c) 25-30 manuscript pages for Seminar III

3. The footer must include the following:

Institute Name, MTech. Mechanical (Heat Power Engineering) Times New Roman 10 pt. and centrally aligned.

4. Page number as second line of footer, Times New Roman 10 Pt, centrally aligned.
5. Print the manuscript using

a) Letter quality computer printing.

b) The main part of manuscript should be Times New Roman 12 pt. and justified.

c) Use 1.5 line spacing.

d) Entire report shall be one chapter. No chapters for Seminar I, II and III.

e) Seminar I shall not have last section as Conclusions, it will be summary only.

6. Use the paper size 8.5’’ × 11’’ or A4 (210 × 197 mm). Please follow the margins given below.

Margin Location	**Paper 8.5’’ × 11’’**	**Paper A4 (210 × 197 mm)**
Top	1’’	25.4 mm
Left	1.5’’	37 mm
Bottom	1.25’’	32 mm
Right	**1’’**	**25.4 mm**

7. All paragraphs will be 1.5 line spaced with a one blank line between each paragraph. Each paragraph will begin without any indentation.
8. Section titles should be bold with 14 pt typed in all capital letters and should be left aligned.
9. Sub-Section headings should be aligning at the left with 12 pt, bold and Title Case (the first letter of each word is to be capitalized).

10. Illustrations (charts, drawings, photographs, figures) are to be in the text. Use only illustrations really pertinent to the text. Illustrations must be sharp, clear, black and white. Illustrations downloaded from internet are not acceptable.

a) Illustrations should not be more than two per page. One could be ideal

b) Figure No. and Title at bottom with 12 pt

c) Legends below the title in 10 pt

d) Leave proper margin in all sides

e) Illustrations as far as possible should not be Xeroxed.

11. Photographs if any should be of glossy prints

12. Please use SI system of units. If students would like to add the equivalent in inch-pound (British) units, they must be stated in parenthesis after the SI units. In case the final result comes out in any other units (say due to empirical formula etc.) covert the unit to SI unit.

13. Please number the pages on the front side, centrally below the footer

14. References should be either in order as they appear in the thesis or in alphabetical order by last name of first author

15. Symbols and notations if any should be included in nomenclature section only

16. Following will be the order of report

i. Cover page and Front page as per the specimen on separate sheet

ii. Certificate from the Institute as per the specimen on separate sheet

iii. Acknowledgement

iv. List of Figures

v. List of Tables

vi. Nomenclature

vii. Contents

viii. Abstract (A brief abstract of the report not more than 150 words. The heading of abstract i.e. word "Abstract" should be bold, Times New Roman, 12 pt and should be typed at the centre. The contents of abstract should be typed on new line without space between heading and contents. Try to include one or two sentences each on motive, method, key-results and conclusions in the Abstract)

ix. Section: Introduction

x. References

17. All section headings and subheadings should be numbered. For sections use numbers 1, 2, 3, …. and for subheadings 1.1, 1.2, …. etc and section subheadings 2.1.1, 2.1.2, …. etc.

18. References should be given in the body of the text and well spread. No verbatim copy or excessive text from only one or two references. If figures and tables are taken from any reference then indicate source of it. Please follow the following procedure for references

19.Reference Books Collier, G. J. and Thome, J. R., Convective boiling and condensation, 3rd ed., Oxford University Press, UK, 1996, pp. 110 – 112.

20. Papers from Journal or Transactions Jung, D. S. and Radermacher, R., Transport properties and surface tension of pure and mixed refrigerants, ASHRAE Trans, 1991, 97 (1), pp. 90 – 98.
Bansal, P. K., Rupasinghe, A. S. and Jain, A. S., An empirical correction for sizing capillary tubes, Int. Journal of Refrigeration, 1996, 19 (8), pp.497 – 505.
Papers from Conference Proceedings Colbourne, D. and Ritter, T. J., Quantitative assessment of flammable refrigerants in room air conditioners, Proc. of the Sixteenth International Compressor Engineering Conference and Ninth International Refrigeration and Air Conditioning Conference, Purdue University, West Lafayette, Indiana, USA, 2002, pp. 34 – 40.
Reports, Handbooks etc. United Nations Environmental Programme, Report of the Refrigeration, Air Conditioning and Heat Pumps, Technical Option Committee, 2002, Assessment - 2002. ASHRAE Handbook: Refrigeration, 1994 (Chapter 44)
Patent, Patent no, Country (in parenthesis), date of application, title, year.
Internet www.(Site) [Give full length URL]

Format for front page and Certificate

A Seminar I / II / III on (TNR, 16pt, centrally aligned)

Title (TNR, 27pt, Bold, Centrally Aligned, Title Case)

By (TNR, 16pt, Centrally Aligned)

Mr. Student's Name (TNR, 16pt, Centrally Aligned)

Guide (TNR, 16pt, Centrally Aligned)

Guide's Name (TNR, 16pt, Centrally Aligned)

Institute

Logo

Department of Mechanical Engineering

Name of the Institute

[2015-16](TNR, 22pt, Title Case Centrally Aligned)

Name of the Institute

Institute
Logo

C E R T I F I C A T E

This is to certify that *Mr. ABCDEF.*, has successfully completed the seminar-I/II/III entitled “Performance analysis of……..” under my supervision, in the partial fulfillment of Master of Technology - Mechanical Engineering (Heat Power Engineering) of University of Pune.

Date :

Place :

Guide’s Name
Guide

Guide’s Name
Guide

Head of Department and
Institute Name

External Examiner

Seal Principal,
Institute Name

MHPP603: DISSERTATION PHASE-I		
Teaching Scheme: **Lectures:** -NIL **Tutorials:** -NIL **Practical:** -08 hrs.	**Examination Scheme (Theory)** **Teacher Assessment Examination:-** NIL **Class Assessment Examination:** NIL **End Semester Examination:** -NIL	**Examination Scheme (Laboratory)** **Continuous Assessment:** 100Marks **External Assessment:** 100 Marks
Credit	**08**	

INSTRUCTIONS FOR DISSERTATION WRITING

It is important that the procedures listed below be carefully followed by all the students of MTech. (Mechanical Engineering).

1. Prepare Three Hard Bound Copies of your manuscript.

2. Limit your Dissertation report to 80 – 120 pages (preferably)

3. The footer must include the following: Institute Name, MTech. Mechanical (Heat Power Engineering) Times New Roman 10 pt. and centrally aligned.

4. Page number as second line of footer, Times New Roman 10 Pt, centrally aligned.

5. Print the manuscript using a. Letter quality computer printing.

b. The main part of manuscript should be Times New Roman 12 pt. with alignment - justified.

c. Use 1.5 line spacing.

d. Entire report shall be of 5- 7 chapters.

6. Use the paper size 8.5’’ × 11’’ or A4 (210 × 197 mm). Please follow the margins given below.

Margin Location	Paper 8.5’’ × 11’’	Paper A4 (210 × 197 mm)
Top	1’’	25.4 mm
Left	1.5’’	37 mm
Bottom	1.25’’	32 mm
Right	1’’	25.4 mm

7. All paragraphs will be 1.5 line spaced with a one blank line between each paragraph. Each paragraph will begin with without any indentation.

8. Section titles should be bold with 14 pt typed in all capital letters and should be left aligned.

9. Sub-Section headings should be aligning at the left with 12 pt, bold and Title Case (the first letter of each word is to be capitalized).

10. Illustrations (charts, drawings, photographs, figures) are to be in the text. Use only illustrations really pertinent to the text. Illustrations must be sharp, clear, black and white. Illustrations downloaded from internet are not acceptable.

a. Illustrations should not be more than two per page. One could be ideal

b. Figure No. and Title at bottom with 12 pt

c. Legends below the title in 10 pt

d. Leave proper margin in all sides

e. Illustrations as far as possible should not be photo copied.

11. Photographs if any should of glossy prints

12. Please use SI system of units only.

13. Please number the pages on the front side, centrally below the footer

14. References should be either in order as they appear in the thesis or in alphabetical order by last name of first author

15. Symbols and notations if any should be included in nomenclature section only

16. Following will be the order of report

i. Cover page and Front page as per the specimen on separate sheet

ii. Certificate from the Institute as per the specimen on separate sheet

iii. Acknowledgements

iv. List of Figures

v. List of Tables

vi. Nomenclature

vii. Contents

viii. Abstract (A brief abstract of the report not more than 150 words. The heading of abstract i.e. word “Abstract” should be bold, Times New Roman, 12 pt and should be typed at the centre. The contents of abstract should be typed on new line without space between heading and contents. Try to include one or two sentences each on motive, method, key-results and conclusions in Abstract

1 Introduction (2-3 pages) (TNR – 14 Bold)

1.1 Problem statement (TNR – 12)

1.2 Objectives

1.3 Scope

1.4 Methodology

1.5 Organization of Dissertation

2 Literature Review (20-30 pages)

Discuss the work done so far by researchers in the domain area and their significant conclusions. No derivations, figures, tables, graphs are expected.

3 This chapter shall be based on your own simulation work (Analytical/ Numerical/FEM/CFD) (15-20 pages)

4 Experimental Validation - This chapter shall be based on your own experimental work (15-20 pages)

5 Concluding Remarks and Scope for the Future Work (2-3 pages)

References ANNEXURE (if any) (Put all mathematical derivations, Simulation program as Annexure)

17. All section headings and subheadings should be numbered. For sections use numbers 1, 2, 3, …. and for subheadings 1.1, 1.2, …. etc and section subheadings 2.1.1, 2.1.2, …. etc.

18. References should be given in the body of the text and well spread. No verbatim copy or excessive text from only one or two references. If figures and tables are taken from any reference then indicate source of it. Please follow the following procedure for references.

Reference Books Collier, G. J. and Thome, J. R., Convective boiling and condensation, 3rd ed., Oxford University Press, UK, 1996, pp. 110 – 112.

Papers from Journal or Transactions Jung, D. S. and Radermacher, R., Transport properties and surface tension of pure and mixed refrigerants, ASHRAE Trans, 1991, 97 (1), pp. 90 – 98.

Bansal, P. K., Rupasinghe, A. S. and Jain, A. S., An empirical correction for sizing capillary tubes, Int. Journal of Refrigeration, 1996, 19 (8), pp.497 – 505.

Papers from Conference Proceedings Colbourne, D. and Ritter, T. J., Quantitative assessment of flammable refrigerants in room air conditioners, Proc. of the Sixteenth International Compressor Engineering Conference and Ninth International Refrigeration and Air Conditioning Conference, Purdue University, West Lafayette, Indiana, USA, 2002, pp. 34 – 40.

Reports, Handbooks etc. United Nations Environmental Programme, Report of the Refrigeration, Air Conditioning and Heat Pumps, Technical Option Committee, 2002, Assessment - 2002. ASHRAE Handbook: Refrigeration, 1994 (Chapter 44)

Patent Patent no, Country (in parenthesis), date of application, title, year.

Internet www.(Site) [Give full length URL]

A Project Stage-I Report on
(TNR, 16pt, centrally aligned)

Title (TNR, 27pt, Bold, Centrally Aligned, Title Case)

By (TNR, 16pt, Centrally Aligned)
Mr. Student's Name (TNR, 16pt, Centrally Aligned)

Guide
Guide's Name (TNR, 16pt, Centrally Aligned)

Institute Logo

Department of Mechanical Engineering
Name of the Institute

[2015-16](TNR, 22pt, Title Case Centrally Aligned)

Name of the Institute

Logo

C E R T I F I C A T E

This is to certify that *Mr. ABCDE* ., has successfully completed the Dissertation entitled "Performance analysis of……..'' under my supervision, in the partial fulfillment of Master of Technology - Mechanical Engineering (Heat Power Engineering) of University of Pune.

Date:

Place:

Guide's Name

Guide

Head of Department and

Institute Name

External Examiner

Seal Principal,

Institute Name

MHPP604-SEMINAR-II		
Teaching Scheme: **Lectures:** NIL **Tutorials:** NIL **Practical:** 04 hrs.	**Examination Scheme (Theory)** **Teacher Assessment Examination:** NIL **Class Assessment Examination:** NIL **End Semester Examination:** -NIL	**Examination Scheme (Laboratory)** **Continuous Assessment:** 50 Marks **External Assessment:** 50 Marks
Credit	**04**	

MHPP605: DISSERTATION PHASE-II		
Teaching Scheme: **Lectures:** NIL **Tutorials:** NIL **Practical:** 20 hrs.	**Examination Scheme (Theory)** **Teacher Assessment Examination:-** NIL **Class Assessment Examination:** NIL **End Semester Examination:** -NIL	**Examination Scheme (Laboratory)** **Continuous Assessment**: 200 marks **External Assessment:** 150 Marks
Credit	**16**	

7. STRUCTURE M.TECH. (COMPUTER AIDED DESIGN, MANUFACTURING AND ENGINEERING)

M.Tech – Mechanical (CADME)

SEMESTER-I

Scheme of Examination for M. Tech. - Mechanical Engineering													
COMPUTER AIDED DESIGN, MANUFACTURE AND ENGINEERING													
Semester- I													
Course Code	**Course Name**	**Teaching scheme (Weekly Load in hrs.)**				**Credits**	**Evaluation Scheme**						**ESE Duration (Hrs.)**
							Theory			**Practical**		**Total**	
		Lecture	**Tutorial**	**Practical**	**Total**		**TAE 20%**	**CAE 20%**	**ESE 60%**	**Cont. Ass.**	**Ext. Ass.**		
MCDL501	Advanced Mathematics	3	1	--	4	4	20	20	60	--	--	100	3
MCDL502	Advanced Machine Design	3	1	--	4	4	20	20	60	--	--	100	3
MCDL503	Computer Aided Design	3	1	--	4	4	20	20	60	--	--	100	3
MCDL504	Research Methodology	3	1	--	4	4	20	20	60	--	--	100	3
MCDL505	Elective I	2	--	--	2	2	20	20	60	--	--	100	3
MCDP506	Modelling and Analysis Lab-I	--	--	4	4	2	--	--	--	50	50	100	--
MSDP501	Advance Skill Development	--	--	2	2	AU	--	--	--	--	--	--	--
	Total	14	4	6	24	**20**	100	100	300	50	50	**600**	--

MHPL505: Elective-I			
Modules of 2 Credits (Select any One)			
Course Code	**Course Name**	**Course Code**	**Course Name**
MCDL505A	Energy Audit and Management	MCDL505G	Operation Management
MCDL505B	Financial Management	MCDL505H	Engineering Economics
MCDL505C	Financial Costing	MCDL505I	Technology Forecasting
MCDL505D	Project Management	MCDL505J	Technology Transfer
MCDL505E	Energy Efficient Technologies in Electrical Systems	MCDL505K	Human Rights
MCDL505F	Environmental Pollution and Control	MCDL504L	Intellectual property Rights

..

SEMESTER- II

Scheme of Examination for M.Tech. - Mechanical Engineering													
COMPUTER AIDED DESIGN, MANUFACTURE AND ENGINEERING													
Semester- II													
Course Code	**Course Name**	**Teaching scheme (Weekly Load in hrs)**				**Credits**	**Evaluation Scheme**						**ESE Duration (Hrs)**
							Theory			**Practical**		**Total**	
		Lecture	**Tutorial**	**Practical**	**Total**		**TAE 20%**	**CAE 20%**	**ISE 60%**	**Cont. Ass.**	**Ext. Ass.**		
MCDL507	Computer Integrated Manufacturing	3	1	-	4	4	20	20	60	--	--	100	3
MCDL508	Finite Element Analysis	3	1	-	4	4	20	20	60	--	--	100	3
MCDL509	Automated Manufacturing System Modelling	3	1	-	4	4	20	20	60	--	--	100	3
MCDL510	Elective II	3	-	-	3	3	20	20	60	--	--	100	3
MCDL511	Elective III	3	-	-	3	3	20	20	60	--	--	100	3
MCDP512	Simulation Lab-II	-	-	4	4	2	--	--	--	50	50	100	-
	Total	15	3	4	22	**20**	100	100	300	50	50	**600**	-

MCDL510: Elective-II			
Modules of 2 Credits (Select any One)			
Course Code	**Title**	**Code**	**Title**
MCDL510A	Iso-parametric Elements And Formulation of Plane Elasticity Problems	MCDL510I	Nonlinear Problems – Geometric, Material And Contact Problems
MCDL5104B	Dynamic Problems – Eigen Value and Time Dependent Problems	MCDL510J	Finite Difference Solutions
MCDL510C	Finite Volume Methods	MCDL510K	Advanced Materials
MCDL510D	Engineering Alloys	MCDL510L	Ceramics
MCDL510E	Composite Materials	MCDL510M	Data Models
MCDL510F	Distributed Database	MCDL510N	Web Languages
MCDL510G	J2EE Technologies:	MCDL510O	Solid - Based Rapid Prototyping Systems
MCDL510H	Tools For Customization	MCDL510P	Automated Solid Modeling Using Customization
Modules of 1 Credits (Select any One)			
MCDL510a	Plate Bending Problems – Plate And Shell Elements	MCDL510d	Turbulence Modeling
MCDL510b	Relational Database Design	MCDL510e	File & System Structure
MCDL510c	Computer-Based System Engineering	MCDL510f	Rapid Development / Solid Modelling Algorithms
MCDL510g	Robotics and its application		

Modules of 3 Credits (Select any One)			
Code No.	**Title**	**Code No.**	**Title**
MCDL511A	Open Elective	MCDL511D	Computational Fluid Dynamics
MCDL511B	Simulation Modelling	MCDL511E	Intelligent Manufacturing Systems
MCDL511C	Optimization Techniques	MCDL511F	Computer Aided Process Planning
MCDL511G	Industrial Product Design & Product Life Cycle Management		

SEMESTER- III

Scheme of Examination for M. Tech. - Mechanical Engineering

COMPUTER AIDED DESIGN, MANUFACTURE AND ENGINEERING

Semester- III

Subject code	Subject Name	Teaching scheme (Weekly Load in hrs)				Credits	Evaluation Scheme						ESE Duration (Hrs)
							Theory			Practical		Total	
		Lecture	Tutorial	Practical	Total		TAE 20%	CAE 20%	ISE 60%	Cont. Ass.	Ext. Ass.		
MCDP601	Technical Writing	--	--	3	3	3	--	--	--	50	50	100	--
MCDP602	Seminar I	--	--	4	4	4	--	--	--	50	50	100	--
MCDP603	Dissertation Phase-I	--	--	8	8	8	--	--	--	100	100	200	--
	Total	--	--	15	15	**15**	--	--	--	200	200	**400**	--

SEMESTER- IV

Scheme of Examination for M .Tech. - Mechanical Engineering

COMPUTER AIDED DESIGN, MANUFACTURE AND ENGINEERING

Semester- IV

Subject code	Subject Name	Teaching scheme (Weekly Load in hrs.)				Credits	Evaluation Scheme						ESE Duration (Hrs.)
							Theory			Practical		Total	
		Lecture	Tutorial	Practical	Total		TAE 20%	CAE 20%	ISE 60%	Cont. Ass.	Ext. Ass.		
MCDP604	Seminar II	--	--	4	4	4	--	--	--	50	50	100	--
MCDP605	Dissertation Phase-II	--	--	16	16	16	--	--	--	200	100	300	--
	Total	--	--	20	20	**20**	--	--	--	250	150	**400**	--

8. SYLLABUS OF M.TECH. COMPUTER AIDED DESIGN, MANUFACTURING AND ENGINEERING

MCDL501 ADVANCED MATHEMATICS		
Teaching Scheme: **Lectures:** 03hrs **Tutorials:** -01hr. **Practical:** -NIL	**Examination Scheme (Theory)** **Teacher Assessment Examination:-** 20 Marks **Class Assessment Examination:** 20 Marks **End Semester Examination:** 60 Marks	**Examination Scheme (Laboratory)** **Internal(TW):** -NIL **External(OR)**:-NIL **External(PR)** :-NIL
Credit :	**04**	

Course Objectives

1. The ability to identify reflects upon, evaluate, integrate, and apply different types of information and knowledge to form independent judgments. Analytical and logical thinking and the habit of drawing conclusions based on quantitative information.
2. The ability to assess and interpret complex situations, choose among several potentially appropriate mathematical methods of solution, persist in the face of difficulty, and present full and cogent solutions that include appropriate justification for their reasoning
3. The ability to communicate and interact effectively with different audiences, developing their ability to collaborate intellectually and creatively in diverse contexts, and to appreciate ambiguity and nuance, while emphasizing the importance of clarity and precision in communication and reasoning

Course Outcomes

1. Can able to use the basic rules of logic, including the role of axioms or assumptions.
2. Student can able to solve partial differential equations ,using Fourier Transform and Ordinary differential equation using Laplace Transform
3. Students can understand physical problems involving vibrations or heat conduction in cylindrical region.
4. Student can solve problems in dynamics of rigid bodies, optimization of orbits and vibration problems.

Course Contents **Hrs**

Unit – I: Inner Product Spaces, Orthogonality 6

Inner products, Cauchy-Schwartz inequality, Orthogonal projections, Gram-Schmidt orthogonalization, Matrix representation of inner product, Least square solutions.

Unit – II : Complex Analysis 6

Complex variables, Complex differentiation, Harmonic functions, conformal mapping, Complex Integration, Cauchy's integral formulae and Calculus of residues.

Unit – III : Transforms 6

Concept of transforms, Fourier transforms, Applications to partial differential equations, Discrete Fourier transform, Laplace transforms and its inverse, Laplace transform of special functions: Unit step, Unit impulse, Periodic and Error. Applications to initial value problem and wave equation using transform techniques.

Unit – IV : Differential Equation 6

Series Solution of differential equations, Bessel's and Legendre's differential equations, Mass spring systems of multi degree freedom, Matrix formulation for differential equations in vibration theory, Normal mode solution, Numerical computation of Eigen value.

Unit – V : Numerical Analysis 6

Finite difference analysis, Explicit and Implicit finite difference scheme, Stability of finite difference method, Applications of finite difference analysis in boundary value problems, one dimensional diffusion equation, Wave equation, Laplace equation.

Unit – VI : Calculus of Variation 6

Introduction, Functional, Euler's equation, Isoperimetric Problem, Functional involving higher order derivative, Approximate solution of boundary value problem, Rayleigh –Ritz method , Galerkin's method, Lagrange's principal.

Text Books: (Book Title, Name of the author, name of the Publisher, edition, year of publication)

1. Advanced Engineering Mathematics, Erwin Kreyszig, Wiley India
2. Higher Engineering Mathematics, B. S. Grewal, Khanna Publishers Delhi
3. Linear Algebra, Jin Ho Kwak and Sungpyo Hong, Springer international edition
4. Mechanical Vibration, Singiresu S. Rao, Pearson Education, Inc
5. Applied Numerical Analysis, Curtis F.Gerald and Patrick O. Wheatley, Pearson Education, Inc
6. Essential Mathematical Methods for Physicists, Hans J. Weber and G. B. Arfken, Academic Press

MCDL502 ADVANCED MACHINE DESIGN		
Teaching Scheme: **Lectures: -** 03 hrs. **Tutorials: -**01 hr. **Practical:** -NIL	**Examination Scheme (Theory)** **Teacher Assessment Examination:-** 20 Marks **Class Assessment Examination:** 20 Marks **End Semester Examination:-** 60 Marks	**Examination Scheme (Laboratory)** **Internal(TW):** -NIL **External(OR)**:-NIL **External(PR)** :-NIL
Credit	**04**	

Prerequisite (If any):

1.Strength of material, Mathematics, Machine Design, Metallurgy

Course Objective:

1. To understand theory of elasticity, concepts of fatigue and creep
2. To use composite materials in practical applications

Course Outcome

1.Able to design components subjected to fatigue, fluctuating loads and creep

2. Ability to apply knowledge of composite material in industry.

3. Ability to Design industrial process equipments.

Course Contents **Hrs**

Unit – I : Theory of Elasticity 6

State of stress at a point, stress components on an arbitrary plane, principal stresses, plane stress, differential equations of equilibrium, boundary conditions. State of strain at a point, plane strain, compatibility conditions, generalized Hooke's Law, relations between elastic constants, displacement equations of equilibrium. Elasticity problems in two dimension and three Dimensions, Airy's Stress Function In Rectangular & Polar Coordinates.

Unit – II : Theories of Failure: 6

Maximum principal stress theory, maximum shear stress theory, maximum elastic strain theory, octahedral shearing stress theory, distortion energy theory, Mohr's theory, significance of theory of failure.

Unit – III : Energy Methods 6

Elastic strain energy, strain energy due to axial force, shear force, torsion, bending moment, Castigliano's theorems, theory of virtual work and energy, Raleigh-Ritz method and Galerkin's method

Unit – IV : Design For Fatigue, Brittle Fracture And Creep 6

Introduction, Fatigue strength, factors affecting fatigue behaviour, Influence of super imposed static stress, Cumulative fatigue damage, fatigue under complex stresses, Fatigue strength after over stresses, True stress and true strength. Design for brittle fracture. Mechanism of creep of material at high temperature, Exponential creep law, hyperbolic sine creep law, stress relaxation, bending etc

Unit – V : Design issues of Composite laminates/plates 6

Composite materials and structures, classical lamination theory, elastic stress analysis of composite material, Fatigue strength improvement techniques, stresses, stress concentration around cut outs in composite laminates, stability of composite laminate plates and shells, Hybrid materials, applications

Unit – VI : Industrial Equipment's Design 6

Process Equipment Design: Storage vessels, reaction vessels, agitation and mixers, heat exchangers, filters and driers. Code practices, selection and specification procedures used in design. Selection of pumps, compressors, electrical equipments and auxiliary services, safety, etc.

Text Books: (Book Title, Name of the author, name of the Publisher, edition, year of publication)

1. L S Srinath, Advanced Solid Mechanics, Tata McGraw-Hill.
2. S P Timoshenko, J N Goodier, Theory of Elasticity (Third Edition), McGraw- Hill.
3. M.F. Spotts & T.E. Shoup, Design of Machine Elements, Pearson Education.
4. Joseph E. Shigley & Chales R. Mischke Mechanical Engineering Design, McGraw Hill
5. George B. Dieter, Engineering Design, McGraw Hill.
6. Arhur H. Burr & John B. Chetham, Mechanical Analysis & Design, Prentice Hall India.
7. Robert C. Juvinall & Kurt, M. Marshel, Fundamentals of Machine Component Design, John Wiley & Sons.
8. Robert L. Norton, Machine Design, An Integrated Approach, Pearson Education.
9. M. F. Spotts, Mechanical Design Analysis, Prentice-Hall.
10. A.M. Wahl, Mechanical Springs, McGraw-Hill Inc .
11. D. Hull and T.W. Clyne, An Introduction to Composite Materials, Cambridge Solid State Science Series .
12. D. W. Dudley, Handbook of Practical Gear Design, Mc Graw-Hill Book Co.

MCDL503 COMPUTER AIDED DESIGN		
Teaching Scheme: **Lectures-** 03hrs **Tutorials:** -01 hr. **Practical:** -NIL	**Examination Scheme (Theory)** **Teacher Assessment Examination:-** 20 Marks **Class Assessment Examination:** 20 Marks **End Semester Examination:** 60 Marks	**Examination Scheme (Laboratory)** **Internal(TW):** -NIL **External(OR)**:-NIL **External(PR)** :-NIL
Credit	**04**	**-**

Prerequisite (If any):

1. CAD
2. CAM

Course Objective:

1. The use of CAD software to generate computer models and technical drawings is presented and supported by computer-based tutorials.
2. Fluent application of engineering techniques, tools and resources.
3. Effective oral and written communication in professional and lay domains.

Course Outcome:

1. Can apply CAD software to engineering design and drawing
2. Apply the skills attained from 2D and 3D modeling to design working drawings by using CAD software
3. Can apply CAD tools for mechanical components manufacturing
4. Can able to generate 2D & 3D CAD including its application to digital fabrication
5. Can utilize computers effectively to solve complex technical problems

Course Contents **Hrs**

Unit – I : CAD Tools 6

Definition of CAD Tools, Types of system, CAD/CAM system evaluation Criteria, Graphics standards, functional areas of CAD, Modeling and viewing, software documentation, efficient use of CAD software,

Wire frame modeling -Types of mathematical representation of curves, wire frame models, wire frame entities, parametric representation of synthetic curves - Hermite cubic splines, Bezier curves, B-Splines, rational curves – NURBS

Unit – II : Surface Modeling 6

Mathematical representation of surfaces, Surface model, Surface entities, surface representation, Parametric representation of surfaces, plane surface, ruled surface, surface of revolution, Tabulated surface..

Unit – III : Parametric Representation Of Synthetic Surfaces

Hermite Bicubic surface, Bezier surface, B-Spline surface, COONs surface, Blending surface, Sculptured surface, Surface manipulation - Displaying, Segmentation, Trimming, Intersection, 6

Transformations - 2D and 3D, Orthogonal and Perspective transformations

Unit – IV : Solid Modeling 6

Solid Representation - Boundary Representation (B-rep), Constructive Solid Geometry (CSG) and other methods, Design Applications: Mechanical tolerances, Mass property calculations, CAD database structure.

CAD/CAM Data Exchange: Evaluation of data- exchange formats, IGES data representations and structure, STEP Architecture, implementation, ACIS & DXF.

Unit – V : Advanced Modeling Concepts: 6

Feature Based Modeling, Assembly Modeling, Behavioral Modeling, Conceptual Design & Top-down Design. Techniques for visual realism - hidden line - Surface removal - Algorithms for shading and Rendering. Parametric and variational modeling, Feature recognition, Design by features, Assembly and Tolerance Modeling, Tolerance representation - specification, analysis and synthesis, AI in Design..

Unit – VI : Collaborative Engineering: 6

Collaborative Design, Principles, Approaches, Tools, Design Systems. Product Data Management (PDM).

Text Books: (Book Title, Name of the author, name of the Publisher, edition, year of publication)

1. Ibrahim Zeid, CAD/CAM Theory and Practice, McGraw Hill international.
2. P. N. Rao, CAD/CAM Tata McGraw Hill.
3. Foley, Van Dam, Feiner and Hughes, Computer Graphics Principles and Practice, second edition, Addison–Wesley, 2000.
4. Martenson, E. Micheal, Geometric Modelling, John Wiley & Sons, 1995.
5. Hill Jr, F.S., Computer Graphics using Open GL, Pearson Education, 2003.
6. Singeresu S. Rao, Engineering Optimization-Theory and Practice, New Age International Limited Publishers, 2000.
7. Johnson Ray, C. Optimum Design of Mechanical Elements, Wiley, John & Sons, 1981.
8. P. Radhakrishnan, S. Subramanyam, CAD/CAM/CIM, New Age International.
9. V. Ramamurti, Computer Aided Mechanical Design and Analysis, Tata Mc Graw Hill-1992

Software Documentation, tutorials, manuals of following software

1. UG/Nx
2. Solid Works
3. Catia
4. Autodesk Inventor Professional
5. AutoCAD
6. Open CASCADE
7. ANSYS Design Modelle
8. Pro/E

MCDL504 Research Methodology		
Teaching Scheme: **Lectures:** 03 hrs. **Tutorials:** -01 hr. **Practical:** -NIL	**Examination Scheme (Theory)** **Teacher Assessment Examination:-** 20 Marks **Class Assessment Examination:** 20 Marks **End Semester Examination:** -60Marks	**Examination Scheme (Laboratory)** **Internal(TW):** -NIL **External(OR)**:-NIL **External(PR)** :-NIL
Credit	**04**	

Course Objective:

1. Will provide an opportunity for participants to establish or advance their understanding of research through critical exploration of research language, ethics, and approaches.
2. The course introduces the language of research, ethical principles and challenges, and the elements of the research process within quantitative, qualitative, and mixed methods approaches
3. Participants will use these theoretical underpinnings to begin to critically review literature relevant to their field or interests and determine how research findings are useful in informing their understanding of their environment (work, social, local, global).

Course Outcome:

1. Can able to formulate and define research problems
2. Students should be able to distinguish a purpose statement, a research question or hypothesis, and a research objective
3. Apply statistical tools to solve engineering problems
4. Can able to model and predict the performance of engineering systems
5. Can use advanced optimization techniques to solve engineering problems

Course Contents **Hrs**

Unit – I : Research Problem 6

Meaning of research problem, Sources of research problem, Criteria / Characteristics of a good research problem, Errors in selecting a research problem, Scope and objectives of research problem

Unit – II : Basic Instrumentation 6

Instrumentation schemes, Static and dynamic characteristics of instruments used in experimental set up, Performance under flow or motion conditions, Data collection using a digital computer system, Linear scaling for receiver and fidelity of instrument, Role of DSP is collected data contains noise

Unit – III : Applied Statistics 6

Regression analysis, Parameter estimation, Multivariate statistics, Principal component analysis, Moments and response curve methods, State vector machines and uncertainty analysis, Probable errors in the research, Error analysis, simple numerical..

Unit – IV : Modeling And Prediction of Performance 7

Setting up a computing model to predict performance of experimental system, Multi-scale modeling and verifying performance of process system, Nonlinear analysis of system and asymptotic analysis, Verifying if assumptions hold true for a given apparatus setup, Plotting family of performance curves to study trends and tendencies, Sensitivity theory and applications and simple numerical.

Unit – V : Developing A Research Proposal 7

Format of research proposal, Individual research proposal, Institutional proposal, Proposal of a student – a presentation and assessment by a review committee consisting of Guide and external expert only, Other faculty members may attend and give suggestions relevant to topic of research

Reference Books:

1. Stuart Melville and Wayne Goddard, Research methodology: An Introduction for Science & Engineering students.
2. Dr. C. R. Kothari, Research Methodology: Methods and Trends
3. Wayne Goddard and Stuart Melville, Research Methodology: An Introduction
4. Ranjit Kumar Research Methodology: A Step by Step Guide for Beginners, 2nd Edition
5. Pressman, Software Engineering

MCDL505 ELECTIVE-I		
Teaching Scheme: **Lectures:-** 02 hr. **Tutorials:** -NIL **Practical:** -NIL	**Examination Scheme (Theory)** **Teacher Assessment Examination:-** 20 Marks **Class Assessment Examination:** 20 Marks **End Semester Examination:** -60Marks	**Examination Scheme (Laboratory)** **Internal(TW):** NIL **External(OR)**: NIL **External(PR)** : NIL
Credit	**02**	

MCDL505: ELECTIVE-I			
Modules of 2 Credits (Select any One)			
Code No.	**Title**	**Code No.**	**Title**
MCDL505A	Energy Audit and Management	MCDL505G	Operation Management
MCDL505B	Financial Management	MCDL505H	Engineering Economics
MCDL505C	Financial Costing	MCDL505I	Technology Forecasting
MCDL505D	Project Management	MCDL505J	Technology Transfer
MCDL505E	Energy Efficient Technologies in Electrical Systems	MCDL505K	Human Rights
MCDL505F	Environmental Pollution and Control	MCDL504L	Intellectual property Rights

MCDL505A: Energy Audit and Management

Definition, Energy audit- need, Types of energy audit, Energy management (audit) approach- understanding energy costs, Bench marking, Energy performance, Matching energy use to requirement, Maximizing system efficiencies, Optimizing the input energy requirements, Fuel and energy substitution, Energy audit instruments

Reference Books: 1. Guide Books, Bureau of Energy Efficiency

MCDL505B: Financial Management

Investment-need, Appraisal and criteria, Financial analysis techniques- Simple payback period, Return on investment, Net present value, Internal rate of return, Cash flows, Risk and sensitivity analysis, Financing options, Energy performance contracting and role of Energy Service Companies (ESCOS).

Reference Books: 1. Guide Books, Bureau of Energy Efficiency

MCDL505C: Financial Costing Significance, Traditional absorption costing, Marginal costing, Contract costing, Activity based costing, Process costing.

Reference Books: Cost Accounting, N K Prasad, Book Syndicate Pvt. Ltd.

MCDL505D: Project Management

Definition and scope of project, Technical design, Financing, Contracting, Implementation and performance monitoring. Implementation plan for top management, Planning Budget, Procurement Procedures, Construction, Measurement & Verification.

MCDL505E: Energy Efficient Technologies in Electrical Systems

Maximum demand controllers, Automatic power factor controllers, Energy efficient motors, Soft starters with energy saver, Variable speed drives, Energy efficient transformers, Electronic ballast, Occupancy sensors, Energy efficient lighting controls.

Reference Books: Guide Books, Bureau of Energy Efficiency

MCDL505G: Operation Management

Introduction, Importance, Operating systems models, key decisions, Planning and controlling, Strategic approach, Processes and systems, supply chain or network approach, Technology and knowledge management, Quality Management, Operations - Challenges, Opportunities, Excellence, risk management and sustainability, Case studies

Reference Books: 1. Operations Management - An Integrated Approach, Danny Samson and Prakash J. Singh, Cambridge, Universal Press. 2. Modern production/Operations Management, 8th Edition, E.S. Buffa and R. K. Sarin, John Wiley & Sons.

MCDL505H: Engineering Economics

Fundamentals, Markets and Government in a Modern economy, Basic Elements of Supply and Demand, Demand and Consumer Behaviour, Analysis of Perfectly Competitive Markets, Unemployment, Inflation and Economic policy

Reference Books: Economics, Samuelson Nordhaus, Tata McGraw Hill

MCDL505I: Technology Forecasting

Approaches, Technology Performance Parameters, Use of Experts in Technology Forecasting, Planning, Technology Progress. Morphological Analysis of a Technology System.

Reference Books: 1) Gerard H. Gaynor, Hand Book of Technology Management, Mc Graw Hill.

MCDL505J: Technology Transfer

Definition, Source of Technology Transfer [TT], Model of TT with Public and Private Enterprises, Success and Failure Factors in Technology Transfer. The concepts of Invention and Innovation, Definition and classifications of Research and Development, New Product Development, Challenges in Commercializing Research Results.

Reference Books: 1. Gerard H. Gaynor, Hand Book of Technology Management, Mc Graw Hill.

MCDL505K: Human Rights

Human Rights – Concept, Development, Evolution, Philosophical, Sociological and Political debates, Benchmarks of Human Rights Movement. Human Rights and the Indian Constitution Human Rights & State Mechanisms, Police & Human Rights, Judiciary & Human Rights, Prisons & Human Rights, National and State Human Rights Commissions, Human Rights of the Different Sections and contemporary issues, Citizens' Role and Civil Society, Human Rights and the international scene Primary Information with reference to Engineering Industry

Reference Books: 1)Study material on UNESCO,UNICEF web site, 2)HUMAN RIGHTS IN INDIA A MAPPING,Usha Ramanathan, 3)Introduction to International Humanitarian Law by Curtis F. J. Doebbler - CD Publishing , 2005 .This book is an introductory text on international humanitarian law (the laws of war) that provides the basics of law, including excerpts from some of the leading treaty texts. Perfect for a short course in the law -- one to five weeks, 4) Freedom of Information by Toby Mendel - UNESCO , 2008

MCDL505F: Environmental and Pollution control

Pollution and Environmental Ethics, Air pollution, Water pollution, Soil pollution, Marine pollution, Noise pollution, Thermal pollution, Nuclear hazards Environmental impact and economic aspects, Emission standards and regulations for Automobiles.

Reference Books: 1) Environmental Pollution and Control, J. Jeffrey Peirce, P Aarne Vesilind, Ruth Weiner, Butterworth-Heinemann, 2) Environmental Pollution Control Engineering, C.S. Rao, New Age International

MCDL505L: Intellectual property Rights

Patentable and non-patentable inventions, statutory exceptions, Persons entitled to apply for patents.

Reference Books: 1) Satyawrat Ponkshe, The Management of Intellectual Property, by, Ponkshe & Bhate Publications, Pune.

MCDP506: MODELLING AND ANALYSIS LAB-I		
Teaching Scheme: **Lectures:** -NIL **Tutorials:** -NIL **Practical:** 04-hr.	**Examination Scheme (Theory)** **Teacher Assessment Examination:** NIL **Class Assessment Examination:** NIL **End Semester Examination:** -NIL	**Examination Scheme (Laboratory)** **Continuous Assessment:** 50 Marks **Eternal Assessment:** 50 Marks
Credit	**02**	

Lab. work or Assignments have to be carried out at respective labs as mentioned in the syllabus of respective subjects excluding Research Methodology and Elective. It is to be submitted as term work at the end of semester after continuous assessment of each by respective teacher. Assessment of term work has to be carried out as per R-1.4 and R-1.5 of PG Rules and Regulations of Credit System. (Refer University web site)

Geometric Modelling & Analysis:

Solid modelling, assembly modelling, drafting assignments using software like UNIGRAPHICS, Solid Works, CATIA, Pro/Engineer, I-DEAS, Autodesk Inventor, etc and study of the various facilities in these software's.

Finite Element Analysis Assignments using software's like ANSYS, Hyper Mesh Ls-Dyna, Abacus etc.

List of Assignments

1. Surface Modelling of Mechanical Components.
2. Solid Modeling of Mechanical Components.
3. Assembly modelling of Mechanical Components
4. Finite Element Analysis of Mechanical Components (2D elements)
5. Finite Element Analysis of Mechanical Systems (3-D components) .
6. Model analyses of simple automobile component

MSDP501: ADVANCE SKILL DEVELOPMENT		
Teaching Scheme: **Lectures:** -NIL **Tutorials:** -NIL **Practical:** 02 hrs.	**Examination Scheme (Theory)** **Teacher Assessment Examination:** NIL **Class Assessment Examination:** NIL **End Semester Examination:** -NIL	**Examination Scheme** **(Laboratory)** **Continuous Assessment:** NIL
Credit	**Audit Course (AU)**	

AUDIT COURSE			
The students must complete any one (A or B) of the following audit course for 20-25 hrs. and submit certificate			
A Certificate Course:		**B General Proficiency / Foreign Language:**	
I	Advanced CFD Tool	I	German
II	Industrial H.E. Design	II	Spanish
III	Energy audit of any process/Industry	III	French
IV	Optimization Tools	IV	Japanese
V	Mechanical CAE Simulation	V	Chinese
VI	Certification course in Quality and testing		

MCDL507 COMPUTER INTEGRATED MANUFACTURING		
Teaching Scheme: **Lectures:** 03 hrs. **Tutorials:** -01 hr. **Practical:** -NIL	**Examination Scheme (Theory)** **Teacher Assessment Examination:-** 20 Marks **Class Assessment Examination:** 20 Marks **End Semester Examination** -60Marks	**Examination Scheme (Laboratory)** **Internal(TW):** -NIL **External(OR)**:-NIL **External(PR)** :-NIL
Credit	**04**	

Prerequisite (If any):

To study this subject you should have the knowledge of CAD, manufacturing processes and the concepts of manufacturing systems

Course Objective:

1. Ability to apply knowledge of basic science and engineering fundamentals in depth technical competence in at least one engineering discipline.
2. Ability to undertake problem identification, formulation and solution
3. Ability to utilize a systems approach to design and operational performance
4. Ability to engage in design and execute designs to an appropriate professional standard

Course Outcome:

1. To Study and Explore the aspects of Manufacturing Automation and its applications
2. Can Understand of the social, cultural, global and environmental responsibilities of the professional Engineer, and the principles of sustainable design and development.
3. Ability to function effectively as an individual and in multi-disciplinary and multi-cultural teams, with the capacity to be a leader or manager as well as an effective team member.
4. Understanding of and commitment to professional and ethical responsibilities Expectation and capacity to undertake lifelong learning.

Course Contents	**Hrs**
Unit – I : CNC and DNC in CIM	
Introduction to CNC Types, Working and its Elements. DNC and its Types, Advantages. Adaptive control systems and advantages. Advanced Tools and softwares applications and CNC Programming. Activities in a CIM networked environment, CIM networking in a manufacturing company.	6
Unit – II : CIM and its Database	
Introduction to CIM, Types of Manufacturing, CIM hardware and software, Elements of CIM, Product development through CIM Design Database requirements of CIM, Database, Database management, Database Models, EDM, Product Data Management (PDM), Advantage of PDM. Collaboration Engineering.	6

Unit – III : Work Cell & Flexible Manufacturing System

Manufacturing cell, Group Technology, Cellular Manufacturing. DNC system and transfer of program from PC to machine. Introduction to FMS, Manufacturing integration model, flexible manufacturing strategy, Components of Flexible Manufacturing-Pallets and fixtures, machining centers, inspection equipment, material handling stations, storage system, In-process storage, manually operated stations, allied operation centers — 6

Unit – IV : Integrative Manufacturing Planning And Control

Role of integrative manufacturing in CAD/CAM integration, Over view of production control - Forecasting, Master production schedule, Capacity planning, M.R.P., Order release, Shop-floor control, Quality assurance, Planning and control systems, Cellular manufacturing, JIT manufacturing philosophy. — 6

Unit – V : Web Based Manufacturing

Integrating process with web, Process management and control through web, Applications of web based manufacturing, casting, machining, forming & forging. — 6

Unit – VI : Future Trends In Manufacturing Systems

Lean Manufacturing: Definition, Principles of Lean Manufacturing, Characteristics of Lean Manufacturing, Value of Product, Continuous Improvement, Focus on Waste, Relationship of Waste to Profit, Four Functions of Lean Production, Performance Measures, The Supply Chain, Benefits of Lean Manufacturing. Introduction to Agile and Web Based Manufacturing systems. — 6

Text Books: (Book Title, Name of the author, name of the Publisher, edition, year of publication)

1. Groover, M.P., (2004), Automation, Production Systems & Computer Integrated Manufacturing second edition, Pearson Education ISBN: 81-7808-511-9.
2. Y. Narahari and N. Vishwadham, performance modeling of automated manufacturing systems, PRENTICE HALL, Englewood Cliffs, New Jersey 07632.
3. Richard N. Shover, An Analysis of CAD/CAM Application with Introduction to C.I.M. Prentice hall.

Reference Books

1. Paul G. Ranky, The Design and Operation of FMS, I.F.S. Publications 1983.
2. Harrington J, Computer Integrated Manufacturing Krieger Publications 1979.
3. David Bedworth et.al Computer Integrated Design and Manufacturing McGraw hill 1991.
4. Scolz B. Reiter C.I.M Interfaces Chapman & Hall 1992.
5. David L. Goetsch, Fundamental of CIM Technology, Delmar Publication 1988.

MCDL508: FINITE ELEMENT ANALYSIS		
Teaching Scheme: **Lectures:** 3 Hrs/Week **Tutorials:** 1 Hrs/Week **Practical:** Nil	**Examination Scheme (Theory)** **Teachers Assessment:** 20 Marks **In-Sem Examination:** 20 Marks **End Sem Examination:** 60 Marks	**Examination Scheme (Laboratory)** **Internal(TW):** Nil **External(OR):** Nil **External(PR) :** Nil
Credit	4	-

Prerequisite (If Any):

1. Mathematics and Physics
2. SOM and design
3. Computer Graphics and Numerical Methods

Course Objective:

1. To familiarize students with the displacement-based finite element method for displacement and stress analysis and to introduce related analytical and computer tools.
2. It provides a bridge between hand calculations based on mechanics of materials and machine design and numerical solutions for more complex geometries and loading states.
3. To study approximate nature of the finite element method and convergence of results are examined.

Course Outcome:

1. Can derive and use 1-D and 2-D element stiffness matrices and load vectors from various methods to solve for displacements and stresses.
2. Can apply mechanics of materials and machine design topics to provide preliminary results used for testing the reasonableness of finite element results.
3. Can apply finite element code for linear stress, displacement, temperature and modal analysis.

Course Contents	**Hrs**
UNIT-I : Introduction of FEA Introduction– Brief History of FEM, Finite Element Terminology, General FEM procedure, Applications of FEM in various fields, P & h formulation, Advantages and disadvantages of FEM. Consistent units system. Review of Solid Mechanics Stress equilibrium equations, Strain-Displacement equations, Stress-Strain Temperature Relations, Plane stress, plane strain and axi-symmetric problems, Strain energy, Total potential energy. Essential and natural boundary conditions Review of Matrix Algebra	6
UNIT - II : 1D Elements Types of 1D element. Displacement function, Global and local coordinate systems, Order of element, primary and secondary variables, shape functions and its properties. Formulation of elemental stiffness matrix and load vector for spring, bar, beam, truss and Plane frame. Transformation matrix for truss and plane frame, Assembly of global stiffness	6

matrix and load vector, Properties of stiffness matrix, Boundary conditions elimination method and penalty approach, Symmetric boundary conditions, Stress calculations.

UNIT - III : 2D Elements

Types of 2D elements, Formulation of elemental stiffness matrix and load vector for Plane stress/strain such as Linear Strain Rectangle (LSR), Constant Strain Triangles (CST), Pascal‘s triangle , primary and secondary variables, properties of shape functions. Assembly of global stiffness matrix and load vector, Boundary conditions, solving for primary variables (displacement), Overview of axi-symmetric elements — 6

UNIT - IV : Isoparametric Elements

Concept of isoparametric elements, super parametric and sub parametric. Isoparmetric formulation of bar element. Coordinate mapping - Natural coordinates, Area coordinates (for triangular elements), higher order elements (Lagrangean and serendipity elements). Convergence requirements- patch test, Uniqueness of mapping - Jacobian matrix. Numerical integration – 2 and 3 point Gauss Quadrature, full and reduced integration. Sub-modeling, sub-structuring. — 6

UNIT - V : 1D Steady State Heat Transfer Problems

Introduction, Governing differential equation, steady-state heat transfer formulation of 1D element for conduction and convection problem, boundary conditions and solving for temperature distribution. — 8

UNIT - VI : Dynamic Analysis

Types of dynamic analysis, General dynamic equation of motion, point and distributed mass, lumped and Consistent mass, Mass matrices formulation of bar and beam element. Undamped-free vibration- Eigenvalue problem, Evaluation of eigenvalues and eigenvectors (natural frequencies and mode shapes). — 8

Text Books: (Book Title, Name of the author, name of the Publisher, edition, year of publication)

1. Daryl L. Logan., A First Course in the Finite Element Method
2. R. D. Cook, Concepts and Applications of Finite Element Analysis, Wiley, India

Reference Books

1. Chandrupatla T. R. and Belegunda A. D., ―Introduction to Finite Elements in Engineering‖, Prentice Hall India.
2. David V. Hutton, Fundamental of Finite Element Analysis, Tata McGraw-Hill
3. Seshu P.,Text book of Finite Element Analysis‖, PHI Learning Private Ltd. New Delhi, 2010.

MCDL509 -AUTOMATED MANUFACTURING SYSTEM MODELING		
Teaching Scheme: **Lectures:** 03 hrs. **Tutorials:** -01 hr. **Practical:** -NIL	**Examination Scheme (Theory)** **Teacher Assessment Examination:-** 20 Marks **Class Assessment Examination:** 20 Marks **End Semester Examination** -60Marks	**Examination Scheme (Laboratory)** **Internal(TW):** -NIL **External(OR)**:-NIL **External(PR)** :-NIL
Credit	**04**	

Prerequisite (If any):

1. MP-I, MP-II and AMP
2. CAD-CAM, Optimization Tools

Course Objective:

1. Recent engineering and technology graduates who have decided to move into manufacturing and related disciplines.
2. Established manufacturing engineers working in industry and faced with the challenge of new areas of responsibility.
3. Professionals from engineering, technology or appropriate business backgrounds working in advisory, consultancy or research roles, who need to familiarize themselves with advanced manufacturing systems.

Course Outcome:

1. Can able to analyze the automated manufacturing systems to improve its performance
2. Can use Markov Chain Models to study and analyze the manufacturing systems and processes
3. Can solve real industrial problems using Petri Net Models and Queuing Models

Course Contents **Hrs**

Unit – I : Introduction 6

Modelling Automated Manufacturing Systems, Performance Modelling Tools development – S-curve, new product development, Simple numericals.

Unit – II : Automated Manufacturing Systems 6

Introduction, Manufacturing Systems, Performance Measures, Computer-Controlled Machines, Material Handling Systems, Plant Layout, Flexible Manufacturing Systems, Computer Control Systems, Simple numericals.

Unit – III : Markov Chain Models 6

Memory less Random Variables, Stochastic Processes in Manufacturing, Discrete Time Markov Chain Models, Continuous Time Markov Chain Models, An Examples Markov Model of a Transfer Line, Birth and Death Processes in Manufacturing, Time Reversible Markov Chains in Manufacturing, Semi-Markov Processes in Manufacturing, Simple numericals.

Unit – IV : Queuing Models 6

Queues, Notation and Examples, The M/M/1 Queue, The M/M/m Queue, Batch Arrival Queuing Systems, Queues with General Distributions, Queues with Breakdowns, Analysis of a Flexible Machine Centre, Queuing Networks, Open Queuing Networks, Closed Queuing, Simple numericals.

Unit – V : Petri Net Models 6

Classical Petri Nets, Stochastic Petri Nets, Generalized Stochastic Petri Nets, GSPN Modeling of Kanban Systems, Deadlock Analysis Using Petri Nets, Extended Classes of Timed Petri Nets, Integrated PRQN-GSPN Models

Text Books: (Book Title, Name of the author, name of the Publisher, edition, year of publication)

1. Narahari Y., Viswanadham N., Performance Modelling Of Automated Manufacturing Systems, Prentice-Hall India.
2. Alan A. Desrochers, Modelling and Control of Automated Manufacturing Systems IEEE Computer Society Press 1990.
3. Paul M. Stanfield, Performance Modelling of Automated Manufacturing Systems, Institute of Industrial Engineers, Inc.

MCDL510 -ELECTIVE-II		
Teaching Scheme: **Lectures:** 03 hrs. **Tutorials:** -NIL **Practical:** -NIL	**Examination Scheme (Theory)** **Teacher Assessment Examination:-** 20 Marks **Class Assessment Examination:** 20 Marks **End Semester Examination: -**60Marks	**Examination Scheme (Laboratory)** **Internal(TW):** -NIL **External(OR)**:-NIL **External(PR)** :-NIL
Credit	**03**	

MCDL510: ELECTIVE-II			
Modules of 2 Credits (Select any One)			
Code No.	**Title**	**Code No.**	**Title**
MCDL510A	Iso-parametric Elements And Formulation of Plane Elasticity Problems	MCDL510I	Nonlinear Problems – Geometric, Material And Contact Problems
MCDL5104B	Dynamic Problems – Eigen Value and Time Dependent Problems	MCDL510J	Finite Difference Solutions
MCDL510C	Finite Volume Methods	MCDL510K	Advanced Materials
MCDL510D	Engineering Alloys	MCDL510L	Ceramics
MCDL510E	Composite Materials	MCDL510M	Data Models
MCDL510F	Distributed Database	MCDL510N	Web Languages
MCDL510G	J2EE Technologies:	MCDL510O	Solid - Based Rapid Prototyping Systems
MCDL510H	Tools For Customization	MCDL510P	Automated Solid Modeling Using Customization
Modules of 1 Credits (Select any One)			
MCDL510a	Plate Bending Problems – Plate And Shell Elements	MCDL510d	Turbulence Modeling
MCDL510b	Relational Database Design	MCDL510e	File & System Structure
MCDL510c	Computer-Based System Engineering	MCDL510f	Rapid Development / Solid Modelling Algorithms
MCDL510g	Robotics and its application		

MCDL510A: Isoparametric Elements and Formulation of Plane Elasticity Problems

Introduction, shape functions – linear & quadratic, displacement function – criteria for the choice of the displacement function, polynomial displacement functions, displacement function in terms of nodal parameters, strain-nodal parameter relationship, stress-strain relationship, element stiffness matrix, convergence of isoparametric elements, numerical integration – Trapezoidal rule, Simpson's 1/3 rule, Newton-Cotes Formula, Gauss Quadrature formula, Guass Quadrature in two and three dimensions.

MCDL510a: PLATE BENDING PROBLEMS – PLATE AND SHELL ELEMENTS

Introduction, thin and thick plates – Kirchhoff theory, Mindlin plate element, triangular and rectangular, conforming and nonconforming elements, degenerated shell elements, reduced and selective integration, shear locking and hour glass phenomenon.

MMECDL1204I: Nonlinear Problems – Geometric, Material and Contact Problems

Introduction to non-linear analysis, formulation for geometrical, material and contact nonlinear problems, Nonlinear equation solving procedure - direct iteration, Newton-Raphson method, modified Newton-Raphson method, incremental techniques.

MCDL510B: Dynamic Problems – Eigen Value and Time Dependent Problems

Formulation of dynamic problems, consistent and lumped mass matrices Solution of Eigen value problems – transformation methods, Jacobi method, Vector Iteration methods, subspace iteration method Forced vibration – steady state and transient vibration analysis, modelling of damping, the mode superposition scheme, direct integration methods – implicit and explicit numerical integration.

Reference Books:

1. Seshu P., Text book of Finite Element Analysis, PHI Learning Private Ltd., New Delhi, 2010.

2. Mukhopadhyay M and Sheikh A. H., Matrix and Finite Element Analyses of Structures, Ane Books Pvt. Ltd., 2009.

3. Bathe K. J., Finite Element Procedures, Prentice-Hall of India (P) Ltd., New Delhi.

4. Cook R. D., Finite Element Modeling for Stress Analysis, John Wiley and Sons Inc, 1995

5. Chandrupatla T. R. and Belegunda A. D., Introduction to Finite Elements in Engineering, Prentice Hall India.

6. Liu G. R. and Quek S. S. The Finite Element Method – A Practical Course, Butterworth-Heinemann, 2003.

7. Reddy, J. N., An Introduction to The Finite Element Method, Tata McGraw Hill, 2003.

8. Reddy, J. N., An Introduction to Nonlinear Finite Element Analysis, Oxford University Press, 2010.

9. Dixit U. S., Finite Element Methods for Engineers, Cengage Learning India Pvt. Ltd., 2009.

MCDL510J: Finite Difference Solutions

Parabolic PDEs – Euler, Crank Nicholson, Implicit methods, Elliptic PDEs – Jacobi, Gauss Seidel, ADI, methods. FD- solution for Viscous incompressible flow using Stream function – Vorticity method & MAC method.

MCDL510C: Finite Volume Methods

Introduction to finite volume method, finite volume formulations for diffusion equation, convection diffusion equation. Solution algorithm for pressure velocity coupling in steady flows. Use of staggered grids simple algorithm.

MCDL510d: Turbulence Modeling

Turbulence energy equation- one-equation model, the k-ω model, the k- ε model

Reference Books:

1. John D Anderson, Computational Fluid Dynamics – The Basics with Applications, McGraw Hill, New Delhi, 1995.

2. Muralidhar K and Sundararajan T, Computational Fluid Flow and Heat Transfer, Narosa Publications, 2003.

3. Chung T J, Computational Fluid Dynamics, Cambridge University Press, London, 2002.

4. David C Wilcox, Turbulence Modeling for CFD, DCW Industries, Inc., 1993.

5. Versteeg H K and Malalasekara W, An Introduction to Computational Fluid Dynamics - The Finite Volume Method, Longman, 1995.

6. Pradip Niyogi, Chakrabartty SK, Laha M.K., Introduction to Computational Fluid Dynamics, Pearson Education, 2005.

7. Patankar, S.V, Numerical Heat Transfer and Fluid flow, Hemisphere Publishing Company, New York, 1980.

MCDL510K: Advanced Materials

HSLA steels, tool and die materials, alloy cast irons, stainless steels, PH and maraging steels, materials for low temperature applications, refractory metals and super alloys, Hadfield steels, ball bearing steels and bearing metals.

MCDL510D: Engineering Alloys

Automobile alloys and aerospace alloys, Inter metallics, Ni and Ti Aluminides - Smart materials, shape memory alloys -Metallic glass - Quasi crystal and nano Crystalline materials.

MCDL510L: Ceramics

Ceramic crystal structures – Binary ceramic structures: Rock salt, Fluorite, Rutile and Silica structures. Ternary ceramic structures. Introduction to phase equilibria in ceramics, Phase equilibrium diagrams and composition calculations. Thermal, Electrical, magnetic and optical behavior of ceramics, Mechanical behavior of ceramics, Engineering ceramics and their applications, (Glass and Glass-ceramics, Aluminum oxide, Silicon nitride, Zirconia and zirconia-Toughned Aluminum, Sailons)

MCDL510E: Composite Materials

Fundamentals, Definition, classification of composite materials, laws of mixtures, factors affecting composite properties: interfacial bonding. Mechanical Behaviour of composite, Young's Modulus and strength considerations for continuous FRCs & short FRCs, Toughening Mechanisms in composites. Fabrication & Properties of fibers-Glass fibers, carbon fibers, Aramid fibers, Silicon Carbide Fibers & Metallic Glasses.

Reference Books:

1. R.S.Kurmi & R.S.Sedha, Material Science, S. Chand & company Ltd.

2. Thomas H. Courtney, Mechanical Behavior of Materials, McGraw-Hill.

3. Michael F. Ashby, Material Selection in Mechanical Design, Butterworth-Heinemann Ltd.

4. Flinn, R.A. and Trojan, P.K., Engineering Materials and their Applications**,** Wiley 1995.

MCDL510b: Relational Database Design

Relational model and relational database design: Structure of relational database, former query languages, commercial query languages. Modifying the database views. Pitfalls in relational database design and normalization.

MMECDL1204M: Data Models

Network data model and hierarchical data model: data structure diagram, the DBTCCODASYL. Model data retrieval Update and set processing facility, three structure diagram, data retrieval and update facility, virtual records.

MMECDL1204e: File & System Structure

File and System Structure, Indexing and Hashing: Physical storage media – file organization, buffer management, Mapping relations, networks and hierarchies to files – Index – sequential files. Bi-tree indexed files.

MCDL510F: Distributed Database

Distributed database, security and integrity: Design, transparency and autonomy, query processing, recovery, concurrency control, deadlock handling and coordinator selection. Security and integrity, near database application.

Reference Books:

1. Korth, H.F. Silbenhatz, A., Database Concepts, Mc Graw Hill, 1986.

2. Gio Wiederhold, Database Design, Mc Graw Hill, 1983.

3. Jefferey O Ullman, Principles of database systems.

4. C.J. Date, An Introduction to database systems, Addison Wisely, 1980.

5. Trembley and Soreson, An Introduction to Data structures with applications, Mc Graw Hills.

MCDL510N: Web Languages

Web: History of Web application, W3C, Introduction to various web building technologies. Mark up languages: Use of markup languages in building web applications, Hypertext Markup language (HTML), (Extensible mark-up Language) XML, XML Parsers: What is parsing, Types of parsers, benefits and limitations of each parser.

MCDL510G: J2ee Technologies

JSP- What is JSP, JSP architecture, Session in JSP, Cookies and use of cookies. Servlet- Introduction to Servlet technology, web container, Methods of Servlet, Lifecycle of a servlet, advantages of servlet, HTTP session listener and filters in servlet.

MCDL510O: Solid - Based Rapid Prototyping Systems

Laminated Object Manufacturing (LOM): Models and specifications, Process, working principle, Applications, Advantages and Disadvantages, Case studies. Fused Deposition Modelling (FDM): Models and specifications, Process, working principle, Applications, Advantages and Disadvantages, Case studies.Ajax- Introduction to framework, rule of ajax in enhancing user experience, ajax examples. Distributed Computing Concepts of Client-Server Architecture (2-Tier, 4-Tier, n-Tier).

MCDL5104H: Tools for Customization

Object Oriented Programming (OOP), OLE interfaces in CAD/CAM software; Use of General programming interfaces like VB, VBS, VC++, Open GL programming and System dependent programming interfaces like Visual LISP (AutoCAD), GRIP (Unigraphics), Pro-Programming (Pro/Engineer)

MCDL510c: Computer-Based System Engineering

System Engineering process, Software product development life cycle, software processes, software development project management, software prototyping.

Reference Books:

1. Ian Summerville, Software Engineering, Pearson Education.
2. Foley, van Dam, Computer Graphics, Pearson Education.
3. Mason Woo, et al, OpenGL Programming Guide.
4. George Omura**,** Advanced AutoCAD.
5. Sham Tickoo, Customizing AutoCAD, Thomson learning

MCDL510f: Rapid Development

Core issues in rapid development, rapid development languages, lifecycle planning and customer oriented development.

Reference Books:

1. Steve McConnell, Rapid development, Microsoft Press.

MCDL510P: Automated Solid Modeling Using Customization:

Creating 2D, 3D and solid entities through API, Editing 2D, 3D and solid entities through API, Design and development of user interfaces - icons, menus, dialog boxes, Integrating databases with CAD; creating BOM or part lists, Automated Assembly modelling through customization, Automated drafting and dimensioning using customization, Creating Automated Animations using API and animation software.

Reference Books:

1. Martti Mantilya, Solid Modelling, Computer Science Press.

MCDL510g: Robotics and its application

Specifications of Robots- Classifications of robots – Work envelope - Flexible automation versus. Robotic technology – Applications of Robots, Robot drive, hydraulic – electric – servomotor- stepper motor - pneumatic drives. Construction of Manipulators, Manipulator Dynamic and Force Control, Electronic and Pneumatic, Manipulators. Classification of End effectors – Tools as end effectors. Drive system for grippers-Mechanical adhesive-vacuum-magnetic-grippers. Hooks & scoops. Gripper force analysis and gripper design, Active and passive grippers. Robot applications in manufacturing, assembly, and testing, welding and metallurgical applictions.

Reference Books:

1. Deb S. R. and Deb S., "Robotics Technology and Flexible Automation", Tata McGraw Hill Education Pvt. Ltd, 2010.
2. John J.Craig , "Introduction to Robotics", Pearson, 2009.
3. Mikell P. Groover et. al., "Industrial Robots - Technology, Programming and Applications", McGraw Hill, New York, 2008.

MCDL51: ELECTIVE-III			
Modules of 3 Credits (Select any One)			
Code No.	**Title**	**Code No.**	**Title**
MCDL511A	Open Elective	MCDL511D	Computational Fluid Dynamics
MCDL511B	Simulation Modelling	MCDL511E	Intelligent Manufacturing Systems
MCDL511C	Optimization Techniques	MCDL511F	Computer Aided Process Planning
MCDL511G	Industrial Product Design & Product Life Cycle Management		

MCDL511A: OPEN ELECTIVE		
Teaching Scheme: **Lectures:** 03 hrs. **Tutorials:** NIL **Practical:** NIL	**Examination Scheme (Theory)** **Teacher Assessment Examination:** 20 Marks **Class Assessment Examination:** 20 Marks **End Semester Examination:** 60Marks	**Examination Scheme (Laboratory)** **Internal(TW):** NIL **External(OR)**: NIL **External(PR)** : NIL
Credits :	**03**	
Note: Student is expected to select one open elective subject (other departments). They will inform course name in begging of the semester to the respective department.		

MCDL511B: SIMULATION MODELLING		
Teaching Scheme: **Lectures:** 3 hrs. **Tutorials:** -NIL **Practical:** -NIL	**Examination Scheme (Theory)** **Teacher Assessment Examination:** 20 Marks **Class Assessment Examination:** 20 Marks **End Semester Examination:** 60Marks	**Examination Scheme (Laboratory)** **Internal(TW): -** NIL **External(OR)**: -NIL **External(PR)** : -NIL
Credit	**3**	

Course Objective:

1. Define basic concepts in modeling and simulation (M&S).
2. Classify various simulation models and give practical examples for each category.
3. Construct a model for a given set of data and motivate its validity
4. Generate and test random number variates and apply them to develop simulation models

Course Outcome:

1. Can able to create simulation models of various types.
2. Can able to apply numerical mathematics, probability and statistics, and basics of programming.
3. Can use principal of simulation and modeling techniques to improve engineering system efficiency

Course Contents	**Hrs**
Unit – I : Introduction To Simulation Definition – history - nature of computer Modelling and simulation, limitations of simulation, areas of application. System and environment**:** Components of a system – types of simulation - discrete and continuous systems. Modelling approaches – simulation examples - manual simulation using event scheduling, single channel queue, two server queue, simulation of inventory problem	6
Unit – II : Random Number Generation And Testing Techniques for generating random numbers – mid square method – mid product method - constant multiplier technique - additive congruential method - linear congruential method – combined linear congruential generators – feedback shift register generators - tests for random numbers – frequency test - the Kolmogorov-Smirnov test, the chi-square test. Independence test – runs up and runs down, runs above and below the mean, autocorrelation,	6
Unit – III : Random Variable Generation Inverse transform technique - exponential distribution, uniform distribution, Weibull distribution, Triangular distribution. Empirical continuous distribution - generating approximate normal variates - Erlang distribution. Empirical discrete distribution - discrete	6

uniform distribution-poisson distribution - geometric distribution - acceptance - rejection technique for poisson distribution - gamma distribution.

Unit – IV : Stages In Model Building

Input modelling – data collection, identifying the distribution with data, parameter estimation, goodness of fit tests, selecting input models without data, models of arrival processes. Verification and validation of simulation models – variance reduction techniques, antithetic variables, calibration and validation of models. output analysis – stochastic nature of output data, measures of performance and their estimation, output analysis for terminating simulation. 6

Text Books: (Book Title, Name of the author, name of the Publisher, edition, year of publication)

1. Jerry Banks, John S, Carson II, Barry L Nelson and David M Nicol, "Discrete Event System Simulation", Prentice Hall Inc., 2006.
2. Law A M, "Simulation Modeling and Analysis", Tata McGraw Hill Companies Inc, 2008.
3. Gordon G, "Systems Simulation", Prentice Hall Ltd., 2006.
4. Narsingh Deo, "System Simulation with Digital Computer", Prentice Hall of India, 2007.
5. Francis Neelamkovil, "Computer Simulation and Modeling", John Wiley and Sons, 1987.

MCDL511C-OPTIMIZATION TECHNIQUES		
Teaching Scheme: **Lectures:** 03hrs. **Tutorials:** NIL **Practical:** NIL	**Examination Scheme (Theory)** **Teacher Assessment Examination:** 20 Marks **Class Assessment Examination:** 20 Marks **End Semester Examination:** 60Marks	**Examination Scheme (Laboratory)** **Internal(TW):** NIL **External(OR)**: NIL **External(PR)** : NIL
Credit	**3**	

Course Objective:

1. The course is spent on discussing evolutionary multi-objective optimization (EMO) methods in details. Strengths and weaknesses of each method are highlighted.
2. The course also discusses a number of current research issues, besides discussing a number of interesting case studies.
3. This course where students get an exposure to both theory and numerical optimization methodologies involving classical and evolutionary methods

Course Outcome:

1. Can formulate engineering design problems as mathematical optimization problems.
2. Can apply linear programing for solving engineering problems
3. Can solve One Dimensional and multi-Dimensional engineering problems

Course Contents	**Hrs**
Unit – I : Introduction To Optimization	
Introduction to optimization, formulation of optimization problem, Classification of optimization problems, Optimum design of components like pins, beams, columns, shafts, spur gears, pressure vessels, etc queue, simulation of inventory problem.	6
Unit – II : Linear Programming	
Linear programming, simplex method and duality in linear programming, sensitivity or post-optimality analysis, Karmarkar's method.	6
Unit – III : One Dimensional Optimization	
One dimensional minimization, optimality criterion, minimum bracketing methods like exhaustive search method, bounding phase method; optimum seeking methods like interval halving, golden section search, successive quadratic estimation, Newton Raphson, bisection, secant, cubic search method.	6
Unit – IV : Multi-Dimensional Optimization	
Multivariable unconstrained optimization, optimality criteria, direct search methods Powell's conjugate direction method; gradient search methods like Cauchy's method, Newton's method, conjugate gradient method and variable metric method.	6

Text Books: (Book Title, Name of the author, name of the Publisher, edition, year of publication)

1. S. S. Rao, Engineering Optimization Theory and Practice, New age international (P) Ltd., reprint 2003
2. Kalyanmoy Deb, Optimization for Engineering Design, PHI, New Delhi, 2005
3. J. S. Arora, Introduction to Optimum Design, McGraw Hill, New York, 1989.

Reference Books:

1. S. S. Stricker, Optimizing Performance of Energy Systems, Battelle Press, New York, 1985.
2. R.C. Johnson, Optimum Design of Mechanical Elements, Willey, New York, 1980.
3. L.C.W. Dixon, Non-Linear Optimization - Theory and Algorithms, Birkhauser, Boston, 1980.
4. R.J. Duffin, E.L. Peterson and C. Zener, Geometric Programming-Theory and Applications, Willey, New York, 1967.
5. G.B. Dantzig Linear Programming and Extensions Princeton University Press, Princeton, N. J. 1963.

MCDL511D, COMPUTATIONAL FLUID DYNAMICS		
Teaching Scheme: **Lectures:** 03 hrs. **Tutorials:** NIL **Practical:** NIL	**Examination Scheme (Theory)** **Teacher Assessment Examination:** 20-Marks **Class Assessment Examination:** 20-Marks **End Semester Examination:** 60-Marks	**Examination Scheme (Laboratory)** **Internal(TW):** NIL **External(OR)**: NIL **External(PR)** : NIL
Credits:	**03**	

Prerequisite (If any):

1. Mathematics
2. Fluid Mechanics
3. Heat Transfer

Course Objective:

1. To have a good understanding of the algorithms used in flow solvers
2. To be able to compare different algorithms

Course Outcome:

1. Can solve a fluid dynamics problem using computational methods
2. Can use governing equations to understand the behavior of engineering systems
3. Can analyze the consistency, stability and convergence of various discretization schemes for parabolic, elliptic and hyperbolic partial differential equations.
4. Can analyze various methods of grid generation techniques and application of finite difference and finite volume methods to various thermal problems

Course Contents **Hrs**

Unit – I : Introduction to CFD 6

Governing equations: the continuity equation, momentum equation and energy equations, convective forms of the equations and general description, Reynolds transport theorem. Classification of partial differential equations; physical examples of elliptic, parabolic and hyperbolic equations. Mathematical nature of the flow equations& their boundary conditions

Unit – II : Discretization: 6

Basic discretization techniques applied to model equations and systems of equations: finite difference, finite volume and finite element methods.

Finite difference methods: Taylor series expansion, different means for formulating finite difference equation; accuracy of finite difference method.

Finite Volume Methods: Finite volume methods; approximation of surface and volume integrals; interpolation methods; central, upwind and hybrid formulations and comparison for convection-diffusion problem.

Analysis of numerical schemes: concept of consistency, accuracy, stability and convergence; Error and stability analysis; some applications.

Unit – III : **Numerical Grid Generation:** 6

Introduction, Structured and Unstructured mesh generation techniques • Structured grid generation: a)Algebraic method, b) Elliptic generation systems. • Unstructured grid generation: a)Voronoi diagram and Delaunay triangulation; b) Advancing front grid generation.

Unit – IV : Solution to Eulers equations: 6

Formulations of Euler equations, Discretization methods for Euler equations. High resolution schemes and TVD.

Text Books:

1.Anderson, J.D. Computational Fluid Dynamics, McGraw Hill, 1995.

2.Anderson,D.A., Tannehill,J.C. and Pletcher,R.H., Computational Fluid Dynamics and Heat Transfer, McGraw Hill, 1984.

Reference Books:

1.Hirsch,C. Numerical Computation of Internal and External Flows, Vol.I, John Wiley, 1990.

2.Pradip Niyogi, S.K. Chakraborty, M.K. Laha, Introduction to Computational Fluid Dynamics, Pearson

MCDL511E: INTELLIGENT MANUFACTURING SYSTEMS

Teaching Scheme:	Examination Scheme (Theory)	Examination Scheme (Laboratory)
Lectures: 03 hrs. **Tutorials:** NIL **Practical:** NIL	**Teacher Assessment Examination:** 20-Marks **Class Assessment Examination:** 20-Marks **End Semester Examination:** 60-Marks	**Internal(TW):** NIL **External(OR)**: NIL **External(PR)** : NIL
Credits:	**03**	

Unit – I : 6

Computer integrated manufacturing systems, structural and functional areas of CIM system, -CAD, CAPP, CAM, CAQC, ASRS. Advantages of CIM. Manufacturing communication systems – MAP/TOP, OSI Model, Data redundancy Top-down and Bottom-up approach. Volume of Information. Intelligent Manufacturing System Components, System Architecture and Data Flow, System Operation

Unit – II : 6

Component Knowledge Based Systems – Basic Components of Knowledge Base Systems, Knowledge Representation, Comparison of Knowledge Representation Schemes, Interference Engine, Knowledge Acquisition.

Unit – III : 6

Machine Learning – Concept of Artificial Intelligence, Conceptual Learning, Artificial Neural Networks Biological Neuron, Artificial Neuron, Types of Neural Networks, Applications in Manufacturing.

Unit – IV : 6

Automated Process Planning - Variant Approach, Generative Approach, Expert System for Process Planning, Feature Recognition, Phases of Process Planning, Knowledge Based System for Equipment Selection(KBSES) – Manufacturing System Design, Equipment Selection Problem, Modeling of Manufacturing Equipment Selection Problem, Problem Solving Approach in KBSES, Structure of The KBSES

Text Books:

1. Intelligent Manufacturing Systems by Andre Kusaic
2. Artificial Neural Networks by Yagna Narayana
3. Automation, Production Systems and CIM By Groover M.P.
4. Neural Networks by Wassarman.

MCDL511F: COMPUTER AIDED PROCESS PLANNING		
Teaching Scheme: **Lectures:** 03 hrs. **Tutorials:** NIL **Practical:** NIL	**Examination Scheme (Theory)** **Teacher Assessment Examination:** 20-Marks **Class Assessment Examination:** 20-Marks **End Semester Examination:** 60-Marks	**Examination Scheme (Laboratory)** **Internal(TW):** NIL **External(OR)**: NIL **External(PR)** : NIL
Credits:	**03**	

Course Contents	**Hrs**
Unit – I :	6
Introduction to CAPP: Information requirement for process planning system, Role of process planning, advantages of conventional process planning over CAPP, structure of Automated process planning system, future recognition, methods.	
Generative CAPP System: importance, principle of Generative CAPP system, automation of logical decisions, Knowledge based systems, Inference engine, implementation, benefits.	
Unit – II :	6
Retrieval CAPP System: significance, group technology, structure, relative advantages, implementation and applications.Selection of manufacturing sequence: significance, alternative-manufacturing processes, reduction of total set-up cost for a particular sequence. Quantitative methods for optimal selection, examples	
Unit – III :	6
Determination of machining parameters: reasons for optimal selection of machining parameters, effect of parameters on production rate, cost and surface quality, different approaches, advantages of mathematical approach over conventional approach, solving optimization models of machining processes.	
Unit – IV :	6
Determination of manufacturing tolerances: design tolerances, manufacturing tolerances, methods of tolerance allocation, sequential approach, integration of design and manufacturing tolerances, advantages of integrated approach over sequential approach over sequential approach.	

Text Books:

1. Automation Production Systems and Computer Integrated Manufacturing Systems – Mikell P Groover
2. Computer Design and Manufacturing – Dr. Sadhu Singh
3. Computer Engineering – David Bedworth

MCDL511G -INDUSTRIAL PRODUCT DESIGN AND PRODUCT LIFECYCLE MANAGEMENT		
Teaching Scheme: **Lectures:** 03 hrs. **Tutorials:** -01 hr. **Practical:** -NIL	**Examination Scheme (Theory)** **Teacher Assessment Examination:-** 20 Marks **Class Assessment Examination:** 20 Marks **End Semester Examination:** -60Marks	**Examination Scheme (Laboratory)** **Internal(TW):** -NIL **External(OR)**:-NIL **External(PR)** :-NIL
Credit	**03**	

Course Objective:

1. Demonstrate an understanding of PLM concepts, particularly product data management, change management, workflows and configurations.
2. Demonstrate literacy in the application of a PDM tool to support product development processes.
3. Integrate lifecycle management strategies and knowledge to develop new and/or formulate appropriate engineering design solutions in engineering environment.

Course Outcome:

1. Exposit legal, social, economic, ethical and environmental interests, values, requirements and expectations of key stakeholders.
2. Identify and assess risks (including OH&S) as well as the economic, social and environmental impacts of engineering activities
3. Anticipate the consequences of intended action or inaction and understand how the consequences are managed collectively by your organization, project or team

Course Contents **Hrs**

Unit – I : Product Development 6

Quality function deployment-quality project approach and the problem solving process. Design creativity-innovations in design alternatives. Concurrent engineering, industrial design principles. Product development versus design, types of design and redesign, modern production development process, reverse engineering and redesign product development process, examples of product development process, scoping product development – S-curve, new product development.

Unit – II : Understanding Customer Needs & Generating Concepts 6

Gathering customer needs, organizing and prioritizing customer needs, establishing product function, FAST method, establishing system functionality. GENERATING CONCEPTS: Information gathering, brain ball, C-sketch/6-3-5 method, morphological analysis, concept selection, technical feasibility, ranking, measurement theory, DFMA, design for robustness

Unit – III : Product Tear Down and Experimentation 6

Tear down method, post teardown report, benchmarking and establishing engineering specifications, product portfolios

Unit – IV : 4. Introduction to Product Life Cycle Management 6

Background, Overview, Need, Benefits, and Concept of Product Life Cycle, Components / Elements of PLM, Emergence of PLM, Significance of PLM, Customer Involvement,. Threads of PLM- computer aided design (CAD), engineering data management (EDM), Product data management (PDM), computer integrated manufacturing (CIM, comparison of PLM to Engineering resource planning (ERP). PLM characteristics -singularity, cohesion, traceability, reflectiveness

Unit – V : Product Life Cycle Environment 6

Product Data and Product Workflow, The Link between Product Data and Product Workflow, Key Management Issues around Product Data and Product Workflow, Developing a PLM strategy, Strategy identification and selection, PLM System Architecture (2tier/3tier/4tier etc)..

Text Books: (Book Title, Name of the author, name of the Publisher, edition, year of publication)

1. John W Gosnay and Christine M Mears, Business Intelligence with Cold Fusion, Prentice Hall India, New Delhi, 2000.
2. David S Linthicum, “B2B Application Integration”, Addison Wesley, Boston, 2001.
3. Alexis Leon, Enterprise Resource Planning, Tata McGraw Hill, New Delhi, 2002.
4. David Ferry and Larry Whipple, Building and Intelligent e-business, Prima Publishing, EEE Edition, California, 2000.
5. David Bedworth, Mark Hederson and Phillip Wolfe, Computer Integrated Design and Manufacturing, McGraw Hill Inc., New York, 1991.
6. Kevin Otto and Kristin Wood, Product Design – Techniques in Reverse Engineering and New Product Development, Pearson Education, New Delhi, 2004.
7. Karl T Ulrich and Stephen D Eppinger, Product Design and Development, McGraw Hill, New York, 1994.
8. Grieves, Michael, Product Lifecycle Management, McGraw-Hill, 2006. ISBN 0071452303

MCDP1206 SIMULATION LAB-II		
Teaching Scheme: **Lectures:** -NIL **Tutorials:** -NIL **Practical:** -NIL	**Examination Scheme (Theory)** **Teacher Assessment Examination:-** NIL **Class Assessment Examination:** NIL **End Semester Examination** –NIL	**Examination Scheme (Laboratory)** **Continuous Assessment:** 50 Marks **External Assessment:** 50 Marks
Credit	**2**	

Lab. work or Assignments have to be carried out at respective labs as mentioned in the syllabus of respective subjects excluding Elective. It is to be submitted as term work at the end of semester after continuous assessment of each by respective teacher. Assessment of term work has to be carried out as per R-1.4 and R-1.5 of PG Rules and Regulations of Credit System. (Refer University web site)

SIMULATION & OPTIMIZATION

04- 06 Assignment on real life problems of manufacturing systems and manufacturing processes to be simulated using simulation software's as ARENA, FORGE, FASTFORM ADVANCED, PAMSTAMP, SIMUFACT FORMING etc. Assignments on optimization using any process/product optimization software.

Assignments:

1. Assignment on Finite Element Simulation of Cooling/Heating Process.
2. Assignment on Finite Element Simulation of Bending for stress analyses.
3. Assignment of Finite Element Simulation of Drawing/Forming for deformation and stresses.
4. Assignment on Tool Path Simulation of Turning/Milling of simple components.
5. Assignment on Process Optimization any one case study.
6. Write a case study of any production application for cost and time optimization based on survey or visit

MCDP601-TECHNICAL WRITING		
Teaching Scheme: **Lectures:** NIL **Tutorials: --** NIL **Practical:** 03 hrs.	**Examination Scheme (Theory)** **Teacher Assessment Examination:-** NIL **Class Assessment Examination:** NIL **End Semester Examination: -**NIL	**Examination Scheme (Laboratory)** **Continuous Assessment:** 50 Marks **Eternal Assessment:** 50 Marks
Credit	**03**	

Hrs.

Unit – I : Seminar Writing **7**

Selection of seminar, literature survey, outcomes and scope discussion based on literature, writing formats, summery and reference writing format. Case studies-based on the other's seminar presentation.

Unit – II : Dissertation Writing **7**

Selection of dissertation area, literature survey, outcomes and scope discussion based on literature, writing formats, summery and reference format. Case studies-based on the other's presentation. Discussion to write conclusion and appendix.

Unit – III : Assignment based on Software Tools and Techniques 8

a) Use technical writing software for seminar.
b) Use technical writing software for dissertation.
c) Use of Latex and its different capabilities.

NOTE: Journal and Report Writing,

Student is required to give the presentation based on report of a, b, and c and writing report on Research proposal and Patent drafting/filing at the end of semester.

MCDS602: SEMINAR-I		
Teaching Scheme: **Lectures:** NIL **Tutorials:** -- NIL **Practical:** 04 hrs.	**Examination Scheme (Theory)** **Teacher Assessment Examination:-** NIL **Class Assessment Examination:** NIL **End Semester Examination:** -NIL	**Examination Scheme (Laboratory)** **Continuous Assessment:** 50 Marks **Eternal Assessment:** 50 Marks
Credit	**04**	

It is important that the procedures listed below be carefully followed by all the students of MTech. (Mechanical Engineering).

1. Prepare 3 **COPIES** of your manuscript.

2. Limit your project report to preferably

a) 15-20 manuscript pages for Seminar I

b) 20-25 manuscript pages for Seminar II

c) 25-30 manuscript pages for Seminar III

3. The footer must include the following:

Institute Name, MTech. Mechanical (Heat Power Engineering) Times New Roman 10 pt. and centrally aligned.

4. Page number as second line of footer, Times New Roman 10 Pt, centrally aligned.

5. Print the manuscript using

a) Letter quality computer printing.

b) The main part of manuscript should be Times New Roman 12 pt. and justified**.**

c) Use 1.5 line spacing.

d) Entire report shall be one chapter. No chapters for Seminar I, II and III.

e) Seminar I shall not have last section as Conclusions, it will be summary only.

6. Use the paper size **8.5’’ × 11’’** or **A4 (210 × 197 mm).** Please follow the margins given below.

Margin Location	Paper 8.5’’ × 11’’	Paper A4 (210 × 197 mm)
Top	1’’	25.4 mm
Left	1.5’’	37 mm
Bottom	1.25’’	32 mm
Right	**1’’**	**25.4 mm**

7. All paragraphs will be 1.5 line spaced with a one blank line between each paragraph. Each paragraph will begin without any indentation.

8. Section titles should be bold with 14 pt typed in all capital letters and should be left aligned.

9. Sub-Section headings should be aligning at the left with 12 pt, bold and Title Case (the first letter of each word is to be capitalized).

10. Illustrations (charts, drawings, photographs, figures) are to be in the text. Use only illustrations really pertinent to the text. Illustrations must be sharp, clear, **black and white. Illustrations downloaded from internet are not acceptable.**

a) Illustrations should not be more than **two** per page. One could be ideal

b) Figure No. and Title at bottom with **12 pt**

c) Legends below the title in **10 pt**

d) Leave proper margin in all sides

e) Illustrations as far as possible should not be Xeroxed.

11. **Photographs** if any should be of glossy prints

12. Please use **SI** system of units. If students would like to add the equivalent in inch-pound (British) units, they must be stated in parenthesis after the **SI** units. In case the final result comes out in any other units (say due to empirical formula etc.) covert the unit to **SI** unit.

13. Please **number the pages** on the front side, centrally below the footer

14. **References** should be either in order as they appear in the thesis or in alphabetical order by last name of first author

15. **Symbols** and **notations** if any should be included in nomenclature section only

16. Following will be the order of report

i. **Cover page** and **Front page** as per the specimen on separate sheet

ii. **Certificate** from the Institute as per the specimen on separate sheet

iii. **Acknowledgement**

iv. **List of Figures**

v. **List of Tables**

vi. **Nomenclature**

vii. **Contents**

viii. **Abstract** (A brief abstract of the report not more than **150 words**. The heading of abstract i.e. word "Abstract" should be **bold, Times New Roman, 12 pt** and should be typed at the **centre.** The contents of abstract should be typed on new line without space between heading and contents. Try to include one or two sentences each on **motive, method, key-results** and **conclusions** in the Abstract)

ix. Section: Introduction

x. References

17. All section headings and subheadings should be numbered. For sections use numbers **1, 2, 3, ….** and for subheadings **1.1**, **1.2**, **….** etc and section subheadings **2.1.1**, **2.1.2, ….** etc.

18. **References** should be given in the body of the text and well spread. No verbatim copy or excessive text from only one or two references. If **figures** and **tables** are taken from any reference then indicate source of it. Please follow the following procedure for references

Reference Books Collier, G. J. and Thome, J. R., Convective boiling and condensation, 3rd ed., Oxford University Press, UK, 1996, pp. 110 – 112.

Papers from Journal or Transactions Jung, D. S. and Radermacher, R., Transport properties and surface tension of pure and mixed refrigerants, *ASHRAE Trans*, 1991, 97 (1), pp. 90 – 98. Bansal,

P. K., Rupasinghe, A. S. and Jain, A. S., An empirical correction for sizing capillary tubes, *Int. Journal of Refrigeration*, 1996, 19 (8), pp.497 – 505.

Papers from Conference Proceedings Colbourne, D. and Ritter, T. J., *Quantitative assessment of flammable refrigerants in room air conditioners*, Proc. of the Sixteenth International Compressor Engineering Conference and Ninth International Refrigeration and Air Conditioning Conference, Purdue University, West Lafayette, Indiana, USA, 2002, pp. 34 – 40.

Reports, Handbooks etc. United Nations Environmental Programme, Report of the Refrigeration, Air Conditioning and Heat Pumps, Technical Option Committee, 2002, Assessment - 2002. ASHRAE Handbook: Refrigeration, 1994 (Chapter 44)

Patent Patent no, Country (in parenthesis), date of application, title, year.

Internet www.(Site) [Give full length URL]

Format for front page and Certificate

A Seminar I / II / III on (TNR, 16pt, centrally aligned)

Title (TNR, 27pt, Bold, Centrally Aligned, Title Case)

By (TNR, 16pt, Centrally Aligned)

Mr. Student's Name (TNR, 16pt, Centrally Aligned)

Guide (TNR, 16pt, Centrally Aligned)

Guide's Name (TNR, 16pt, Centrally Aligned)

Institute
Logo

Department of Mechanical Engineering

Name of the Institute

[2015-16](TNR, 22pt, Title Case Centrally Aligned)

Name of the Institute

Institute
Logo

C E R T I F I C A T E

This is to certify that *Mr. ABCDEF.*, has successfully completed the seminar-I/II/III entitled "Performance analysis of……..'' under my supervision, in the partial fulfillment of Master of Technology - Mechanical Engineering (Heat Power Engineering) of University of Pune.

Date :

Place :

Guide's Name
Guide

Head Department
and Institute Name

External Examiner

Seal Principal,
Institute Name

MCDP603: DISSERTATION PHASE-I		
Teaching Scheme: **Lectures:** -NIL **Tutorials:** -NIL **Practical:** -08 hrs.	**Examination Scheme (Theory)** **Teacher Assessment Examination:-** NIL **Class Assessment Examination:** NIL **End Semester Examination:** -NIL	**Examination Scheme (Laboratory)** **Continuous Assessment:** 100 Marks **Eternal Assessment:** 50 Marks
Credit	**08**	

INSTRUCTIONS FOR DISSERTATION WRITING

It is important that the procedures listed below be carefully followed by all the students of MTech. (Mechanical Engineering).

1. Prepare **Three Hard Bound Copies** of your manuscript.
2. Limit your Dissertation report to 80 – 120 pages (preferably)
3. The footer must include the following: Institute Name, MTech. Mechanical (Heat Power Engineering) Times New Roman 10 pt. and centrally aligned.
4. Page number as second line of footer, Times New Roman 10 Pt, centrally aligned.
5. Print the manuscript using a. Letter quality computer printing.

b. The main part of manuscript should be Times New Roman 12 pt. with alignment - justified**.**

c. Use 1.5 line spacing.

d. Entire report shall be of 5- 7 chapters.

6. Use the paper size **8.5’’ × 11’’** or **A4 (210 × 197 mm).** Please follow the margins given below.

Margin Location	Paper 8.5’’ × 11’’	Paper A4 (210 × 197 mm)
Top	1’’	25.4 mm
Left	1.5’’	37 mm
Bottom	1.25’’	32 mm
Right	1’’	25.4 mm

7. All paragraphs will be 1.5 line spaced with a one blank line between each paragraph. Each paragraph will begin with without any indentation.
8. Section titles should be bold with 14 pt typed in all capital letters and should be left aligned.
9. Sub-Section headings should be aligning at the left with 12 pt, bold and Title Case (the first letter of each word is to be capitalized).
10. Illustrations (charts, drawings, photographs, figures) are to be in the text. Use only illustrations really pertinent to the text. Illustrations must be sharp, clear, **black and white. Illustrations downloaded from internet are not acceptable.**

a. Illustrations should not be more than **two** per page. One could be ideal

b. Figure No. and Title at bottom with **12 pt**

c. Legends below the title in **10 pt**

d. Leave proper margin in all sides

e. Illustrations as far as possible should not be photo copied.

11. **Photographs** if any should of glossy prints

12. Please use **SI** system of units only.

13. Please **number the pages** on the front side, centrally below the footer

14. **References** should be either in order as they appear in the thesis or in alphabetical order by last name of first author

15. **Symbols** and **notations** if any should be included in nomenclature section only

16. Following will be the order of report

i. **Cover page** and **Front page** as per the specimen on separate sheet

ii. **Certificate** from the Institute as per the specimen on separate sheet

iii. **Acknowledgements**

iv. **List of Figures**

v. **List of Tables**

vi. **Nomenclature**

vii. **Contents**

viii. **Abstract** (A brief abstract of the report not more than **150 words**. The heading of abstract i.e. word "Abstract" should be **bold, Times New Roman, 12 pt** and should be typed at the **centre.** The contents of abstract should be typed on new line without space between heading and contents. Try to include one or two sentences each on **motive, method, key-results** and **conclusions** in Abstract

1 Introduction (2-3 pages) (TNR – 14 Bold)

1.1 Problem statement (TNR – 12)

1.2 Objectives

1.3 Scope

1.4 Methodology

1.5 Organization of Dissertation

2 Literature Review (20-30 pages)

Discuss the work done so far by researchers in the domain area and their significant conclusions. No derivations, figures, tables, graphs are expected.

3 This chapter shall be based on your own simulation work (Analytical/ Numerical/FEM/CFD) (15-20 pages)

4 Experimental Validation - This chapter shall be based on your own experimental work (15-20 pages)

5 Concluding Remarks and Scope for the Future Work (2-3 pages)

References ANNEXURE (if any) (Put all mathematical derivations, Simulation program as Annexure)

17. All section headings and subheadings should be numbered. For sections use numbers **1, 2, 3, ….** and for subheadings **1.1**, **1.2**, **….** etc and section subheadings **2.1.1**, **2.1.2, ….** etc.

18. **References** should be given in the body of the text and well spread. No verbatim copy or excessive text from only one or two references. If **figures** and **tables** are taken from any reference then indicate source of it. Please follow the following procedure for references

Reference Books Collier, G. J. and Thome, J. R., Convective boiling and condensation, 3rd ed., Oxford University Press, UK, 1996, pp. 110 – 112.

Papers from Journal or Transactions Jung, D. S. and Radermacher, R., Transport properties and surface tension of pure and mixed refrigerants, *ASHRAE Trans*, 1991, 97 (1), pp. 90 – 98. Bansal, P. K., Rupasinghe, A. S. and Jain, A. S., An empirical correction for sizing capillary tubes, *Int. Journal of Refrigeration*, 1996, 19 (8), pp.497 – 505.

Papers from Conference Proceedings Colbourne, D. and Ritter, T. J., *Quantitative assessment of flammable refrigerants in room air conditioners*, Proc. of the Sixteenth International Compressor Engineering Conference and Ninth International Refrigeration and Air Conditioning Conference, Purdue University, West Lafayette, Indiana, USA, 2002, pp. 34 – 40.

Reports, Handbooks etc. United Nations Environmental Programme, Report of the Refrigeration, Air Conditioning and Heat Pumps, Technical Option Committee, 2002, Assessment - 2002. ASHRAE Handbook: Refrigeration, 1994 (Chapter 44)

Patent Patent no, Country (in parenthesis), date of application, title, year.

Internet www.(Site) [Give full length URL]

A Project Stage-I Report on
(TNR, 16pt, centrally aligned)

Title (TNR, 27pt, Bold, Centrally Aligned, Title Case)

By (TNR, 16pt, Centrally Aligned)
Mr. Student’s Name (TNR, 16pt, Centrally Aligned)

Guide
Guide’s Name (TNR, 16pt, Centrally Aligned)

Institute Logo

Department of Mechanical Engineering
Name of the Institute

[2015-16](TNR, 22pt, Title Case Centrally Aligned)

Name of the Institute

Logo

C E R T I F I C A T E

This is to certify that *Mr. ABCDE* ., has successfully completed the Dissertation entitled "Performance analysis of…….." under my supervision, in the partial fulfillment of Master of Technology - Mechanical Engineering (Heat Power Engineering) of University of Pune.

Date:

Place:

Guide's Name

Guide

Head

Department and

Institute Name

External Examiner

Seal

Principal,

Institute Name

MCDP604-SEMINAR-II		
Teaching Scheme: **Lectures:** NIL **Tutorials:** NIL **Practical:** 04 hrs.	**Examination Scheme (Theory)** **Teacher Assessment Examination:-** NIL **Class Assessment Examination:** NIL **End Semester Examination:** -NIL	**Examination Scheme (Laboratory)** **Continuous Assessment:** 50 Marks **External Assessment:** 50 Marks
Credit	**04**	

MCDP605 DISSERTATION PHASE-II		
Teaching Scheme: **Lectures:** -NIL **Tutorials:** -NIL **Practical:** -08 hrs.	**Examination Scheme (Theory)** **Teacher Assessment Examination:-** NIL **Class Assessment Examination:** NIL **End Semester Examination:** -NIL	**Examination Scheme (Laboratory)** **Continuous Assessment:** 250 Marks **External Assessment: 1**50 Marks
Credit	**16**	

9. RULES AND REGULATIONS

9.1 Registration of Postgraduate Engineering (M.Tech) students

The PG students shall be promoted to higher semester as per the conditions laid down below:-

Admission to	Candidates should have earned PASS grade in all the heads of the following examination	Candidates should have earned at least 50% credits of the following examination taken together
I Sem.	B.E/ B.Tech/ Equivalent Courses	---
II Sem.	--	---
III Sem.	--	I & II Sem.
IV Sem.	----	----

The minimum CGPA for award of degree shall be 5.5.

9.2 Semester System

There shall be two Semesters, namely Odd Semester and Even Semester in each academic year. Duration of semesters for different programs shall be as follows.

Duration:

i	B.Tech. Programme	8 Semesters
ii	MCA Programme	6 Semesters
iii	M.Tech Programme	4 Semesters

For the sections starting late, especially for First Year, provision of makeup classes shall be made to compensate for the loss of teaching. For Direct Second Year admissions, the provision of makeup classes shall be made.

9.3 Course Credit System/Structure

Number of credits for a course in any semester is generally calculated as follows.

Sr. No	Course	Hour	Credits for UG	Credits for PG
1	Lecture	1	1	1
2	Tutorial hour / week	1	1	1
3	Workshop / Laboratory/ Drawing	2	1	-
4	Laboratory	1	-	1
4	Project/Dissertation		*(As given below)	8
5	Project/ Dissertation		*(As given below)	20

9.4 Minimum requirement for award of Degree

M. Tech. Programs

- The minimum number of credits to be earned for M.Tech. Programs in a discipline shall not be less than 100 credit points.
- Completion of all audit courses
- The minimum CGPA for award of degree shall be 5.5

9.5 Class Assessment Examination (CAE):

This examination shall be conducted at the department in the scheduled week and the evaluated papers shall be shown to the students within three working days. There shall be three such examinations equi-spaced in the semester out of which one shall be online examination for UG. There shall be two such examinations equi-spaced in the semester for PG. However for the performance improvement of the student one additional examination shall be conducted at the end of the term (in case PG it should be online examination).

Criteria for Improvement Test:

- Student is absent any one OR both the CAE
- UG Student is having less than 8 marks in any one of CAE
- PG student is having less than 15 marks in any one of CAE

9.6 Teacher Assessment Examination (TAE):

It shall be evaluated by the teacher/forum in-charge based on the options like surprise test, quiz, seminar, paper reading, group discussion and the performance of the student in the co-curricular and extracurricular activities and his / her attentiveness in the class. There shall be total seven parameters, out of which best five will be consider.

TAE Parameters:

TAE Parameter	I/II Sem BE	III-VIII Sem BE	I/II Sem PG	III Sem PG
TAE - I	Quiz	Activity based learning	Delivery of technical topic without audio visual aid and backboard	Delivery of Seminar on latest Topic
TAE – II	Surprise Test	Technical	Chapter review	Demonstration of

TAE Parameter	I/II Sem BE	III-VIII Sem BE	I/II Sem PG	III Sem PG
		Presentations	from test book / reference book	Equipment / Lab
TAE – III	Home Assignment	Mini models/ Minor project	Mini Project	Review paper submitted in the Journal
TAE – IV	Attendance in Class	Attendance in Class	Attendance in Class	Attendance in Class
TAE – V	Seminar	Poster Presentation Seminar	Review of Journal Paper	Chapter review from test book / reference book
TAE – VI	Co-curricular & extra Curricular activates	Co-curricular & extra Curricular activates/CSIR	Poster presentation / Paper presentation / Seminar	Paper presentation
TAE - VII	Any Other	Attendance in two industrial visits and two guest lecturers / latest exposure advance facility in the lab	Attendance in two industrial visits and two guest lecturers	Attendance in two industrial visits and two guest lecturers Experiment Design / Kit Fabrication for UG

9.7 End Semester Examination (ESE) :

The Controller of Examinations shall conduct this examination after completion of the semester for which the date is given in the Academic Calendar. The time-table of the End Semester examination is prepared in the meeting of class representatives for each semester before one month before the start of examination. Each question paper shall have questions with choice upto 20 % and the student shall attempt all questions. The questions should be uniformly distributed from the entire syllabus of the subject. The duration of examination is 2 hours /3 hours/ 4 hours as per teaching scheme. All the question papers shall be audited by audit committee (comprising of senior most paper setter of respective subject as chairman and two teachers who have been appointed as paper setters as members) appointed by examination committee. The audit shall be done and completed in one sitting. The opinion of the subject teacher teaching the respective subject shall be sought before finalizing the question paper without disclosing the paper to the subject teacher. If there is shortage of paper sets, the audit committee shall prepare the required number of paper sets on spot. The audit shall be limited to maximum 20% for a particular set.

9.8 Exam From submission:

Every student has to fill online examination from as per the dates given in academic calendar through available portal

- Generate bank challan and online exam form
- Submit amount in bank through challan (within two days)
- Paste your current attested passport size photo on exam form.
- Submit challan and exam form to account section

9.9 M. Tech Project Report:

1. Topic selection of PG projects is done under the guidance of Industry expert/Experts from NITs. Due weight-age is given for project progress seminars and rubrics for the same are prepared by each department.
    a) Three seminar for Literature Review , project identification, topic finalization is conducted by Departmental Project Recognition Committee.
    b) Synopsis of topic to be submitted in standard format.
    c) RRC Committee is constituted by Dean(R and D).
    d) Changes, if any, suggested by RRC, to be incorporated in the synopsis.
    e) Title and scope of topic is finalized.

2. Three progress seminars based on Project work in M.Tech./M.E. III Semester.
3. Four progress seminars based on Project work in M.Tech./M.E. IV Semester.
4. Rigorous experimentation and analysis to be done in M.Tech./M.E. IV Semester.
5. Research paper based on Experimental work to be published by students in M.Tech./M.E. IV Semester.
6. Pre- Submission Seminar in front of Panel of eminent experts from NIT.
7. Suggestions, if any, suggested by Panel, to be incorporated in the work.
8. Write up of project report has to be in standard format prescribed by GHRCEM.
9. Submission of project report in standard format prescribed by GHRCEM.
10. Panel of Examiners from NIT, IIT constituted by Dean(R and D).
11. Final defense and viva conducted.

9.10 The Grading System

Students' performance/ progress shall be assessed by number of credits he/she has earned successfully. Based on course credits and grade points obtained by the student, semester grade point average and cumulative grade point average shall be calculated. The academic performance of a student shall be graded on a 10- Point Scale. This college shall adopt the relative grading system in the larger academic interest.

The grading system is produced below:

Grades	Grade points	Description
AA	10	Outstanding
AB	9	Excellent
BB	8	Very good
BC	7	Good
CC	6	Average
CD	5	Below Average
DD	4	Marginal
FF	0	Very Poor

As per AICTE CGPA may be converted into equivalent marks as

below: (C GPA – 0.75) x 10= Equivalent Percentage e.g

S.No.	CGPA	Class of degree awarded
1	≥7.75	First class with Distinction
2	≥6.75 or <7.75	First class
3	≥6.25 or < 6.75	Higher second class
4	≥5.5 or < 6.25	Second class

9.11 Guidelines for the Award of Grades:

The following are the general guidelines for the award of grades:

i. For each student, all evaluations in different components of a course shall be done in absolute marks considering the weightage in teaching scheme.
ii. The marks of various components shall be added to get total marks secured on a 10-points scale. The rounding off shall be done on the higher side.
iii. The relative grading system shall be used for award of grades.
iv. Examination committee shall appoint a sub-committee which shall be called as Grade
v. Moderation committee. (GMC) This committee shall be responsible for grade moderation. Dean academics shall be the convener of Under Graduate programs and PG Head for Post Graduate Programs. Grade shall be awarded by subject teachers and forward it to grade moderation committee through Head of concerned department. Grades shall be modified by the GMC based on the normal distribution.

9.11.1 Explanation:

‘FF Grades

A student who was awarded “FF” grade in a core course has to repeat it compulsorily for getting passing grade is obtained.

For the elective courses in which 'FF' grade has been obtained, the student may take the same course or any other course from the same category.

Further, 'FF' grades secured in any course stay permanently on the grade card. The weightage of these grades is not counted in the calculation of the CGPA, however these are counted in the calculation of the SGPA.