SYLLABUS

B.TECH

2019 SCHEME

SEMESTER-I &II

MAT 101 LINEAR ALGEBRA AND CALCULUS

L-T-P

3-1-0

Credit 4

Course Objectives:

- This course introduces students to some basic mathematical ideas and tools which are at the core of any engineering course.
- A brief course in Linear Algebra familiarizes students with some basic techniques in matrix theory which are essential for analyzing linear systems.
- The calculus of functions of one or more variables taught in this course are useful in modelling and analyzing physical phenomena involving continuous change of variables or parameters and have applications across all branches of engineering.

Course Outcomes:

Student will be able to:

- Solve systems of linear equations, diagonalize matrices and characterize quadratic forms
- Compute the partial and total derivatives and maxima and minima of multivariable functions
- Compute multiple integrals and apply them to find areas and volumes of geometrical shapes, mass and Centre of gravity of plane laminas
- Perform various tests to determine whether a given series is convergent, absolutely convergent or conditionally convergent
- Determine the Taylor and Fourier series expansion of functions and learn their applications.

SYLLABUS

MODULE I

Linear algebra- Systems of linear equations, Solution by Gauss elimination, row echelon form and rank of a matrix, fundamental theorem for linear systems (homogeneous and non-homogeneous, without proof), Eigen values and Eigen vectors. Diagonaliztion of matrices, orthogonal transformation, quadratic forms and their canonical forms.

MODULE II

Multivariable calculus-Differentiation- Concept of limit and continuity of functions of two variables, partial derivatives, Differentials, Local Linear approximations, chain rule, total derivative, Relative maxima and minima, Absolute maxima and minima on closed and bounded set.

MODULE III

Multivariable calculus-Integration- Double integrals (Cartesian), reversing the order of integration, Change of coordinates (Cartesian to polar), finding areas and volume using double integrals, mass and Centre of gravity of inhomogeneous laminas using double integral. Triple integrals, volume calculated as triple integral, triple integral in cylindrical and spherical coordinates (computations involving spheres, cylinders).

MODULE IV

Sequences and series- Convergence of sequences and series, convergence of geometric series and p-series(without proof), test of convergence (comparison, ratio and root tests without proof); Alternating series and Leibnitz test, absolute and conditional convergence.

MODULE V

Series representation of functions- Taylor series (without proof, assuming the possibility of power series expansion in appropriate domains), Binomial series and series representation of exponential, trigonometric, logarithmic functions (without proofs of convergence); Fourier series, Euler formulas, Convergence of Fourier series (without proof), half range sine and cosine series, Parseval's theorem (without proof).

Text Books

1. H. Anton, I. Biven,S.Davis, "Calculus", Wiley, 10th edition, 2015.
2. Erwin Kreyszig, Advanced Engineering Mathematics, 10thEdition, John Wiley & Sons, 2016.

Reference Books

1. J. Stewart, Essential Calculus, Cengage, 2nd edition, 2017
3. G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, 9 th Edition, Pearson, Reprint, 2002.
1. Peter V. O'Neil, Advanced Engineering Mathematics , Cengage, 7th Edition, 2012
2. Veerarajan T., Engineering Mathematics for first year, Tata McGraw-Hill, New Delhi, 2008.
3. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 36 Edition, 2010.

CYT 100 ENGINEERING CHEMISTRY

L-T-P

3-1-0

Credit 4

Course Objectives:

- To enable the students to acquire knowledge in the concepts of chemistry for engineering applications
- To familiarize the students with different application oriented topics like spectroscopy, electrochemistry, instrumental methods etc.
- To familiarize the students with topics like mechanism of corrosion, corrosion prevention methods, SEM, stereochemistry, polymers, desalination etc., which enable them to develop abilities and skills that are relevant to the study and practice of chemistry.

Course outcomes:

Students will be able to:

- Apply the basic concepts of electrochemistry and corrosion to explore its possible applications in various engineering fields.
- Understand various spectroscopic techniques like UV-Visible, IR, NMR and its applications.
- Apply the knowledge of analytical method for characterizing a chemical mixture or a compound. Understand the basic concept of SEM for surface characterization of nanomaterial.
- Learn about the basics of stereochemistry and its application. Apply the knowledge of conducting polymers and advanced polymers in engineering.
- Study various types of water treatment methods to develop skills for treating wastewater.

SYLLABUS

MODULE I

Electrochemistry and Corrosion Introduction - Differences between electrolytic and electrochemical cells - Daniel cell - redox reactions - cell representation. Different types of electrodes (brief) - Reference electrodes - SHE - Calomel electrode - Glass Electrode - Construction and Working. Single electrode potential - definition - Helmholtz electrical double layer -Determination of E0 using calomel electrode. Determination of pH using glass electrode. Electrochemical series and its applications. Free energy and EMF - Nernst

Equation - Derivation - single electrode and cell (Numericals) -Application - Variation of emf with temperature. Potentiometric titration - Introduction -Redox titration only.Lithiumion cell - construction and working. Conductivity- Measurement of conductivity of a solution (Numericals). Corrosion-Electrochemical corrosion – mechanism. Galvanic series- cathodic protection - electro less plating –Copper and Nickel plating.

MODULE II

Spectroscopic Techniques and Applications Introduction- Types of spectrum - electromagnetic spectrum - molecular energy levels - Beer Lambert's law (Numericals). UV-Visible Spectroscopy – Principle - Types of electronic transitions - Energy level diagram of ethane, butadiene, benzene and hexatriene. Instrumentation of UV-Visible spectrometer and applications.IR-Spectroscopy – Principle - Number of vibrational modes - Vibrational energy states of a diatomic molecule and -Determination of force constant of diatomic molecule (Numericals) –Applications. 1H NMR spectroscopy – Principle - Relation between field strength and frequency - chemical shift - spin-spin splitting (spectral problems) - coupling constant (definition) - applications of NMR- including MRI (brief).

MODULE III

Instrumental Methods and Nanomaterials Thermal analysis –TGA- Principle, instrumentation (block diagram) and applications – TGA of CaC2O4.H2O and polymers. DTA-Principle, instrumentation (block diagram) and applications - DTA of CaC2O4.H2O. Chromatographic methods - Basic principles and applications of column and TLCRetention factor. GC and HPLC-Principle, instrumentation (block diagram) - retention time and applications. Nanomaterials - Definition - Classification - Chemical methods of preparation - Hydrolysis and Reduction - Applications of Nanomaterials - Surface characterization -SEM – Principle and instrumentation (block diagram).

MODULE IV

Stereochemistry and Polymer Chemistry Isomerism-Structural, chain, position, functional, tautomerism and matamerism - Definition with examples - Representation of 3D structures-Newman, Sawhorse, Wedge and Fischer projection of substituted methane and ethane. Stereoisomerism - Geometrical isomerism in double bonds and cycloalkanes (cis-trans and E-Z notations). R-S Notation – Rules and examples - Optical isomerism, Chirality, Enantiomers and Diastereoisomers-Definition with examples. Conformational analysis of ethane, butane, cyclohexane, mono and di methyl substituted cyclohexane. Copolymers - Definition - Types - Random, Alternating, Block and Graft copolymers - ABS - preparation, properties and applications. Kevlar-preparation, properties and applications. Conducting polymers - Doping -Polyaniline and Polypyrrole - preparation properties and applications. OLED - Principle, construction and advantages.

MODULE V

Water Chemistry and Sewage Water Treatment Water characteristics - Hardness - Types of hardness- Temporary and Permanent - Disadvantages of hard water -Units of hardness- ppm

and mg/L -Degree of hardness (Numericals) - Estimation of hardness-EDTA method (Numericals). Water softening methods-Ion exchange process-Principle, procedure and advantages. Reverse osmosis – principle, process and advantages. Municipal water treatment (brief) - Disinfection methods - chlorination, ozone andUV irradiation. Dissolved oxygen (DO) -Estimation (only brief procedure-Winkler's method), BOD and CODdefinition, estimation (only brief procedure) and significance (Numericals). Sewage water treatment - Primary, Secondary and Tertiary - Flow diagram -Trickling filter and UASB process.

Text Books

1. B. L. Tembe, Kamaluddin, M. S. Krishnan, "Engineering Chemistry (NPTEL Web-book)", 2018.
2. P. W. Atkins, "Physical Chemistry", Oxford University Press, 10th edn. 2014.

Reference Books

1. C. N. Banwell, "Fundamentals of Molecular Spectroscopy", McGraw-Hill, 4thedn. 1995.
2. Donald L. Pavia, "Introduction to Spectroscopy", Cengage Learning India Pvt. Ltd., 2015.
3. B. R. Puri, L. R. Sharma, M. S. Pathania, "Principles of Physical Chemistry", Vishal Publishing Co., 47th Edition, 2017.
4. H. H. Willard, L. L. Merritt, "Instrumental Methods of Analysis", CBS Publishers, 7th Edition, 2005.
5. Ernest L. Eliel, Samuel H. Wilen, "Stereo-chemistry of Organic Compounds", WILEY, 2008.
6. Raymond B. Seymour, Charles E. Carraher, "Polymer Chemistry: An Introduction", Marcel Dekker Inc; 4th Revised Edition, 1996.
7. MuhammedArif, Annette Fernandez, Kavitha P. Nair "Engineering Chemistry", Owl Books, 2019.
8. Ahad J., "Engineering Chemistry", Jai Publication, 2019.
9. Roy K. Varghese, "Engineering Chemistry", Crownplus Publishers, 2019.
10. Soney C. George,RinoLaly Jose, "Text Book of Engineering Chemistry", S. Chand & Company Pvt Ltd, 2019.

PHT 100 ENGINEERING PHYSICS A (FOR CIRCUIT BRANCHES)

L-T-P

3-1-0

Credit 4

Course Objectives:

- The aim of the Engineering Physics Program is to offer students a solid background in the fundamentals of Physics and to impart that knowledge in engineering disciplines.
- The program is designed to develop scientific attitudes and enable the students to correlate the concepts of Physics with the core Programmes

Course Outcomes:

Student will be able to:

- Compute the quantitative aspects of waves and oscillations in engineering systems.
- Apply the interaction of light with matter through interference, diffraction and identify these phenomena in different natural optical processes and optical instruments.
- Analyze the behaviour of matter in the atomic and subatomic level through the principles of quantum mechanics to perceive the microscopic processes in electronic devices.
- Classify the properties of magnetic materials and apply vector calculus to static magnetic fields and use Maxwell's equations to diverse engineering problems
- Analyze the principles behind various superconducting applications, explain the working of solid state lighting devices and fibre optic communication system

SYLLABUS

ENGINEERING PHYSICS A (FOR CIRCUIT BRANCHES)

MODULE I

Oscillations and Waves Harmonic oscillations, Damped harmonic motion-Derivation of differential equation and its solution, Over damped, Critically damped and Under damped Cases, Quality factor-Expression, Forced oscillations-Differential Equation-Derivation of expressions for amplitude and phase of forced oscillations, Amplitude Resonance-Expression for Resonant frequency, Quality factor and Sharpness of Resonance, Electrical analogy of mechanical oscillators Wave motion- Derivation of one dimensional wave equation and its solution, Three dimensional wave equation and its solution (no derivation), Distinction

between transverse and longitudinal waves, Transverse vibration in a stretched string, Statement of laws of vibration

MODULE II

Wave Optics Interference of light-Principle of superposition of waves, Theory of thin films - Cosine law (Reflected system), Derivation of the conditions of constructive and destructive Interference, Interference due to wedge shaped films -Determination of thickness and test for optical planeness, Newton's rings - Measurement of wavelength and refractive index, Antireflection coatings Diffraction of light, Fresnel and Fraunhofer classes of diffraction, Diffraction grating-Grating equation, Rayleigh criterion for limit of resolution, Resolving and Dispersive power of a grating with expression (no derivation)

MODULE III

Quantum Mechanics & Nanotechnology Introduction for the need of Quantum mechanics, Wave nature of Particles, Uncertainty principle, Applications-Absence of electrons inside a nucleus and Natural line broadening mechanism, Formulation of time dependent and independent Schrodinger wave equations-Physical meaning of wave function, Particle in a one dimensional box- Derivation for normalized wave function and energy Eigen values, Quantum Mechanical Tunneling (Qualitative) Introduction to Nanoscience and technology, Increase in surface to volume ratio for Nanomaterials, Quantum confinement in one dimension, two dimension and three dimension-Nano sheets, Nano wires and Quantum dots, Properties of Nanomaterials-mechanical, electrical and optical, Applications of nanotechnology (qualitative ideas)

MODULE IV

Magnetism & Electro Magnetic Theory Magnetic field and Magnetic flux density, Gauss's law for Magnetic flux density, Ampere's Circuital law, Faraday's law in terms of EMF produced by changing magnetic flux, Magnetic permeability and susceptibility, Classification of magnetic materials-para, dia and ferromagnetic materials Fundamentals of vector calculus, concept of divergence, gradient and curl along with physical significance, Line, Surface and Volume integrals, Gauss divergence theorem & Stokes' theorem, Equation of continuity, Derivation of Maxwell's equations in vacuum, Comparison of displacement current with conduction current. Electromagnetic waves, Velocity of Electromagnetic waves in free space, Flow of energy and Poynting's vector (no derivation)

MODULE V

Superconductivity & Photonics Superconducting phenomena, Meissner effect and perfect diamagnetism, Types of superconductors Type I and Type II, BCS Theory (Qualitative), High temperature superconductors-Applications of super conductivity Introduction to photonics-Photonic devices-Light Emitting Diode, Photo detectors -Junction and PIN photodiodes, Solar cells-I-V Characteristics, Optic fibre-Principle of propagation of light, Types of fibres-Step index and Graded index fibres, Numerical aperture –Derivation, Fibre optic communication system (block diagram), Industrial, Medical and Technological

applications of optical fibre, Fibre optic sensors-Intensity Modulated and Phase modulated sensors.

Text Books

1. M.N.Avadhanulu, P.G.Kshirsagar,TVS Arun Murthy "A Text book of Engineering Physics", S.Chand &Co., Revised Edition 2019
2. H.K.Malik, A.K. Singh, "Engineering Physics" McGraw Hill Education, Second Edition 2017

Reference Books

1. Arthur Beiser, "Concepts of Modern Physics ", Tata McGraw Hill Publications, 6th Edition 2003
2. D.K. Bhattacharya, Poonam Tandon, "Engineering Physics", Oxford University Press, 2015
3. Md.N.Khan & S.Panigrahi "Principles of Engineering Physics 1&2", Cambridge University Press, 2016
4. Aruldhas G., "Engineering Physics", PHI Pvt. Ltd., 2015
5. Ajoy Ghatak, "Optics", Mc Graw Hill Education, Sixth Edition, 2017
6. T. Pradeep, "Nano:The Essentials'', McGraw Hill India Ltd, 2007
7. Halliday, Resnick, Walker, "Fundamentals of Physics'', John Wiley & Sons.Inc, 2001
8. David J Griffiths, "Introduction to Electrodynamics'', Addison-Wesley publishing, 3rd Edition, 1999
9. Premlet B., "Advanced Engineering Physics", Phasor Books, 10th edition,2017
10. I. Dominic and. A. Nahari, "A Text Book of Engineering physics", Owl Books Publishers, Revised edition, 2016

PHT 110 ENGINEERING PHYSICS B (FOR NON-CIRCUIT BRANCHES)

L-T-P

3-1-0

Credit 4

Course Objectives:

- The aim of the Engineering Physics program is to offer students a solid background in the fundamentals of Physics and to impart that knowledge in engineering disciplines.
- The program is designed to develop scientific attitudes and enable the students to correlate the concepts of Physics with the core Programmes

Course Outcomes:

Student will be able to:

- Compute the quantitative aspects of waves and oscillations in engineering systems.
- Apply the interaction of light with matter through interference, diffraction and identify these phenomena in different natural optical processes and optical instruments.
- Analyze the behaviour of matter in the atomic and subatomic level through the principles of quantum mechanics to perceive the microscopic processes in electronic devices.
- Apply the knowledge of ultrasonics in non-destructive testing and use the principles of acoustics to explain the nature and characterization of acoustic design and to provide a safe and healthy environment
- Apply the comprehended knowledge about laser and fibre optic communication systems in various engineering applications

SYLLABUS

ENGINEERING PHYSICS B (FOR NON-CIRCUIT BRANCHES)

MODULE I

Oscillations and Waves Harmonic oscillations, Damped harmonic motion-Derivation of differential equation and its solution, Over damped, Critically damped and Under damped Cases, Quality factor-Expression, Forced oscillations-Differential Equation-Derivation of expressions for amplitude and phase of forced oscillations, Amplitude Resonance-Expression for Resonant frequency, Quality factor and Sharpness of Resonance, Electrical analogy of mechanical oscillators Wave motion- Derivation of one dimensional wave equation and its solution, Three dimensional wave equation and its solution (no derivation), Distinction

between transverse and longitudinal waves, Transverse vibration in a stretched string, Statement of laws of vibration

MODULE II

Wave Optics Interference of light-Principle of superposition of waves, Theory of thin films - Cosine law (Reflected system), Derivation of the conditions of constructive and destructive Interference, Interference due to wedge shaped films -Determination of thickness and test for optical planeness, Newton's rings - Measurement of wavelength and refractive index, Antireflection coatings Diffraction of light, Fresnel and Fraunhofer classes of diffraction, Diffraction grating-Grating equation, Rayleigh criterion for limit of resolution, Resolving and Dispersive power of a grating with expression (no derivation)

MODULE III

Quantum Mechanics & Nanotechnology Introduction for the need of Quantum mechanics, Wave nature of Particles, Uncertainty principle, Applications-Absence of electrons inside a nucleus and Natural line broadening Mechanism, Formulation of time dependent and independent Schrodinger wave equations-Physical Meaning of wave function, Particle in a one dimensional box- Derivation for normalized wave function and energy Eigen values, Quantum Mechanical Tunneling (Qualitative) Introduction to nanoscience and technology, Increase in surface to volume ratio for Nanomaterials, Quantum confinement in one dimension, two dimension and three dimension-Nano sheets, Nano wires and Quantum dots, Properties of Nanomaterials-mechanical, electrical and optical, Applications of nanotechnology (qualitative ideas)

MODULE IV

Acoustics & Ultrasonics Acoustics, Classification of sound-Musical sound-Noise, Characteristics of Musical Sounds-Pitch or frequency-Loudness or Intensity-Measurement of Intensity level-Decibel-Quality or timbre, Absorption coefficient, Reverberation-Reverberation time-Significance- Sabine's formula (no derivation), Factors affecting architectural acoustics and their remedies Ultrasonics-Production- Magnetostriction effect and Piezoelectric effect, Magnetostriction oscillator and Piezoelectric oscillator –Working, Detection of ultrasonic waves - Thermal and Piezoelectric methods, Ultrasonic diffractometer- Expression for the velocity of ultrasonic waves in a liquid , Applications of ultrasonic waves -SONAR,NDT and Medical

MODULE V

Laser and Fibre optics Properties of laser, Absorption and emission of radiation, Spontaneous and stimulated emission, Einstein's coefficients (no derivation), Population inversion, Metastable states, basic components of laser, Active medium, Pumping mechanism, Optical resonant cavity, working principle, Construction and working of Ruby laser and Helium neon laser ,Construction and working of semiconductor laser(Qualitative) ,Applications of laser, Holography, Difference between hologram and photograph, Recording of hologram and reconstruction of image, Applications Optic fibre-Principle of propagation of light, Types of

fibres-Step index and Graded index fibres, Numerical aperture –Derivation, Fibre optic communication system (block diagram), Industrial, Medical and Technological applications, Fibre optic sensors-Intensity Modulated and Phase modulated sensors

Text Books

1. M.N.Avadhanulu, P.G.Kshirsagar,TVS Arun Murthy "A Text book of Engineering Physics", S.Chand &Co., Revised Edition, 2019.
2. H.K.Malik, A.K. Singh, "Engineering Physics" McGraw Hill Education, Second Edition, 2017.

Reference Books

1. Arthur Beiser, "Concepts of Modern Physics ", Tata McGraw Hill Publications, 6th Edition 2003
2. D.K. Bhattacharya, Poonam Tandon, "Engineering Physics", Oxford University Press, 2015
3. Md.N.Khan & S.Panigrahi "Principles of Engineering Physics 1&2", Cambridge University Press, 2016
4. Aruldhas G., "Engineering Physics", PHI Pvt. Ltd., 2015
5. Ajoy Ghatak, "Optics", Mc Graw Hill Education, Sixth Edition, 2017
6. T. Pradeep, "Nano:The Essentials'', McGraw Hill India Ltd, 2007
7. B. B. Laud, "Lasers and Non linear optics", New age International Publishers, 2nd Edition, 2005
8. Premlet B., "Advanced Engineering Physics", Phasor Books, 10th edition, 2017
9. I. Dominic and. A. Nahari, "A Text Book of Engineering physics", Owl Books Publishers, Revised edition, 2016

EST 100 ENGINEERING MECHANICS

L-T-P

2-1-0

Credit 3

Course Objectives:

- Goal of this course is to expose the students to the fundamental concepts of mechanics and enhance their problem-solving skills.
- It introduces students to the influence of applied force system and the geometrical properties of the rigid bodies while stationary or in motion.
- After this course students will be able to recognize similar problems in real-world situations and respond accordingly.

Course Outcomes:

Student will be able to:

- Recall principles and theorems related to rigid body mechanics
- Identify and describe the components of system of forces acting on the rigid body
- Apply the conditions of equilibrium to various practical problems involving different force system.
- Choose appropriate theorems, principles or formulae to solve problems of mechanics.
- Solve problems involving rigid bodies, applying the properties of distributed areas and masses

SYLLABUS

MODULE I

Introduction to Engineering Mechanics-statics-basic principles of statics-Parallelogram law, equilibrium law, principles of superposition and transmissibility, law of action and reaction(review) free body diagrams. Concurrent coplanar forces-composition and resolution of forces-resultant and equilibrium equations – methods of projections – methods of moments – Varignon's Theorem of moments.

MODULE II

Friction – sliding friction - Coulomb's laws of friction – analysis of single bodies –wedges, ladder analysis of connected bodies. Parallel coplanar forces – couple - resultant of parallel forces – Centre of parallel forces – equilibrium of parallel forces – Simple beam subject to concentrated vertical loads. General coplanar force system - resultant and equilibrium equations.

MODULE III

Centroid of composite areas- – moment of inertia-parallel axis and perpendicular axis theorems. Polar moment of inertia, radius of gyration, mass moment of inertia-ring, cylinder and disc. Theorem of Pappus Guldinus (demonstration only) Forces in space - vectorial

representation of forces, moments and couples –resultant and equilibrium equations – concurrent forces in space (simple problems only)

MODULE IV

Dynamics – rectilinear translation - equations of kinematics (review) kinetics – equation of motion – D'Alembert's principle. – Motion on horizontal and inclined surfaces, motion of connected bodies. Impulse momentum equation and work energy equation (concepts only). Curvilinear translation - equations of kinematics –projectile motion (review), kinetics – equation of motion. Moment of momentum and work energy equation (concepts only).

MODULE V

Rotation – kinematics of rotation- equation of motion for a rigid body rotating about a fixed axis – rotation under a constant moment. Plane motion of rigid body – instantaneous Centre of rotation (concept only). Simple harmonic motion – free vibration –degree of freedom-undamped free vibration of spring mass system-effect of damping (concept only)

Text Books

1. Timoshenko and Young, Engineering Mechanics, McGraw Hill Publishers
2. Shames, I. H., Engineering Mechanics - Statics and Dynamics, Prentice Hall of India.
3. R. C. Hibbeler and Ashok Gupta, Engineering Mechanics, Vol. I statics, Vol II Dynamics, Pearson Education.

References

1. Merriam J. L and Kraige L. G., Engineering Mechanics - Vols. 1 and 2, John Wiley.
2. Tayal A K, Engineering Mechanics – Statics and Dynamics, Umesh Publications
3. Bhavikkatti, S.S., Engineering Mechanics, New Age International Publishers
4. F.P.Beer abd E.R.Johnston (2011), Vector Mechanics for Engineers, Vol.I-Statics, Vol.II-Dynamics, 9 th Ed, Tata McGraw Hill
5. Rajasekaran S and Sankarasubramanian G, Engineering Mechanics - Statics and Dynamics, Vikas Publishing House Pvt Ltd

EST 110 ENGINEERING GRAPHICS

L-T-P

2-0-2

Credit 3

Course Objectives:

- To enable the student to effectively perform technical communication through graphical representation as per global standards.

Course Outcomes:

Student will be able to:

- Draw the projection of points and lines located in different quadrants
- Prepare multiview orthographic projections of objects by visualizing them in different positions
- Draw sectional views and develop surfaces of a given object
- Prepare pictorial drawings using the principles of isometric and perspective projections to visualize objects in three dimensions.
- Convert 3D views to orthographic views
- Obtain multiview projections and solid models of objects using CAD tools

SYLLABUS

General Instructions:

1. First angle projection to be followed
2. Section A practice problems to be performed on A4 size sheets
3. Section B classes to be conducted on CAD lab

SECTION A

MODULE I

Introduction: Relevance of technical drawing in engineering field. Types of lines, Dimensioning, BIS code of practice for technical drawing. Orthographic projection of Points and Lines: Projection of points in different quadrants, Projection of straight lines inclined to one plane and inclined to both planes. Trace of line. Inclination of lines with reference planes True length of line inclined to both the reference planes.

MODULE II

Orthographic projection of Solids: Projection of Simple solids such as Triangular, Rectangle, Square, Pentagonal and Hexagonal Prisms, Pyramids, Cone and Cylinder. Projection of solids in simple position including profile view. Projection of solids with axis inclined to one of the reference planes and with axis inclined to both reference planes.

MODULE III

Sections of Solids: Sections of Prisms, Pyramids, Cone, Cylinder with axis in vertical position and cut by different section planes. True shape of the sections. Also locating the section plane when the true shape of the section is given. Development of Surfaces: Development of surfaces of the above solids and solids cut by different section planes. Also finding the shortest distance between two points on the surface.

MODULE IV

Isometric Projection: Isometric View and Projections of Prisms, Pyramids, Cone , Cylinder, Frustum of Pyramid, Frustum of Cone, Sphere, Hemisphere and their combinations.

MODULE V

Perspective Projection: Perspective projection of Prisms and Pyramids with axis perpendicular to the ground plane, axis perpendicular to picture plane. Conversion of Pictorial Views: Conversion of pictorial views into orthographic views.

SECTION B (To be conducted in CAD Lab)

Introduction to Computer Aided Drawing: Role of CAD in design and development of new products, Advantages of CAD. Creating two dimensional drawing with dimensions using suitable software. (Minimum 2 exercises mandatory) Introduction to Solid Modelling: Creating 3D models of various components using suitable modelling software. (Minimum 2 exercises mandatory)

Text Books

1. Bhatt, N.D., Engineering Drawing, Charotar Publishing House Pvt. Ltd.
2. John, K.C. Engineering Graphics, Prentice Hall India Publishers.

Reference Books

1. Anilkumar, K.N., Engineering Graphics, Adhyuth narayan Publishers
2. Agrawal, B. And Agrawal, C.M., Engineering Darwing, Tata McGraw Hill Publishers.
3. Benjamin, J., Engineering Graphics, Pentex Publishers- 3rd Edition, 2017
4. Duff, J.M. and Ross, W.A., Engineering Design and Visualisation, Cengage Learning.
5. Kulkarni, D.M., Rastogi, A.P. and Sarkar, A.K., Engineering Graphics with AutoCAD, PHI.
6. Luzaddff, W.J. and Duff, J.M., Fundamentals of Engineering Drawing, PHI.
7. Varghese, P.I., Engineering Graphics, V I P Publishers
8. Venugopal, K., Engineering Drawing and Graphics, New Age International Publishers.

EST 120 -BASICS OF CIVIL & MECHANICAL ENGINEERING

L-T-P

4-0-0

Credit-4

Course Objective

- Objective of this course is to provide an insight and inculcate the essentials of Civil Engineering discipline to the students of all branches of Engineering and to provide the students an illustration of the significance of the Civil Engineering Profession in satisfying the societal needs.

Course Outcomes:

Student will be able to:

- Recall the role of civil engineer in society and to relate the various disciplines of Civil Engineering.
- Summarize the basic infrastructure services MEP, HVAC, elevators, escalators and ramps
  Summarize the basic infrastructure services MEP, HVAC, elevators, escalators and ramps
- Discuss the Materials, energy systems, water management and environment for green buildings
- Illustrate the working and features of IC Engines
- Illustrate the working and features of IC Engines
- Explain the basic principles of Refrigeration and Air Conditioning
- Describe the working of hydraulic machines
- Explain the working of power transmission elements
- Describe the basic manufacturing, metal joining and machining processes

MODULE 1

General Introduction to Civil Engineering: Relevance of Civil Engineering in the overall infrastructural development of the country. Responsibility of an engineer in ensuring the safety of built environment. Brief introduction to major disciplines of Civil Engineering like Transportation Engineering, Structural Engineering, Geo-technical Engineering, Water Resources Engineering and Environmental Engineering. Introduction to buildings: Types of buildings, selection of site for buildings, components of a residential building and their functions. Building rules and regulations: Relevance of NBC, KBR & CRZ norms (brief discussion only). Building area: Plinth area, built up area, floor area, carpet area and floor area ratio for a building as per KBR.

MODULE II

Surveying: Importance, objectives and principles. Construction materials, Conventional construction materials: types, properties and uses of building materials: bricks, stones, cement, sand and timber Cement concrete: Constituent materials, properties and types. Steel: Steel sections and steel reinforcements, types and uses. Modern construction materials: - Architectural glass, ceramics, Plastics, composite materials, thermal and acoustic insulating materials, decorative panels, waterproofing materials. Modern uses of gypsum, pre-fabricated building components (brief discussion only).

MODULE III

Building Construction: Foundations: Bearing capacity of soil (definition only), functions of foundations, types – shallow and deep (brief discussion only). Load bearing and framed structures (concept only). Brick masonry: - Header and stretcher bond, English bond &

Flemish bond random rubble masonry. Roofs and floors: - Functions, types; flooring materials (brief discussion only). Basic infrastructure services: MEP, HVAC, elevators, escalators and ramps (Civil Engineering aspects only), fire safety for buildings. Green buildings:- Materials, energy systems, water management and environment for green buildings. (Brief discussion only).

MODULE IV

Analysis of thermodynamic cycles: Carnot, Otto, Diesel cycles, Derivation of efficiency of these cycles, Problems to calculate heat added, heat rejected, network and efficiency. IC Engines: CI, SI, 2- Stroke, 4-Stroke engines. Listing the parts of different types of IC Engines. Efficiencies of IC Engines (Definitions only), Air, Fuel, cooling and lubricating systems in SI and CI Engines, CRDI, MPFI. Concept of hybrid engines.

MODULE V

Refrigeration: Unit of refrigeration, reversed Carnot cycle, COP, vapour compression cycle (only description and no problems); Definitions of dry, wet & dew point temperatures, specific humidity and relative humidity, Cooling and dehumidification, Layout of unit and central air conditioners. Description about working with sketches of: Reciprocating pump, Centrifugal pump, Pelton turbine, Francis turbine and Kaplan turbine. Overall efficiency, Problems on calculation of input and output power of pumps and turbines (No velocity triangles) Description about working with sketches of: Belt and Chain drives, Gear and Gear trains, Single plate clutches.

MODULE VI

Manufacturing Process: Basic description of the manufacturing processes – Sand Casting, Forging, Rolling, Extrusion and their applications. Metal Joining Processes: List types of welding, Description with sketches of Arc Welding, Soldering and Brazing and their applications Basic Machining operations: Turning, Drilling, Milling and Grinding. Description about working with block diagram of: Lathe, Drilling machine, Milling machine, CNC Machine. Principle of CAD/CAM, Rapid and Additive manufacturing.

Text Books:

1. Rangwala, S. C., Essentials of Civil Engineering, Charotar Publishing House
2. Mckay, W.B. and Mckay, J. K., Building Construction, Volumes 1 to 4, Pearson India Education Services

References Books:

1. Chen W.F and Liew J Y R (Eds), The Civil Engineering Handbook. II Edition CRC Press (Taylor and Francis)

2. Chudley, R and Greeno R, Building construction handbook, Addison Wesley, Longman group, England
3. Chudley, R, Construction Technology, Vol. I to IV, Longman group, England Course Plan
4. Kandya A A, Elements of Civil Engineering, Charotar Publishing house
5. Mamlouk, M. S., and Zaniewski, J. P., Materials for Civil and Construction Engineering, Pearson Publishers
6. Rangwala S.C and Dalal K B Building Construction Charotar Publishing house
7. Clifford, M., Simmons, K. and Shipway, P., An Introduction to Mechanical Engineering Part I - CRC Press
8. Roy and Choudhary, Elements of Mechanical Engineering, Media Promoters &Publishers Pvt. Ltd., Mumbai.
9. Sawhney, G. S., Fundamentals of Mechanical Engineering, PHI
10. G Shanmugam, M S Palanichamy, Basic Civil and Mechanical Engineering, McGraw Hill Education; First edition, 2018
11. Benjamin,J.,Basic Mechanical Engineering,Pentex Books,9th Edition,2018
12. Balachandran, P.Basic Mechanical Engineering,Owl Books

EST 130 BASICS OF ELECTRICAL AND ELECTRONICS ENGINEERING

L-T-P

4-0-0

Credit-4

Course Objectives:

This course aims to:

- Equip the students with an understanding of the fundamental principles of electrical engineering
- Provide an overview of evolution of electronics, and introduce the working principle and examples of fundamental electronic devices and circuits
- Provide an overview of evolution of communication systems, and introduce the basic concepts in radio communication.

Course Outcomes:

- Apply fundamental concepts and circuit laws to solve simple DC electric circuits
- Develop and solve models of magnetic circuits
- Apply the fundamental laws of electrical engineering to solve simple ac circuits in steady state
- Describe working of a voltage amplifier
- Outline the principle of an electronic instrumentation system
- Explain the principle of radio and cellular communication

MODULE I

Elementary Concepts of Electric Circuits Elementary concepts of DC electric circuits: Basic Terminology including voltage, current, power, resistance, emf; Resistances in series and parallel; Current and Voltage Division Rules; Capacitors & Inductors: V-I relations and energy stored. Ohms Law and Kirchhoff's laws-Problems; Star-delta conversion (resistive networks only-derivation not required)-problems. Analysis of DC electric circuits: Mesh current method - Matrix representation - Solution of network equations. Node voltage methods-matrix representation-solution of network equations by matrix methods. Numerical problems.

MODULE II

Elementary Concepts of Magnetic circuits, Electromagnetic Induction and AC fundamentals Magnetic Circuits: Basic Terminology: MMF, field strength, flux density, reluctance - comparison between electric and magnetic circuits- Series and parallel magnetic circuits with composite materials, numerical problems. Electromagnetic Induction: Faraday's laws, problems, Lenz's law- statically induced and dynamically induced emfs - Self-inductance and mutual inductance, coefficient of coupling Alternating Current fundamentals: Generation of alternating voltages-Representation of sinusoidal waveforms: frequency, period, Average, RMS values and form factor of waveforms-Numerical Problems.

MODULE III

AC Circuits AC Circuits: Phasor representation of sinusoidal quantities. Trigonometric, Rectangular, Polar and complex forms. Analysis of simple AC circuits: Purely resistive, inductive & capacitive circuits; Inductive and capacitive reactance, concept of impedance. Average Power Power factor. Analysis of RL, RC and RLC series circuits-active, reactive and apparent power. Simple numerical problems. Three phase AC systems: Generation of three phase voltages; advantages of three phase systems, star and delta connections (balanced only), relation between line and phase voltages, line and phase currents- Numerical problems

MODULE IV

Introduction to Semiconductor devices: Evolution of electronics – Vacuum tubes to Nano electronics. Resistors, Capacitors and Inductors (constructional features not required): types, specifications. Standard values, color coding. PN Junction diode: Principle of operation, V-I characteristics, principle of avalanche breakdown. Bipolar Junction Transistors: PNP and

NPN structures, Principle of operation, relation between current gains in CE, CB and CC, input and output characteristics of common emitter configuration.

MODULE V

Basic electronic circuits and instrumentation: Rectifiers and power supplies: Block diagram description of a dc power supply, Working of a full wave bridge rectifier, capacitor filter (no analysis), working of simple zener voltage regulator. Amplifiers: Block diagram of Public Address system, Circuit diagram and working of common emitter (RC coupled) amplifier with its frequency response, Concept of voltage divider biasing. Electronic Instrumentation: Block diagram of an electronic instrumentation system.

MODULE VI

Introduction to Communication Systems: Evolution of communication systems – Telegraphy to 5G. Radio communication: principle of AM & FM, frequency bands used for various communication systems, block diagram of super heterodyne receiver, Principle of antenna – radiation from accelerated charge. Mobile communication: basic principles of cellular communications, principle and block diagram of GSM.

Text Books

1. D P Kothari and I J Nagrath, “Basic Electrical Engineering”, Tata McGraw Hill, 2010.
2. D C Kulshreshtha, “Basic Electrical Engineering”, Tata McGraw Hill, 2010.
3. ChinmoySaha, Arindham Halder and Debarati Ganguly, Basic Electronics - Principles and Applications, Cambridge University Press, 2018.
4. M.S.Sukhija and T.K.Nagsarkar, Basic Electrical and Electronics Engineering, Oxford University Press, 2012.
5. Wayne Tomasi and Neil Storey, A Textbook on Basic Communication and Information Engineering, Pearson, 2010.

Reference Books

1. Del Toro V, “Electrical Engineering Fundamentals”, Pearson Education.
2. T. K. Nagsarkar, M. S. Sukhija, “Basic Electrical Engineering”, Oxford Higher Education.
3. Hayt W H, Kemmerly J E, and Durbin S M, “Engineering Circuit Analysis”, Tata McGraw-Hill
4. Hughes, “Electrical and Electronic Technology”, Pearson Education.
5. V. N. Mittle and Arvind Mittal, “Basic Electrical Engineering,” Second Edition, McGraw Hill.
6. Parker and Smith, “Problems in Electrical Engineering”, CBS Publishers and Distributors.

7. S. B. Lal Seksena and Kaustuv Dasgupta, "Fundamentals of Electrical Engineering", Cambridge University Press.
8. Anant Agarwal, Jeffrey Lang, Foundations of Analog and Digital Electronic Circuits, Morgan Kaufmann Publishers, 2005.
9. Bernard Grob, Ba sic Electronics, McGraw Hill.
10. A. Bruce Carlson, Paul B. Crilly, Communication Systems: An Introduction to Signals and Noise in Electrical Communication, Tata McGraw Hill, 5th Edition.

MAT 102 VECTOR CALCULUS, DIFFERENTIAL EQUATIONS AND TRANSFORMS

L-T-P

3-1-0

Credit 4

Course Objectives:

- This course introduces the concepts and applications of differentiation and integration of vector valued functions, differential equations, Laplace and Fourier Transforms.
- The objective of this course is to familiarize the prospective engineers with some advanced concepts and methods in Mathematics which include the Calculus of vector valued functions, ordinary differential equations and basic transforms such as Laplace and Fourier Transforms which are invaluable for any engineer's mathematical tool box.

The topics treated in this course have applications in all branches of engineering.

Course Outcomes:

Student will be able to:

- Compute the derivatives and line integrals of vector functions and learn their applications
- Evaluate surface and volume integrals and learn their inter-relations and applications.

- Solve homogeneous and non-homogeneous linear differential equation with constant coefficients
- Compute Laplace transform and apply them to solve ODEs arising in engineering
- Determine the Fourier transforms of functions and apply them to solve problems arising in engineering

SYLLABUS

MODULE I

Calculus of vector functions- Vector valued function of single variable, derivative of vector function and geometrical interpretation, motion along a curve-velocity, speed and acceleration. Concept of scalar and vector fields , Gradient and its properties, directional derivative , divergence and curl, Line integrals of vector fields, work as line integral, Conservative vector fields , independence of path and potential function(results without proof).

MODULE II

Vector integral theorems- Green's theorem (for simply connected domains, without proof) and applications to evaluating line integrals and finding areas. Surface integrals over surfaces of the form z = g(x, y), y = g(x, z) or x = g(y, z) , Flux integrals over surfaces of the form z = g(x, y), y = g(x, z) or x = g(y, z), divergence theorem (without proof) and its applications to finding flux integrals, Stokes' theorem (without proof) and its applications to finding line integrals of vector fields and work done.

MODULE III

Ordinary differential equations- Homogenous linear differential equation of second order, superposition principle,general solution, homogenous linear ODEs with constant coefficients-general solution. Solution of Euler-Cauchy equations (second order only).Existence and uniqueness (without proof). Non homogenous linear ODEs-general solution, solution by the method of undetermined coefficients (for the right hand side of the form x □,e □ $sinax$,$cosax$, e □ $sinaxe$□ $cosax$and their linear combinations), methods of variation of parameters. Solution of higher order equations-homogeneous and non-homogeneous with constant coefficient using method of undetermined coefficient.

MODULE IV

Laplace transforms- Laplace Transform and its inverse ,Existence theorem (without proof) , linearity, Laplace transform of basic functions, first shifting theorem, Laplace transform of derivatives and integrals, solution of differential equations using Laplace transform, Unit step function, Second shifting theorems. Dirac delta function and its Laplace transform, Solution of ordinary differential equation involving unit step function and Dirac delta functions. Convolution theorem (without proof) and its application to finding inverse Laplace transform of products of functions. **MODULEV**

Fourier Transforms- Fourier integral representation, Fourier sine and cosine integrals. Fourier sine and cosine transforms, inverse sine and cosine transform. Fourier transform and inverse Fourier transform, basic properties. The Fourier transform of derivatives. Convolution theorem (without proof)

Text Books

1. H. Anton, I. Biven S.Davis, “Calculus”, Wiley, 10th edition, 2015.
2. Erwin Kreyszig, “Advanced Engineering Mathematics”, Wiley, 10th edition, 2015. Reference Books 1. J. Stewart, Essential Calculus, Cengage, 2nd edition, 2017 2. G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, 9 th Edition, Pearson, Reprint, 2002.
3. Peter O Neil, Advanced Engineering Mathematics, 7th Edition, Thomson, 2007.
4. Louis C Barret, C Ray Wylie, “Advanced Engineering Mathematics”, Tata McGraw Hill, 6th edition, 2003.
5. VeerarajanT.”Engineering Mathematics for first year”, Tata McGraw - Hill, 2008.
6. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 36th edition, 2010.
7. Srimanta Pal, Subodh C. Bhunia, “Engineering Mathematics”, Oxford University Press, 2015.
8. Ronald N. Bracewell, “The Fourier Transform and its Applications”, McGraw – Hill International Editions, 2000.

HUN 101- LIFE SKILLS

L-T-P

2-0-2

Credit 0

Course Objectives:

- Life skills are those competencies that provide the means for an individual to be resourceful and positive while taking on life's vicissitudes.
- Development of one's personality by being aware of the self, connecting with others, reflecting on the abstract and the concrete, leading and generating change, and staying rooted in time-tested values and principles is being aimed at.
- This course is designed to enhance the employability and maximize the potential of the students by introducing them to the principles that underly personal and professional success, and help them acquire the skills needed to apply these principles in their lives and careers.

Course Outcomes:

Student will be able to:

- Define and Identify different life skills required in personal and professional life
- Develop an awareness of the self and apply well-defined techniques to cope with emotions and stress.

- Explain the basic mechanics of effective communication and demonstrate these through presentations.
- Take part in group discussions
- Use appropriate thinking and problem solving techniques to solve new problems
- Understand the basics of teamwork and leadership

SYLLABUS

MODULE I

Overview of Life Skills: Meaning and significance of life skills, Life skills identified by WHO: Self-awareness, Empathy, Critical thinking, Creative thinking, Decision making, problem solving, Effective communication, interpersonal relationship, coping with stress, coping with emotion. Life skills for professionals: positive thinking, right attitude, attention to detail, having the big picture, learning skills, research skills, perseverance, setting goals and achieving them, helping others, leadership, motivation, self-motivation, and motivating others, personality development, IQ, EQ, and SQ

MODULE II

Self-awareness: definition, need for self-awareness; Coping with Stress and Emotions, Human Values, tools and techniques of SA: questionnaires, journaling, reflective questions, meditation, mindfulness, psychometric tests, feedback. Stress Management: Stress, reasons and effects, identifying stress, stress diaries, the four A's of stress management, techniques, Approaches: action-oriented, emotion-oriented, acceptance oriented, resilience, Gratitude Training, Coping with emotions: Identifying and managing emotions, harmful ways of dealing with emotions, PATH method and relaxation techniques. Morals, Values and Ethics: Integrity, Civic Virtue, Respect for Others, Living Peacefully. Caring, Sharing, Honesty, Courage, Valuing Time, Time management, Cooperation, Commitment, Empathy, Self-Confidence, Character, Spirituality, Avoiding Procrastination, Sense of Engineering Ethics.

MODULE III

21st century skills: Creativity, Critical Thinking, Collaboration, Problem Solving, Decision Making, Need for Creativity in the 21st century, Imagination, Intuition, Experience, Sources of Creativity, Lateral Thinking, Myths of creativity, Critical thinking Vs Creative thinking, Functions of Left Brain & Right brain, Convergent & Divergent Thinking, Critical reading & Multiple Intelligence. Steps in problem solving: Problem Solving Techniques, Six Thinking Hats, Mind Mapping, Forced Connections. Analytical Thinking, Numeric, symbolic, and graphic reasoning. Scientific temperament and Logical thinking.

MODULE IV

Group and Team Dynamics: Introduction to Groups: Composition, formation, Cycle, thinking, Clarifying expectations, Problem Solving, Consensus, Dynamics techniques, Group

vs Team, Team Dynamics, Virtual Teams. Managing team performance and managing conflicts, Intrapreneurship.

MODULE V

Leadership: Leadership framework, entrepreneurial and moral leadership, vision, cultural dimensions. Growing as a leader, turnaround leadership, managing diverse stakeholders, crisis management. Types of Leadership, Traits, Styles, VUCA Leadership, Levels of Leadership, Transactional vs Transformational Leaders, Leadership Grid, Effective Leaders. Lab Activities Verbal Effective communication and Presentation skills. Different kinds of communication; Flow of communication; Communication networks, Types of barriers; Miscommunication Introduction to presentations and group discussions.

Learning styles: visual, aural, verbal, kinaesthetic, logical, social, solitary; Previewing, KWL table, active listening, REAP method Note-taking skills: outlining, non-linear note-taking methods, Cornell notes, three column note taking. Memory techniques: mnemonics, association, flashcards, keywords, outlines, spider diagrams and mind maps, spaced repetition. Time management: auditing, identifying time wasters, managing distractions, calendars and checklists; Prioritizing - Goal setting, SMART goals; Productivity tools and apps, Pomodoro technique.

Non Verbal: Non-verbal Communication and Body Language: Forms of non-verbal communication; Interpreting body-language cues; Kinesics; Proxemics; Chronemics; Effective use of body language, Communication in a multi-cultural environment.

Reference Books

1. Shiv Khera, You Can Win, Macmillan Books, New York, 2003.
2. Barun K. Mitra, “Personality Development & Soft Skills”, Oxford Publishers, Third impression, 2017.
3. ICT Academy of Kerala, "Life Skills for Engineers", McGraw Hill Education (India) Private Ltd., 2016.
4. Caruso, D. R. and Salovey P, “The Emotionally Intelligent Manager: How to Develop and Use the Four Key Emotional Skills of Leadership”, John Wiley & Sons, 2004.
5. Kalyana, “Soft Skill for Managers”; First Edition; Wiley Publishing Ltd, 2015.
6. Larry James, “The First Book of Life Skills”; First Edition, Embassy Books, 2016.
7. Shalini Verma, “Development of Life Skills and Professional Practice”; First Edition; Sultan Chand (G/L) & Company, 2014.
8. Daniel Goleman, "Emotional Intelligence"; Bantam, 2006.
9. Remesh S., Vishnu R.G., "Life Skills for Engineers", Ridhima Publications, First Edition, 2016.
10. Butterfield Jeff, “Soft Skills for Everyone”, Cengage Learning India Pvt Ltd; 1 edition, 2011.
11. Training in Interpersonal Skills: Tips for Managing People at Work, Pearson Education, India; 6 edition, 2015.

12. The Ace of Soft Skills: Attitude, Communication and Etiquette for Success, Pearson Education; 1 edition, 2013

HUN 102 PROFESSIONAL COMMUNICATION

L-T-P

2-0-2

Credit 0

Course Objectives:

- Clear, precise, and effective communication has become a sine qua non in today's information-driven world given its interdependencies and seamless connectivity.
- Any aspiring professional cannot but master the key elements of such communication.
- The objective of this course is to equip students with the necessary skills to listen, read, write, and speak so as to comprehend and successfully convey any idea, technical or otherwise, as well as give them the necessary polish to become persuasive communicators.

Course Outcomes:

Student will be able to:

- Develop vocabulary and language skills relevant to engineering as a profession
- Analyze, interpret and effectively summarize a variety of textual content
- Create effective technical presentations
- Discuss a given technical/non-technical topic in a group setting and arrive at generalizations/consensus
- Identify drawbacks in listening patterns and apply listening techniques for specific needs
- Create professional and technical documents that are clear and adhering to all the necessary conventions

SYLLABUS

MODULE 1

Use of language in communication: Significance of technical communication Vocabulary Development: technical vocabulary, vocabulary used in formal letters/emails and reports, sequence words, misspelled words, compound words, finding suitable synonyms, paraphrasing, verbal analogies. Language Development: subject-verb agreement, personal passive voice, numerical adjectives, embedded sentences, clauses, conditionals, reported speech, active/passive voice. Technology-based communication: Effective email messages, slide presentations, editing skills using software. Modern day research and study skills: search engines, repositories, forums such as Git Hub, Stack Exchange, OSS communities (MOOC, SWAYAM, NPTEL), and Quora; Plagiarism

MODULE II

Reading, Comprehension, and Summarizing: Reading styles, speed, valuation, critical reading, reading and comprehending shorter and longer technical articles from journals, newspapers, identifying the various transitions in a text, SQ3R method, PQRST method, speed reading. Comprehension: techniques, understanding textbooks, marking and underlining, Note-taking: recognizing non-verbal cues.

MODULE III

Oral Presentation: Voice modulation, tone, describing a process, Presentation Skills: Oral presentation and public speaking skills, business presentations, Preparation: organizing the material, self-Introduction, introducing the topic, answering questions, individual presentation practice, presenting visuals effectively. Debate and Group Discussions: introduction to Group Discussion (GD), differences between GD and debate; participating GD, understanding GD, brainstorming the topic, questioning and clarifying, GD strategies, activities to improve GD skills

MODULE IV

Listening and Interview Skills Listening: Active and Passive listening, listening: for general content, to fill up information, intensive listening, for specific information, to answer, and to understand. Developing effective listening skills, barriers to effective listening, listening to longer technical talks, listening to classroom lectures, talks on engineering /technology, listening to documentaries and making notes, TED talks. Interview Skills: types of interviews, successful interviews, interview etiquette, dress code, body language, telephone/online (Skype) interviews, one-to-one interview & panel interview, FAQs related to job interviews

MODULE V

Formal writing: Technical Writing: differences between technical and literary style. Letter Writing (formal, informal and semi-formal), Job applications, Minute preparation, CV preparation (differences between Bio-Data, CV and Resume), and Reports. Elements of style, Common Errors in Writing: describing a process, use of sequence words, Statements of Purpose, Instructions, Checklists. Analytical and issue-based Essays and Report Writing: basics of report writing; Referencing Style (IEEE Format), structure of a report; types of

reports, references, bibliography. Lab Activities Written: Letter writing, CV writing, Attending a meeting and Minute Preparation, Vocabulary Building Spoken: Phonetics, MMFS (Multimedia Feedback System), Mirroring, Elevator Pitch, telephone etiquette, qualities of a good presentation with emphasis on body language and use of visual aids.

Listening: Exercises based on audio materials like radio and podcasts. Listening to Song. Practice and exercises. Reading: Speed Reading, Reading with the help of Audio Visual Aids, Reading Comprehension Skills Mock interview and Debate/Group Discussion: concepts, types, do's and don'ts- intensive practice

Reference Books

1. English for Engineers and Technologists (Combined edition, Vol. 1 and 2), Orient Blackswan 2010.
2. Meenakshi Raman and Sangeetha Sharma,"Technical Communication: Principles and Practice", 2nd Edition, Oxford University Press, 2011
3. Stephen E. Lucas, "The Art of Public Speaking", 10th Edition; McGraw Hill Education, 2012.
4. Ashraf Rizvi, "Effective Technical Communication", 2nd Edition, McGraw Hill Education, 2017.
5. William Strunk Jr. & E.B. White, "The Elements of Style", 4th Edition, Pearson, 1999.
6. David F. Beer and David Mc Murrey, Guide to writing as an Engineer, John Willey. New York, 2004.
7. Goodheart-Willcox, "Professional Communication", First Edition, 2017.
8. Training in Interpersonal Skills: Tips for Managing People at Work, Pearson Education, India, 6 edition, 2015.
9. The Ace of Soft Skills: Attitude, Communication and Etiquette for Success, Pearson Education; 1 edition, 2013.
10. Anand Ganguly, "Success in Interview", RPH, 5th Edition, 2016.
11. Raman Sharma, "Technical Communications", Oxford Publication, London, 2004.

EST 102 PROGRAMING IN C

L-T-P

2-1-2

Credit 4

Course Objectives:

- The syllabus is prepared with the view of preparing the Engineering Graduates capable of writing readable C programs to solve computational problems that they may have to solve in their professional life.
- The course content is decided to cover the essential programming fundamentals which can be taught within the given slots in the curriculum.
- This course has got 2 Hours per week for practicing programming in C. A list showing 24 mandatory programming problems are given at the end.
- The instructor is supposed to give homework/assignments to write the listed programs in the rough record as and when the required theory part is covered in the class.
- The students are expected to come prepared with the required program written in the rough record for the lab classes.

Course Outcomes:

Student will be able to:

- Analyze a computational problem and develop an algorithm/flowchart to find its solution
- Develop readable* C programs with branching and looping statements, which uses Arithmetic, Logical, Relational or Bitwise operators.
- Write readable C programs with arrays, structure or union for storing the data to be processed
- Divide a given computational problem into a number of modules and develop a readable multi-function C program by using recursion if required, to find the solution to the computational problem
- Write readable C programs which use pointers for array processing and parameter passing
- Develop readable C programs with files for reading input and storing output

SYLLABUS

Programming in C (Common to all disciplines)

MODULE I

Basics of Computer Hardware and Software Basics of Computer Architecture: processor, Memory, Input& Output devices Application Software & System software: Compilers, interpreters, High level and low level languages Introduction to structured approach to programming, Flow chart Algorithms, Pseudo code (bubble sort, linear search - algorithms and pseudo code)

MODULE II

Program Basics Basic structure of C program: Character set, Tokens, Identifiers in C, Variables and Data Types , Constants, Console IO Operations, printf and scanf Operators and Expressions: Expressions and Arithmetic Operators, Relational and Logical Operators, Conditional operator, size of operator, Assignment operators and Bitwise Operators. Operators Precedence Control Flow Statements: If Statement, Switch Statement, Unconditional Branching using go to statement, While Loop, Do While Loop, For Loop, Break and Continue statements.(Simple programs covering control flow)

MODULE III

Arrays and strings Arrays Declaration and Initialization, 1-Dimensional Array, 2-Dimensional Array String processing: In built String handling functions (strlen, strcpy, strcat and strcmp, puts, gets) Linear search program, bubble sort program, simple programs covering arrays and strings

MODULE IV

Working with functions Introduction to modular programming, writing functions, formal parameters, actual parameters Pass by Value, Recursion, Arrays as Function Parameters structure, union, Storage Classes, Scope and life time of variables, simple programs using functions

MODULE V

Pointers and Files Basics of Pointer: declaring pointers, accessing data though pointers, NULL pointer, array access using pointers, pass by reference effect File Operations: open, close, read, write, append Sequential access and random access to files: In built file handling functions (rewind() ,fseek(), feel(), feof(), fread(), fwrite()), simple programs covering pointers and files.

Text Books

1. Schaum Series, Gottfried B.S.,Tata McGraw Hill,Programming with C
2. E. Balagurusamy, Mcgraw Hill,Programming in ANSI C
3. Asok N Kamthane, Pearson,Programming in C
4. Anita Goel, Pearson, Computer Fundamentals

Reference Books

1. Anita Goel and Ajay Mittal, Pearson, Computer fundamentals and Programming in C
2. Brian W. Kernighan and Dennis M. Ritchie, Pearson, C Programming Language
3. Rajaraman V, PHI, Computer Basics and Programming in C
4. Yashavant P, Kanetkar, BPB Publications, Let us C

CYL 120 ENGINEERING CHEMISTRY LAB

L-T-P

0-0-2

Credit 1

Course Objectives:

- To impart scientific approach and to familiarize with the experiments in chemistry relevant for research projects in higher semesters

Course outcomes:

Students will be able to:

- Understand and practice different techniques of quantitative chemical analysis to generate experimental skills and apply these skills to various analyses
- Develop skills relevant to synthesize organic polymers and acquire the practical skill to use TLC for the identification of drugs
- Develop the ability to understand and explain the use of modern spectroscopic techniques for analyzing and interpreting the IR spectra and NMR spectra of some organic compounds
- Acquire the ability to understand, explain and use instrumental techniques for chemical analysis
- Learn to design and carry out scientific experiments as well as accurately record and analyze the results of such experiments
- Function as a member of a team, communicate effectively and engage in further learning. Also understand how chemistry addresses social, economical and environmental problems and why it is an integral part of curriculum

SYLLABUS

LIST OF EXPERIMENTS (MINIMUM 8 MANDATORY)

1. Estimation of total hardness of water-EDTA method
2. Potentiometric titration
3. Determination of cell constant and conductance of solutions.
4. Calibration of pH meter and determination of pH of a solution
5. Estimation of chloride in water
6. Identification of drugs using TLC
7. Determination of wavelength of absorption maximum and colorimetric estimation of Fe3+ in solution

8. Determination of molar absorptivity of a compound (KMnO4 or any water soluble food colorant)
9. Synthesis of polymers (a) Urea-formaldehyde resin (b) Phenol-formaldehyde resin
10. Estimation of iron in iron ore
11. Estimation of copper in brass
12. Estimation of dissolved oxygen by Winkler's method
13. (a) Analysis of IR spectra (minimum 3 spectra) (b) Analysis of 1H NMR spectra (minimum 3 spectra)
14. Flame photometric estimation of Na+ to find out the salinity in sand
15. Determination of acid value of a vegetable oil
16. Determination of saponification of a vegetable oil

Reference Books

1. G. Svehla, B. Sivasankar, "Vogel's Qualitative Inorganic Analysis", Pearson, 2012.
2. R. K. Mohapatra, "Engineering Chemistry with Laboratory Experiments", PHI Learning, 2017.
3. Muhammed Arif, "Engineering Chemistry Lab Manual", Owl publishers, 2019.
4. Ahad J., "Engineering Chemistry Lab manual", Jai Publications, 2019.
5. Roy K Varghese, "Engineering Chemistry Laboratory Manual", Crownplus Publishers, 2019.
6. Soney C George, Rino Laly Jose, "Lab Manual of Engineering Chemistry", S. Chand & Company Pvt Ltd, New Delhi, 2019.

ESL 120 CIVIL & MECHANICAL WORKSHOP

L-T-P

0-0-2

Credit 1

Course Objectives:

- The course is designed to train the students to identify and manage the tools, materials and methods required to execute an engineering project.
- Students will be introduced to a team working environment where they develop the necessary skills for planning, preparing and executing an engineering project.
- To enable the student to familiarize various tools, measuring devices, practices and different methods of manufacturing processes employed in industry for fabricating components.

Course Outcomes:

Student will be able to:

- Name different devices and tools used for civil engineering measurements
- Explain the use of various tools and devices for various field measurements
- Demonstrate the steps involved in basic civil engineering activities like plot measurement, setting out operation, evaluating the natural profile of land, plumbing and undertaking simple construction work.
- Choose materials and methods required for basic civil engineering activities like field measurements, masonry work and plumbing.
- Compare different techniques and devices used in civil engineering measurements
- Identify Basic Mechanical workshop operations in accordance with the material and objects
- Apply appropriate Tools and Instruments with respect to the mechanical workshop trades
- Apply appropriate safety measures with respect to the mechanical workshop trades

SYLLABUS

PART 1 CIVIL WORKSHOP

1. Calculate the area of a built-up space and a small parcel of land- Use standard measuring tape and digital distance measuring devices
   a) Use screw gauge and Vernier caliper to measure the diameter of a steel rod and thickness of a flat bar
   b) Transfer the level from one point to another using a water level
   c) Set out a one room building with a given plan and measuring tape
2. Find the level difference between any two points using dumpy level

3. a) Construct a 1 ଢ଼ thick brick wall of 50 cm height and 60 cm length using English bond. Use spirit level to assess the tilt of walls. b) Estimate the number of different types of building blocks to construct this wall.
4. a) Introduce the students to plumbing tools, different types of pipes, type of connections, traps, valves, fixtures and sanitary fittings.
   b) Install a small rainwater harvesting installation in the campus

Reference Books:

1. Khanna P.N, "Indian Practical Civil Engineering Handbook", Engineers Publishers.
2. Bhavikatti. S, "Surveying and Levelling (Volume 1)", I.K. International Publishing House
3. Arora S.P and Bindra S.P, "Building Construction", Dhanpat Rai Publications
4. S. C. Rangwala, "Engineering Materials," Charotar Publishing House.

PART II MECHANICAL WORKSHOP

LIST OF EXERCISES (Minimum EIGHT units mandatory and FIVE models from Units 2 to 8 mandatory)

UNIT 1

General: Introduction to workshop practice, Safety precautions, Shop floor ethics, Basic First Aid knowledge. Study of mechanical tools, components and their applications: (a) Tools: screw drivers, spanners, Allen keys, cutting pliers etc and accessories (b) bearings, seals, O-rings, circlips, keys etc.

UNIT 2

Carpentry: Understanding of carpentry tools Minimum any one model 1. T –Lap joint 2. Cross lap joint 3. Dovetail joint 4. Mortise joints

UNIT 3

Foundry: Understanding of foundry tools Minimum any one model 1.Bench Molding 2. Floor Molding 3. Core making 4. Pattern making

UNIT 4

Sheet Metal: Understanding of sheet metal working tools Minimum any one model 1. Cylindrical shape 2. Conical shape 3. Prismatic shaped job from sheet metal

UNIT 5

Fitting: Understanding of tools used for fitting Minimum any one model 1. Square Joint 2. V-Joint 3. Male and female fitting

UNIT 6

Plumbing: Understanding of plumbing tools, pipe joints Any one exercise on joining of pipes making use of minimum three types of pipe joints

UNIT 7

Smithy: Understanding of tools used for smithy. Demonstrating the forge-ability of different materials (MS, Al, alloy steel and cast steels) in cold and hot states. Observing the qualitative difference in the hardness of these materials Minimum any one exercise on smithy 1. Square prism 2. Hexagonal headed bolt 3. Hexagonal prism 4. Octagonal prism

UNIT 8

Welding: Understanding of welding equipment Minimum any one welding practice Making Joints using electric arc welding. bead formation in horizontal, vertical and overhead positions

UNIT 9

Assembly: Demonstration only Dissembling and assembling of 1. Cylinder and piston assembly 2. Tail stock assembly 3. Bicycle 4. Pump or any other machine

UNIT 10

Machines: Demonstration and applications of the following machines Shaping and slotting machine; Milling machine; Grinding Machine; Lathe; Drilling Machine.

UNIT 11

Modern manufacturing methods: Power tools, CNC machine tools, 3D printing, Glass cutting.

ESL 130 ELECTRICAL & ELECTRONICS WORKSHOP

L-T-P

0-0-2

Credit 1

Course Objectives:

- Electrical Workshop is intended to impart skills to plan and carry out simple electrical wiring.
- It is essential for the practicing engineers to identify the basic practices and safety measures in electrical wiring.

Course Outcomes:

student will be able to

Demonstrate safety measures against electric shocks.

Identify the tools used for electrical wiring, electrical accessories, wires, cables, batteries and standard symbols

Develop the connection diagram, identify the suitable accessories and materials necessary for wiring simple lighting circuits for domestic buildings

Identify and test various electronic components

Draw circuit schematics with EDA tools

Assemble and test electronic circuits on boards

Work in a team with good interpersonal skills

SYLLABUS

PART 1 -ELECTRICAL

LIST OF EXERCISES / EXPERIMENTS

1. a) Demonstrate the precautionary steps adopted in case of Electrical shocks. b) Identify different types of cables, wires, switches, fuses, fuse carriers, MCB, ELCB and MCCB with ratings.

2. Wiring of simple light circuit for controlling light/ fan point (PVC conduit wiring)

3. Wiring of light/fan circuit using Two way switches. (Staircase wiring)

4. Wiring of Fluorescent lamps and light sockets (6A) with a power circuit for controlling power device. (16A socket)

5. Wiring of power distribution arrangement using single phase MCB distribution board with ELCB, main switch and Energy meter.

6. a)Identify different types of batteries with their specifications. b) Demonstrate the Pipe and Plate Earthing Schemes using Charts/Site Visit.

PART II –ELECTRONICS

LIST OF EXERCISES / EXPERIMENTS (MINIMUM OF 7 MANDATORY)

1. Familiarization/Identification of electronic components with specification (Functionality, type, size, colour coding, package, symbol, cost etc. [Active, Passive, Electrical, Electronic, Electro-mechanical, Wires, Cables,

Connectors, Fuses, Switches, Relays, Crystals, Displays, Fasteners, Heat sink etc.)

2. Drawing of electronic circuit diagrams using BIS/IEEE symbols and introduction to EDA tools (such as Dia or X Circuit), Interpret data sheets of discrete components and IC's, Estimation and costing.
3. Familiarization/Application of testing instruments and commonly used tools. [Multimeter, Function generator, Power supply, DSO etc.] [Soldering iron, De soldering pump, Pliers, Cutters, Wire strippers, Screw drivers, Tweezers, Crimping tool, Hot air soldering and de- soldering station etc.]
4. Testing of electronic components [Resistor, Capacitor, Diode, Transistor and JFET using multimeter.]
5. Inter-connection methods and soldering practice. [Bread board, Wrapping, Crimping, Soldering - types - selection of materials and safety precautions, soldering practice in connectors and general purpose PCB, Crimping.]
6. Printed circuit boards (PCB) [Types, Single sided, Double sided, PTH, Processing methods, Design and fabrication of a single sided PCB for a simple circuit with manual etching (Ferric chloride) and drilling.]
7. Assembling of electronic circuits using SMT (Surface Mount Technology) stations.
8. Assembling of electronic circuit/system on general purpose PCB, test and show the functioning (Any Two circuits). 1. Fixed voltage power supply with transformer, rectifier diode, capacitor filter, zener/IC regulator. 2. Square wave generation using IC 555 timer in IC base. 3. Sine wave generation using IC 741 OP-AMP in IC base. 4. RC coupled amplifier with transistor BC107.

2015 SCHEME

SEMESTER-I

MA102 DIFFERENTIAL EQUATIONS

L-T-P

3-1-0

Credit 4

Course Objectives:

- This course introduces basic ideas of differential equations, both ordinary and partial, which are widely used in the modelling and analysis of a wide range of physical phenomena and has got applications across all branches of engineering.
- The course also introduces Fourier series which is used by engineers to represent and analyze periodic functions in terms of their frequency components.

Course Outcomes:

- At the end of the course students will have acquired basic knowledge of differential equations and methods of solving them and their use in analyzing typical mechanical or electrical systems.
- The included set of assignments will familiarize the students with the use of software packages for analyzing systems modelled by differential equations.

MODULE I

HOMOGENEOUS DIFFERENTIAL EQUATIONS

Existence and uniqueness of solutions for initial value problems, Homogenous linear ODEs of second order. Homogenous linear ODEs with constant coefficients, Existence and Uniqueness of solutions Wronskian, Homogenous linear ODEs with constant Coefficients (Higher Order) (For practice and submission as assignment only: Modelling of free oscillations of a mass – spring system)

MODULE II

NON-HOMOGENEOUS LINEAR ORDINARY DIFFERENTIAL EQUATIONS

The particular Integral (P.I.), Working rule for P.I. when g(x) is Xm , To find P.I. when g(x) = eax.V1(x), Working rule for P.I. when g(x) = x.V(x), Homogeneous Linear Equations, PI of Homogenous equations Legendde's Linead eduations Method of variation of parameters for finding PIs (For practice and submission as assignments only: Modelling forced oscillations, resonance, electric circuits)

MODULE III

FOURIER SERIES

Periodic functions ,Orthogonally of Sine and Cosine functions (Statement only), Fourier series and Euler's formulas Fourier cosine series and Fourier sine series (Fourier series of even and Odd functions) Half range expansions (All results without proof (For practice and submission as assignment only: Plots of partial sums of Fourier series and demonstrations of convergence using plotting software)

MODULE IV

PARTIAL DIFFERENTIAL EQUATIONS

Introduction to partial differential equations , formation of PDE, Solutions of first order PDE(Linear only) Lagrange's Method Linear PDE with constant coefficients , Solutions of Linear Homogenous PDE with constant coefficients , Shorter method for finding PI when

g(x,y)=f(ax+by), Method of finding PI when g(x,y) = xmyn , method of find PI when g(x,y)= e ax+by V(x,y)

MODULE V

ONE DIMENSIONAL WAVE EQUATION

Method of separation of variables The wave Equation Vibrations of a stretched string Solutions of one dimensional wave equation using method of separation of variables and problems

MODULE VI

ONE DIMENSIONAL HEAT EQUATION

The equation of Heat conduction One dimensional Heat transfer equation. Solutions of One Dimensional Heat transfer equation, A long insulated rod with ends at zero temperatures, A long insulated rod with ends at non zero temperatures

Text Books

1. Erwin Kreyszig: Advanced Engineering Mathematics, 10th ed. Wiley
2. A C Srivastava, P K Srivasthava, Engineering Mathematics Vol 2. PHI Learning Private Limited, New Delhi.

References:

1. Simmons: Differential Equation with Applications and its historical Notes,2e McGrawHill Education India 2002
2. Datta, Mathematical Methods for Science and Engineering. CengageLearing,1st. ed
3. B. S. Grewal. Higher Engineering Mathematics, Khanna Publishers, New Delhi.
4. N. P. Bali, Manish Goyal. Engineering Mathematics, Lakshmy Publications
5. D. W. Jordan, P Smith. Mathematical Techniques, Oxford University Press, 4th Edition.
6. C. Henry Edwards, David. E. Penney. Differential Equations and Boundary Value Problems. Computing and Modelling, 3rd ed. Pearson

EE100 BASICS OF ELECTRICAL ENGINEERING

L-T-P

2-1-0

Credit 3

Course Objectives

- To impart a basic knowledge in Electrical Engineering with an understanding of fundamental concepts.

Course outcomes

- The course will enable the students to gain preliminary knowledge in basic concepts of Electrical Engineering.

MODULE I

Elementary concepts of electric circuits: Kirchhoff's laws, constant voltage and current sources-Problems 2 Formation of network equations by mesh current and node voltage methods-matrix representation-solution of network equations by matrix methods-problems star-delta conversion(resistive networks only-derivation is not needed)-problems

MODULE II

Magnetic Circuits: MMF, field strength, flux density, reluctance(definition only)-comparison between electric and magnetic circuits Energy stored in magnetic circuits, magnetic circuits with air gap-Numerical problems on series magnetic circuits Electromagnetic Induction: Faraday's laws, Lenz's laws- statically induced and dynamically induced emf-self-inductance and mutual inductance, coefficient of coupling (derivation not needed)

MODULE III

Alternating Current fundamentals: Generation of alternating voltages-waveforms, frequency, period, average, RMS values and form factor of periodic waveform (pure sinusoidal) - Numerical Problems

AC Circuits: Phasor representation of alternating quantities- rectangular and polar representation Analysis of simple AC circuits: concept of impedance, power and power factor in ac circuits-active, reactive and apparent power solution of RL,RC and RLC series circuits-Numerical problems Three phase systems: Generation of three phase voltages advantages of three phase systems, star and delta connection (balanced only), relation between line and phase voltages, line and phase currents three phase power measurement by two wattmeter method (derivation is not required) - Numerical problems

MODULE IV

Generation of power: Block schematic representation of generating stations- hydroelectric power plants Block schematic representation of Thermal and nuclear power plants Renewable energy sources: solar, wind, tidal and geothermal (Block diagram and working only- No Problems)

Power transmission: Typical electrical power transmission scheme-need for high voltage transmission-(Derivation is not needed, No Problems)

Power Distribution: substation equipment, primary and secondary transmission and distribution systems- feeder, servicemains

MODULE V

Electric Machines: DC Generator and Motor-Construction working principle- Back EMF

Types of motor-shunt, series, compound (short and long) - principle of operation of dc motor, applications-numerical problems (voltage -current relations only) Transformer: Construction of single phase and three phase Transformers (core type only)-EMF equation and related

numerical problems Losses and efficiency of transformer for full load –numerical problems (no equivalent circuit)

MODULE VI

AC Motors: Three phase induction motor-squirrel cage and slip ring induction motor

Working principle-synchronous speed, slip and related numerical problems. (No equivalent circuit) AC Motors: Construction, principles of operation of single phase induction motor (no equivalent circuit) starting methods in single phase induction motors -split phase and capacitor start

References Books:

1. Bhattacharya, S. K., Basic Electrical & Electronics Engineering, Pearson
2. Bird, J., Electrical Circuit Theory and Technology, Routledge, Taylor & Francis Group
3. Del Toro,V.,Electrical Engineering Fundamentals, Prentice Hall of India.
4. Hayt, W. H., Kemmerly, J. E., and Durbin, S. M., Engineering Circuit Analysis, Tata McGraw Hill •Hughes, Electrical and Electronic Technology, Pearson Education
5. Mehta, V.K. and Mehta,R., Basic Electrical Engineering, S. Chand Publishing
6. Parker and Smith, Problems in Electrical Engineering, CBS Publishers and Distributors
7. Sudhakar and Syam Mohan, Circuits and Networks Analysis and Synthesis, Tata McGraw Hill
8. Suresh Kumar, K. S, Electric Circuits and Networks, Pearson Education

BE110 ENGINEERING GRAPHICS

L-T-P

1-1-3

Credit 3

Course Objectives

- To enable the student to effectively communicate basic designs through graphical representations as per standards.

Course Outcome

Upon successful completion of this course, the student would have accomplished the following abilities and skills:

1. Fundamental Engineering Drawing Standards.
2. Dimensioning and preparation of neat drawings and drawing sheets.
3. Interpretation of engineering drawings
4. The features of CAD software

SYLLABUS

MODULE I

Introduction to Engineering Graphics: Need for engineering drawing. Drawing instruments; BIS code of practice for general engineering drawing. Orthographic projections of points and lines:-Projections of points in different quadrants; Projections of straight lines inclined to one of the reference planes, straight lines inclined to both the planes; True length and inclination of lines with reference planes; Traces of lines.

MODULE II

Orthographic projections of solids:-Projections of simple solids* in simple positions, projections of solids with axis inclined to one of the reference planes and axis inclined to both the reference planes.

MODULE III

Isometric Projections:-Isometric projections and views of plane figures simple* and truncated simple* solids in simple position including sphere and hemisphere and their combinations. Freehand sketching: Freehand sketching of real objects, conversion of pictorial views into orthographic views and vice versa

MODULE IV

Introduction to Computer Aided Drafting - familiarizing various coordinate systems and commands used in any standard drafting software - drawing of lines, circle, polygon, arc, ellipse, etc. Creating 2D drawings. Transformations: move, copy, rotate, scale, mirror, offset and array, trim, extend, fillet, chamfer. Dimensioning and text editing. Exercises on basic drafting principles, to create technical drawings. Creation of orthographic views of simple solids from pictorial views. Creation of isometric views of simple solids from orthographic views. Solid modelling and sectioning of solids, extraction of 2D drawings from solid models. (For internal examination only, not for University Examination).

(Additional hours are allotted in U slot for CAD practice) Internal

MODULE V

Sections and developments of solids: - Sections of simple* solids in simple vertical positions with section plane inclined to one of the reference planes - True shapes of sections. Developments of surfaces of these solids.

MODULE VI

Intersection of surfaces: - Intersection of prism in prism and cylinder in cylinder - axis bisecting at right angles only. Perspective projections: - perspective projections of simple* solids.

*Triangular, square, pentagonal and hexagonal prisms, pyramids, cones and cylinders.

References Books:

1. Agrawal, B. and Agrawal, C. M., Engineering Drawing, Tata McGraw Hill Publishers
2. Anilkumar, K. N., Engineering Graphics, Adhyuth Narayan Publishers
3. Benjamin, J., Engineering Graphics, Pentex Publishers
4. Bhatt, N., D., Engineering Drawing, Charotar Publishing House Pvt Ltd.
5. Duff, J. M. and Ross, W. A., Engineering Design and Visualization, Cengage Learning, 2009
6. John, K. C., Engineering Graphics, Prentice Hall India Publishers
7. Kirstie Plantenberg, Engineering Graphics Essentials with AutoCAD 2016 Instruction, 4th Ed., SDC Publications
8. Kulkarni, D. M., Rastogi, A. P. and Sarkar, A. K., Engineering Graphics with AutoCAD, PHI 2009
9. Luzadder, W. J. and Duff, J. M., Fundamentals of Engineering Drawing, PHI 1993
10. Parthasarathy, N. S., and Murali, V., Engineering Drawing, Oxford University Press
11. Varghese, P. I., Engineering Graphics, V I P Publishers
12. Venugopal, K., Engineering Drawing & Graphics, New Age International Publishers

SEMESTER-III

MA201 LINEAR ALGEBRA AND COMPLEX ANALYSIS

L-T-P

3-1-0

Credit 4

Course Objectives:

- To equip the students with methods of solving a general system of linear equations.
- To familiarize them with the concept of Eigen values and Diagonaliztion of a matrix which havemany applications in Engineering.
- To understand the basic theory of functions of a complex variable and conformal Transformations.

Course Outcome:

Students will be able to:

1. Solve any given system of linear equations
2. Find the Eigen values of a matrix and how to diagonalize a matrix
3. Identify analytic functions and harmonic functions.
4. Evaluate real definite integrals as application of residue theorem
5. Identify conformal mappings
6. Find regions that are mapped under certain transformations

SYLLABUS

MODULE I

Complex differentiation Limit, continuity and derivative of complex functions Analytic Functions-Cauchy–Riemann Equation(Proof of sufficient condition of analyticity & C R Equations in polar form not required)-Laplace's Equation Harmonic functions, Harmonic Conjugate

MODULE II

Conformal mapping: Geometry of Analytic functions Conformal Mapping,Circles and straight lines, extended complex plane, fixed points Special linear fractional Transformations, Cross Ratio, Cross Ratioproperty-Mapping of disks and half planesConformal mapping by w sinz & w cos z(Assignment: Application of analyticfunctions in Engineering)

MODULE III

Complex Integration. Definition Complex Line Integrals, First Evaluation Method, Second Evaluation Method Cauchy's Integral Theorem(without proof), Independence of path(without proof), Cauchy's Integral Theorem for Multiply Connected Domains (without proof) Cauchy's Integral Formula- Derivatives of Analytic Functions(without proof)Application of derivative of Analytical Functions Taylor and Maclaurin series(without proof), Power series as Taylor series, Practical methods(without proof) Laurent's series (without proof)

MODULE IV

Residue Integration Singularities, Zeros, Poles, Essential singularity, Zeros of analytic functionsResidue Integration Method, Formulas for Residues, Several singularities inside the contour Residue Theorem. Evaluation of Real Integrals (i) Integrals of rational functions ofSinT and cosT (ii)Integrals of the type f, f (x) dx (Type I, Integrals from 0 to f) (Assignment : Application of Complex integration in Engineering)

MODULE V

Linear systems of Equations, Coefficient Matrix, Augmented MatrixGauss Elimination and back substitution, Elementary row operations, Row equivalent systems, Gauss elimination-Three possible cases, Row Echelon form and Information from it. Linear independence-rank of a matrix Vector Space-Dimension-basis-vector spaceSolution of linear systems,

Fundamental theorem of non-homogeneous linear systems(Without proof)-Homogeneous linear systems (Theory only)

MODULE VI

Matrix Eigen value Problem -Determination of Eigen values and Eigen vectors-Eigen spaceSymmetric, Skew Symmetric and Orthogonal matrices –simple properties (without proof) Basis of Eigen vectors- Similar matrices Diagonaliztion of a matrix- Quadratic forms-Principal axis theorem (without proof)

Text Books:

1. Erwin Kreyszig: Advanced Engineering Mathematics, 10th ed. Wiley

References:

1. Dennis g Zill&Patric D Shanahan-A first Course in Complex Analysis with Applications-Jones&BartletPublishers
2. B. S. Grewal. Higher Engineering Mathematics, Khanna Publishers, New Delhi.
3. Lipschutz, Linear Algebra,3e (Schaums Series)McGraw Hill Education India 2005
4. Complex variables introduction and applications-second edition-Mark.J.Owitz-Cambridge Publication

HS200 BUSINESS ECONOMICS

L-T-P

3-0-0

Credit 3

Course Objectives

- To familiarize the prospective engineers with elementary Principles of Economics and Managerial Economics
- To acquaint the students with tools and techniques that are useful in their profession in Managerial Decision Making which will enhance their employability;
- To gain understanding of some Macroeconomic concepts to improve their ability to understand the business climate;
- To prepare and understand balance sheet at an elementary level.

Course Outcome

A student who has undergone this course:

- Would be able to make investment decisions based on capital budgeting methods in alignment with microeconomic and macroeconomic theories.

- Would be able to analyze the profitability of the firm, economy of operation, determination of price under various market situations with good grasp on the effect of trade cycles in business.
- Would gain knowledge on monetary theory, measures by rbi in controlling interest rate and emerging concepts like bit coin.
- Would gain knowledge of elementary accounting concepts used for preparing balance sheet and interpretation of balance sheet

SYLLABUS

MODULE I

Nature of Economics Definitions of Economics and theirlimitations, Economic Problems , EconomicSystems, meaning of Business or Managerial Economics and its role and relevance in managerial decisionmaking in an industrial setting

MODULE II

Demand and Supply Analysis Demand Curve, Demandfunction,Elasticity of demand and its estimation,Supply curve, equilibrium price and price mechanism

MODULE III

Production Economics Economies of Scale andDiseconomies of Scale Production and CostFunctions. Factors of Production Law ofDiminishing marginal Productivity. Construction andanalysis of Break Even Charts

MODULE IV

Market Structure and Price-Output Decisions Price andoutput determination under Perfect Competition, Monopolyand Monopolistic Competition .Collusion andCartel, Nash Equilibrium

MODULE V

Money, National Income and Taxation Money, EmergingBit Coin concept, Quantity Theory of Money, Interest Rate Management , Open Market Operations by RBI,Selective Credit Controls, SLR, CRR , Definition &Measurement of National Income, methods, sectors of economy, inflation, deflation, trade cycles- Value-Added Tax .

MODULE VI

Investment Decisions and Balance Sheet Analysis CapitalBudgeting, Investment Analysis – NPV, IRR, ProfitabilityIndex, ARR, Payback Period , Depreciation, Timevalue of money. Business Forecasting– Elementary techniques. Balance sheet preparation principles and interpretation

Text Book

1. Yogesh, Maheswari, Management Economics , PHI learning, NewDelhi, 2012

References

1. Dornbusch, Fischer and Startz, Macroeconomics, McGraw Hill, 11th edition, 2010.
2. Khan M Y, Indian Financial System, Tata McGraw Hill, 7th edition, 2011.
3. Samuelson, Managerial Economics, 6th edition, Wiley
4. Snyder C and Nicholson W, Fundamentals of Microeconomics, Cengage Learning
2. (India), 2010.
5. Truett, Managerial Economics: Analysis, Problems, Cases, 8th Edition, Wiley
3. Welch, Economics: Theory and Practice 7th Edition, Wiley

CE201 MECHANICS OF SOLIDS

L-T-P

3-1-0

Credit 4

Course Objectives:

- To enable the students to calculate stresses and strains generated in material due to external loads for various types of loading conditions

Course Outcome:

- Ability to calculate internal forces in members subject to axial loads, shear, torsion and bending and plot their distributions
- Ability to calculate normal, shear, torsion and bending stresses and strains
- Ability to transform the state of stress at a point and determine the principal and maximum shear stresses using equations as well as the Mohr's circle
- Understanding of column buckling and ability to calculate critical load and stress

SYLLABUS

MODULE I

Review of StaticsTypes of external loads - internal stresses - normal and shearstresses - strain - Hooke's law - working stress - stress straindiagrams - Poisson's ratio - relationship between elastic constants

MODULE II

Elongation of bars of constant and varying sections –statically indeterminate problems in tension and compression–Temperature effects – strain energy and complementaryenergy-strain energy due to tension, compression and shear

MODULE III

Bending Moment & Shear force: Different types of beams-various types of loading – Relationship connecting intensity ofloading , shearing force and bending moment- shear force andbending moment diagrams for cantilever beams and Simplysupported beams for different types of loading.

MODULE IV

Stresses in beams of symmetrical cross sections:Theory of simple bending –assumptions and limitations –Normal stresses in beams- Moment of resistance - beams ofuniform strength - beams of two materials – strain energy dueto bending - shearing stresses in beams.

MODULE V

Analysis of stress and strain on oblique sections: Stress on inclined planes for axial and biaxial stress fields - principal stresses - Mohr's circle of stress Thin and Thick Cylinders: Stresses in thin cylinders – thick cylinders - Lame's equation – stresses in thick cylinders due to internal and external pressures Torsion: Torsion of solid and hollow circular shafts.-Pure shear- strain energy in pure shear and torsion. Springs: Close coiled and open coiled helical springs.

MODULE VI

Deflection of statically determinate beams: Differentialequation of the elastic curve - Method of successiveintegration, Macaulay's method, Method of superposition,moment area method.Theory of columns: Direct and bending stresses in shortcolumns- Kern of a section. Buckling and stability-Euler'sbuckling/crippling load for columns with different end conditions. Rankine's formula

Text Books:

1. Timoshenko , Strength of Materials Vol. I & Vol. II , CBS Publishers & Distributers, NewDelhi
2. Rattan, Strength of Materials 2e McGraw Hill Education India 2011

References:

1. Crandall, An Introduction to Mechanics of Solids 3e McGraw Hill Education India 2014
2. Egor P Popov , Mechanics of solids, Prentice Hall of India, New Delhi
3. M.L. Gambhir, Fundamentals of structural Mechanics and analysis, Prentice Hall India
4. Stephen H Crandall, N C Dahi, Thomas J L, M S Sivakumar, an introduction to Mechanics
1. of Solids , McGraw hill Education, 3rd edition
5. Cheng, Statics and Strength of Materials 2e McGraw Hill Education India 2013
6. Hearn E.J., Mechanics of Materials, Pergamon Press, Oxford
7. Nash W A, Strength of Materials (SIE) (Schaum's Outline Series) 5e McGraw Hill
2. Education India 2010
8. Rajput R.K. Strength of Materials, S.Chand&company Ltd., New Delhi
9. James M Gere & Stephen P Timoshenko , Mechanics of Materials , CBS Publishers &
10. Distributers, New Delhi
11. Punmia B. C., A. K. Jain and A. K. Jain, Mechanics of Materials, Laxmi Publications(P)Ltd, New Delhi

CE203 FLUID MECHANICS – I

L-T-P

3-1-0

Credit 4

Course Objectives

- To understand the basic properties of the fluid, fluid statics, kinematics, and fluid dynamics so as to analyze and appreciate the complexities involved in solving the fluid flow problems.
- To give an introduction to the fundamentals of fluid flow and its behavior so as to equip the students to learn related subjects and their applications in the higher semesters.
- To develop the skill for applying the fluid statics, kinematics and dynamics of fluid flow concepts for solving civil engineering problems, Fluid Statics, Fluid pressure, Buoyancy and floatation, Fluid Kinematics, Dynamics of fluid flow, Flow through orifice and notches, Flow through pipes, Boundary layer, Drag and lift on Immersed bodies

Course Outcomes:

- Students will be able to get a basic knowledge of fluids in static, kinematic and dynamic equilibrium, so as to solve real life problems in fluid mechanics.
- Students will gain the knowledge of the applicability of physical laws in addressing problems in hydraulics.

SYLLABUS

MODULE I

Fluid properties - density – specific gravity – surface tension and capillarity - vapour pressure - viscosity and compressibility - Classification of Fluids (No questions to be asked) .Fluid statics: Fluid pressure, variation of pressure in a fluid, measurement of pressure using manometers- simple

manometers, differential manometers, Pressure head. Forces on immersed plane and curved surfaces. Pressure distribution diagram for vertical surfaces, Practical application of total pressure (spillway gates).Buoyancy and Floatation: Buoyant force, stability of floating and submerged bodies, metacentre and metacentric height, Analytical and experimental determination of metacentric height.

MODULE II

Kinematics of fluid flow: Methods of describing fluid motion, Lagrangian and Eulerian methods, Types of fluid flow: steady and unsteady flow, uniform and non-uniform flow, one, two and three dimensional flow, laminar and turbulent flow, rotational and irrotational flow. Types of flow lines: stream line, path line, streak lines, conservation of mass, equation of continuity in one, two and three dimensions, (Derivation in Cartesian co-ordinate system only) Velocity & Acceleration of fluid particle, convective and local acceleration, Deformation of fluid elements: circulation and vorticity, velocity potential, stream function, equipotential lines, flow net, uses of flow net; Vortex motion, free and forced vortex (no problems).

MODULE III

Dynamic of fluid flow: Euler's equation of motion and integration of Euler's equation of motion along a streamline. Bernoulli's Equation, Energy correction factors, Applications of Bernoulli's equation: Pitot tube, Venturimeter and orifice meter. Momentum Principle- Steady flow momentum equation- Momentum correction factor, Force computation on a pipe bend

MODULE IV

Flow through orifices: Different types of orifices, Flow over a sharp edged orifice, Hydraulic coefficients – Experimental determination of these coefficients, flow through large rectangular orifice, Flow through submerged orifices, flow under variable heads, time of emptying. Flow over weirs: flow over rectangular, triangular and trapezoidal sharp crested weir, Cipolletti weir, Broad crested weir, submerged weirs, Proportional weir.

MODULE V

Flow through pipes: Viscous flow - Shear stress, pressure gradient relationship - laminar flow between parallel plates - Laminar flow through circular tubes (Hagen Poiseulle's Eqn) - Hydraulic and energy gradient - flow through pipes - Darcy -Weisbach's equation - pipe roughness -friction factor- Moody's diagram- Major and minor losses of flow in pipes - Pipes in series and in parallel.

MODULE VI

Boundary layer theory-no slip condition, boundary layer thickness, boundary layer growth over long thin plate, laminar, turbulent boundary layer, laminar sub layer, Momentum integral equation of boundary layer (no derivation), Blasius boundary layer equations for laminar and turbulent boundary layer. Drag and lift on Immersed bodies-Pressure drag and friction drag, profile drag, Drag and lift co-efficient computation of drag on a flat plate. Separation of boundary layer and control.

Text Books

1. Modi P. N. and S. M. Seth, Hydraulics & Fluid Mechanics, S.B.H Publishers, New Delhi, 2002.
2. Subramanya K., Theory and Applications of Fluid Mechanics, Tata McGraw-Hill, 1993.

References

1. Streeter.V.L. Fluid Mechanics, Mc Graw Hill Publishers.
2. Bruce R Munson, Donald F Young . Fundamentals of Fluid Mechanics, John Wiley & sons, 2011.
3. Jain A. K., Fluid Mechanics, Khanna Publishers, Delhi, 1996.

4. Joseph Katz, Introductory Fluid Mechanics, Cambridge University Press, 2015
5. Arora.K.R. Fluid Mechanics, Hydraulics and Hydraulic Machines, Standard Publishers, 2005.
6. Narasimhan S., A First Course in Fluid Mechanics, University Press (India) Pvt. Ltd., 2006.
7. Frank.M.White, Fluid Mechanics, Mc Graw Hill, 2013.
8. Mohanty.A.K. Fluid Mechanics, Prentice Hall, New Delhi, 2011
9. Narayana Pillai,N. Principles of Fluid Mechanics and Fluid Machines, University Press, 2011.
10. Kumar.D.N. Fluid Mechanics and Fluid power Engineering, S.K.Kataria & sons, 2013.

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CE205 ENGINEERING GEOLOGY

L-T-P

3-0-1

Credit 4

Course Objectives

- Awareness about earth resources and processes to be considered in various facets of civil engineering
- Appreciation of surface of earth as the fundamental foundation structure and the natural phenomena that influence its stability

Course Outcomes:

- The course would help the student to understand of the factors that determine the stability ofearth's surface
- The student would comprehend better the earth resources used as building materials

SYLLABUS

MODULE I

Relevance of geology in Civil Engineering.Subdivisions of Geology. Weathering, types and itsengineering significance. Laboratory tests used incivil engineering for assessing intensity ofweathering. Engineering classification of weatheredrock masses. Soil profile. Geological classification ofsoils.

MODULE II

Hydrogeology-occurrence of groundwater, Types ofaquifers, permeability / hydraulic conductivity.Engineering significance of subsurface water-problems created in construction, as an erosionalagent. Methods to control of subsurface water-barriers and liners, drains and wells. (Resistivitysurvey of groundwater may be demonstrated)

MODULE III

Minerals- Properties that affect the strength ofminerals. Physical properties and chemicalcomposition of following minerals -quartz,feldspars (orthoclase and plagioclase), micas(biotite and muscovite), amphibole (hornblende),pyroxene (augite and hypersthene), gypsum,calcite, clay minerals (kaolinite), their chemical formulae. Earth quakes- in relation to internal structure of earth and plate tectonics

MODULE IV

Rocks as aggregates of minerals. Basic concepts-igneous, sedimentary and metamorphic rocks, Briefaccount of following rocks- granite, basalt,sandstone, limestone, shale, marble and quartzite.Rock features that influence the strength of rocksas construction material-concepts of lineation andfoliation-schistosity and gneissosity. Rock types ofKerala. Brief account of engineering properties ofrocks used as construction material (building andfoundation) and road aggregates. Assessment ofthese properties. (Students should be taught toidentify common rock forming minerals andcommon rocks based on their physical properties).

MODULE V

Attitude of geological structures- strike and dip.Brunton compass. Deformation structures andtheir engineering significance- folds, faults and joints. Geological factors considered in the construction of dams and reservoirs, tunnels. (Simple exercises based on geological/topographic maps for determination of dip, apparent dip and thickness of lithological beds and preparation of geological cross sections should be performed. The students should be instructed in handling clinometer/Brunton compass to determine strike and dip)

MODULE VI

Introduction to natural hazards-Mass movements (Landslides), floods, their common management strategies. Coastal Processes- waves, currents and landforms. Types of coastal protection strategies. Soil erosion- causes and types and soil conservation measures.

Text Books / References:

1. Duggal, SK,Rawal,N and Pandey, HK (2014) Engineering Geology, McGraw Hill
1. Education, New Delhi
2. Garg, SK (2012) Introduction to Physical and Engineering Geology, Khanna Publishers,
3. New Delhi

4. Gokhale, KVGK (2010) Principles of Engineering Geology, BS Pubications, Hyderabad
5. Kanithi V (2012) Engineering Geology, Universities Press (India) Ltd., Hyderabad
6. Singh, P (2004) Engineering and General Geology, S. K. Kataria and Sons, New Delhi
7. Bennison, GM, Olver, PA and Moseley, KA (2013) An introduction to geological structuresand maps, Routledge, London
6. Gokhale, NW (1987) Manual of geological maps, CBS Publishers, New Delhi

CE207 SURVEYING

L-T-P

3-0-0

Credit 3

Course objectives:

- To introduce the principle of surveying
- To impart awareness on the various fields of surveying and types of instruments
- To understand the various methods of surveying and computations

Course Outcomes:

- After successful completion of the course, the students will possess knowledge on the basics of surveying and different methods of surveying

SYLLABUS

MODULE I

Introduction to Surveying- Principles, Linear, angular and graphical methods, Survey stations, Survey lines- ranging, Bearing of survey lines, Local attraction, Declination, Dip, Latitude and Departure, Methods of orientation, Principle of resection

MODULE II

Levelling: Principles of levelling- Dumpy level-booking and reducing levels, Methods-simple, differential, reciprocal leveling, profile levelling and cross sectioning. Digital and Auto Level, Errors inlevellingContouring: Characteristics, methods, uses.

MODULE III

Area and Volume: Various methods ofcomputation. Theodolite survey: Instruments, Measurement ofhorizontal and vertical angle. Mass diagram: Construction, Characteristics and Uses.

MODULE IV

Triangulation: Triangulation figures, Strength of figure, Triangulation stations, Inter visibility of stations, Towers and signals – Satellite Stations and reduction to Centre.

MODULE V

Theory of Errors – Types, theory of least squares,Weighting of observations, most probable value,Application of weighting, Computation of indirectlyobserved quantities - method of normal equations.

MODULE VI

Electromagnetic distance measurement (EDM) –Principle of EDM, Modulation, Types of EDMinstruments, DistomatTotal Station – Parts of a Total Station – Accessories – Advantages and Applications, Introduction toAstronomical terms, Field Procedure for total stationsurvey, Errors in Total Station Survey.

Text Books:

1. Prof. T.P.Kenetkar & Prof.S.V.Kulkarni - Surveying and Levelling , Pune Vidyarthi GrihaPrakashan,2004
2. N N Basak, Surveying and Levelling, Mc GrawHill Education

References:

1. R.Agor - A Text book of Surveying and Levelling, Khanna Publishers, 2005
2. C. Venkatramaiah, Textbook of Surveying, Universities Press (India) Private Limited 2011
3. James M Andersen, Edward M Mikhail, Surveying Theory and Practice, McGraw HillEducation
4. Dr. B.C.Punmia , Ashok Kumar Jain &Arun Kumar Jain - Surveying , Laxmi publications(P)Ltd , 2005
5. S.K.Duggal - Surveying Vol. I, Tata Mc Graw Hill Ltd, Reprint 2015.

CE231 CIVIL ENGINEERING DRAFTING LAB

L-T-P

0-0-3

Credit 1

Course Objectives:

- To introduce the fundamentals of Civil Engineering drawing.
- To understand the principles of planning
- To learn drafting of buildings.
- To impart knowledge on drafting software such as AutoCAD.

Course Outcomes:

- To accomplish the abilities/skills for the following.
- 1. To understand the drawings of various components of buildings
- 2. Preparation of building drawings.
- 3. Interpretation of building drawings.
- 4. Use of a drafting software.

LIST OF EXERCISES: (at least 10 exercises / plates are mandatory)

1. Paneled Doors
2. Glazed Windows and Ventilators in wood
3. Steel windows
4. Roof truss in steel sections
5. Reinforced concrete staircase
6. Residential buildings with flat roof
7. Residential buildings with tiled roof
8. Preparation of site plan and service plans as per building rules
9. Building Services (for single and two storied buildings only). Septic tanks and soak pit detailed drawing
10. Two storied and multi storied buildings
11. Public buildings like office, dispensary, post office, bank etc.
12. Industrial buildings with trusses

Text Books:

1. National Building Code of India.

2. Kerala Municipal Building Rules.

3. Dr. Balagopal T.S. Prabhu, Building Drawing and Detailing, Spades Publishers, Calicut

4. AutoCAD Essentials, Autodesk official Press, John Wiley & Sons, USA

References:

1. Shah, M.G., Kale, C. M. and Patki, S.Y. Building Drawing With an Integrated Approach to Built Environment, Tata McGraw Hill Publishing Company Limited, New Delhi

CE233 SURVEYING LAB

L-T-P

0-0-3

Credit 1

Course Objectives:

- To equip the students to undertake survey using tacheometer
- To equip the students to undertake survey using total station
- To impart awareness on distomat and handheld GPS

Course Outcome:

- Ability to undertake survey using level and theodolite and total station

LIST OF EXERCISES/EXPERIMENTS: (10 to12 exercises are mandatory)

1. Introduction to conventional surveying -1 class
2. Levelling (dumpy level) -2 class
3. Theodolite surveying (Theodolite) -3class
4. Total Station survey (Total Station) -5 class
    a. Heights and Distance
    b. Area computation
    c. Downloading
5. Study of instruments –Automatic level, digital level, Handheld GPS -2 class
6. Test -2 class

SEMESTER-IV

MA202 PROBABILITY DISTRIBUTIONS, TRANSFORMS AND NUMERICAL METHODS

L-T-P

3-1-0

Credit 4

Course Objectives

- To introduce the concept of random variables, probability distributions, specific discrete and continuous distributions with practical application in various Engineering and social life situations.
- To know Laplace and Fourier transforms which has wide application in all Engineering courses.
- To enable the students to solve various engineering problems using numerical methods.

Course Outcomes:

Student is expected to have concept of:

- Discrete and continuous probability density functions and special probability distributions.
- Laplace and Fourier transforms and apply them in their Engineering branch numerical methods and their applications in solving Engineering problems.

SYLLABUS

MODULE I

Discrete Probability Distributions Discrete Random Variables, Probability distribution function, Cumulative distribution function. Mean and Variance of Discrete Probability Distribution. Binomial Distribution-Mean and variance Poisson Approximation to the Binomial Distribution. Poisson distribution-Mean and variance.

MODULE II

Continuous Probability Distributions. Continuous Random Variable, Probability density function, Cumulative density function, Mean and variance. Normal Distribution, Mean and variance (without proof).Uniform Distribution. Mean and variance. Exponential Distribution, Mean and variance.

MODULE III

Fourier Integrals and transforms-Fourier Integrals. Fourier integral theorem (without proof).Fourier Transform and inverse transform. Fourier Sine & Cosine Transform, inverse transform.

MODULE IV

Laplace transforms-Laplace Transforms, linearity, first shifting Theorem. Transform of derivative and Integral, Inverse Laplace transform, Solution of ordinary differential equation using Laplace transform. Unit step function, second shifting theorem. Convolution Theorem (without proof).Differentiation and Integration of transforms.

MODULE V

Numerical Techniques-Solution Of equations by Iteration, Newton- Raphson Method. Interpolation of Unequal intervals-Lagrange's Interpolation formula. Interpolation of Equal intervals-Newton's forward difference formula, Newton's backward difference formula.

MODULE VI

Numerical Techniques-Solution to linear System- Gauss Elimination, Gauss SeidalIteration Method. Numeric Integration-Trapezoidal Rule, Simpson's 1/3 Rule. Numerical solution of first order ODE-Euler method,Runge-Kutta Method (fourth order).

Text Books:

1. Miller and Freund's "Probability and statistics for Engineers"-Pearson-Eighth Edition.
2. Erwin Kreyszig, "Advanced Engineering Mathematics", 10th edition, Wiley, 2015.

References:

1. V. Sundarapandian, "Probability, Statistics and Queuing theory", PHI Learning, 2009.
2. C. Ray Wylie and Louis C. Barrett, "Advanced Engineering Mathematics"-Sixth Edition.
3. Jay L. Devore, "Probability and Statistics for Engineering and Science"-Eight Edition.
4. Steven C. Chapra and Raymond P. Canale, "Numerical Methods for Engineers"-Sixth
1. Edition-Mc Graw Hill.

HS210 LIFE SKILLS

L-T-P

2-0-2

Credit 3

Course Objectives:

- To develop communication competence in prospective engineers.
- To enable them to convey thoughts and ideas with clarity and focus.
- To develop report writing skills.
- To equip them to face interview & Group Discussion.
- To inculcate critical thinking process.
- To prepare them on problem solving skills.
- To provide symbolic, verbal, and graphical interpretations of statements in a problem description.
- To understand team dynamics & effectiveness.
- To create an awareness on Engineering Ethics and Human Values.
- To instill Moral and Social Values, Loyalty and also to learn to appreciate the rights of others.
- To learn leadership qualities and practice them.

Course Outcomes:

- Communicate effectively.
- Make effective presentations.
- Write different types of reports.
- Face interview & group discussion.
- Critically think on a particular problem.
- Solve problems.
- Work in Group & Teams
- Handle Engineering Ethics and Human Values.
- Become an effective leader.

SYLLABUS

MODULE I

Need for Effective Communication, Levels of communication; Flow of communication; Use of language in communication; Communication networks; Significance of technical communication, Types of barriers; Miscommunication; Noise; Overcoming measures, Listening as an active skill; Types of Listeners; Listening for general content; Listening to fill

up information; Intensive Listening; Listening for specific information; Developing effective listening skills; Barriers to effective listening skills. Technical Writing: Differences between technical and literarystyle, Elements of style; Common Errors, Letter Writing: Formal, informal and demi-official letters; business letters, Job Application: Cover letter, Differences between bio-data, CVand Resume, Report Writing: Basics of Report Writing; Structure of a report; Types of reports. On-verbal Communication and Body Language: Forms of non-verbal communication; Interpreting body-language cues; Kinesics; Proxemics; Chronemics; Effective use of bodylanguageInterview Skills: Types of Interviews; Ensuring success in jobinterviews; Appropriate use of non-verbal communication,Group Discussion: Differences between group discussion and debate; Ensuring success in group discussions, PresentationSkills: Oral presentation and public speaking skills; business presentations, Technology-based Communication: Netiquettes: effective e-mail messages; power-point presentation; enhancing editing skills using computer software.

MODULE II

Need for Creativity in the 21st century, Imagination, Intuition, Experience, Sources of Creativity, Lateral Thinking, Myths ofcreativityCritical thinking Vs Creative thinking, Functions of Left-brain & Right brain, Convergent & Divergent Thinking, Critical reading & Multiple Intelligence. Steps in problem solving, Problem Solving Techniques, Problem Solving through Six Thinking Hats, Mind Mapping, Forced Connections. Problem Solving strategies, Analytical Thinking and quantitative reasoning expressed in written form, Numeric, symbolic, and graphic reasoning, solving applicationproblems.

MODULE III

Introduction to Groups and Teams, Team Composition, Managing Team Performance, Importance of Group, Stages of Group, Group Cycle, Group thinking, getting acquainted, Clarifying expectations. Group Problem Solving, Achieving Group Consensus. Group Dynamics techniques, Group vs Team, Team Dynamics, Teams for enhancing productivity, Building &Managing Successful Virtual Teams. Managing Team Performance & Managing Conflict in Teams. Working Together in Teams, Team Decision-Making, Team Culture & Power, and Team Leader Development.

MODULEIV

Morals, Values and Ethics, Integrity, Work Ethic, Service Learning, Civic Virtue, Respect for Others, Living Peacefully. Caring, Sharing, Honesty, Courage, Valuing Time, Cooperation, Commitment, Empathy, Self-Confidence,Character,Spirituality, Senses of 'Engineering Ethics', variety of moral issued, Types of inquiry, moral dilemmas, moral autonomy, Kohlberg's theory, Gilligan's theory, Consensus and controversy, Models of Professional Roles, Theories about right action, Self-interest, customs and religion, application of ethical theories. Engineering as experimentation, engineers as responsible experimenters, Codes of ethics, balanced outlook on. The challenger case study, Multinational corporations, Environmental ethics, computer ethics, Weapons development, engineers as managers, consulting engineers, engineers as expert witnesses and advisors, moral leadership, sample

code of Ethics like ASME, ASCE, IEEE, Institution of Engineers(India), Indian Institute of Materials Management, Institution of electronics and telecommunication engineers(IETE), India, etc.

MODULE V

Introduction, a framework for considering leadership, entrepreneurial and moral leadership, vision, people selection and development, cultural dimensions of leadership, style, followers, crises. Growing as a leader, turnaround leadership, gaining control, trust, managing diverse stakeholders, crisis management Implications of national culture and multicultural leadership Types of Leadership, Leadership Traits. Leadership Styles, VUCA Leadership, DART Leadership, Transactional vs Transformational Leaders, Leadership Grid, Effective Leaders, making of a Leader, Formulate Leadership

References:

1. Barun K. Mitra; (2011), "Personality Development & Soft Skills", First Edition; OxfordPublishers.
2. Kalyana; (2015) "Soft Skill for Managers"; First Edition; Wiley Publishing Ltd.
3. Larry James (2016); "The First Book of Life Skills"; First Edition; Embassy Books.
4. Shalini Verma (2014); "Development of Life Skills and Professional Practice"; FirstEdition; Sultan Chand (G/L) & Company
5. John C. Maxwell (2014); "The 5 Levels of Leadership", Centre Street, A division ofHachette Book Group Inc.

CE202 STRUCTURAL ANALYSIS -I

L-T-P

3-1-0

Credit 4

Course objectives:

- To equip the students with the comprehensive methods of structural analysis with emphasis on analysis of elementary structures.

Course Outcomes:

The students will be able to:

- Analyze trusses and study displacement response of statically determinate structural
- Systems using energy methods:
- Apply unit load method and strain energy method for determination of deflection of
- Statically determinate beams, frames & pin jointed trusses
- Analyze statically indeterminate structures using strain energy method and method of
- Consistent deformation
- Know about moving loads and influence lines
- Know about statically determinate and indeterminate suspension bridges and arches

SYLLABUS

MODULE I

TRUSS ANALYSIS: Analysis of determinate truss-Methods of joints and sections (Numerical problems)Elastic theorems and energy principles - strain energy due to axial load, bending moment, shear and torsion - strain energy method,Castigliano's method for deflection (Derivations only)

MODULE II

Principle of virtual work – Unit load method-Betti's theorem –Maxwell's law of reciprocal deflections - principle of least work -application of unit load method and strain energy method for determination of deflection of statically determinate beams, frames -pin jointed trusses (simple numerical problems)Concepts of temperature effects and lack of fit.(No numerical problems)Statically indeterminate structures: Degree of static and kinematic indeterminacies – Introduction to force and displacement method(step by step procedure)

MODULE III

Strain Energy methods: Analysis of beams, frames and trusses with internal and external redundancy – (Simple problems with maximum two redundant)Concepts of effect of prestrain, lack of fit, temperature changes and support settlement.(No numerical problems)Method of Consistent deformations: Analysis of beams frames and trusses with internal and external redundancy(Simple problems with maximum two redundants)Concepts of effect of prestrain, lack of fit, temperature changes and support settlement.(No numerical problems)

MODULE IV

Moving loads and influence lines. Introduction to moving loads - concept of influence lines - influence lines for reaction, shear force and bending moment in simply supported beams and over hanging beams - analysis for different types of moving loads - single concentrated load - several concentrated loads, uniformly distributed load on shorter and longerthan the span.

MODULE V

Cables: Analysis of forces in cables under concentrated and uniformly distributed loads - Anchor Cables Suspension Bridges: Un-stiffened suspension bridges, maximum tension in the suspension cable and backstays, pressure on towers.

MODULE VI

Arches: Theory of arches - Eddy's theorem - analysis of three hinged arches-Support reactions-normal thrust and Radial shear at any section of a parabolic and segmental arch due to simple cases offloading. Moving loads on three hinged arches (simple problems)

Text Books:

1. Gere and Timoshenko, Mechanics of materials, CBS. Publishers
2. Kenneth Leet,Chia M Uang& Anne M Gilbert., Fundamentals of Structural Analysis,
1. McGraw Hill
2. R.Vaidyanathan and P.Perumal, Comprehensive Structural Analysis Volume I & II, Laxmi
3. Publications (P) Ltd
4. Wang C.K., Intermediate Structural Analysis, McGraw Hill

References:

1. Aslam Kassimali., Structural Analysis, Cenage Learning
2. Chandramouli P N, Structural Analysis I –Analysis of Statically Determinate Structures,
1. Yes DeePublishing Pvt Ltd.,Chennai,Tamil Nadu.
2. DevdasMenon, Structural Analysis, Narosa Publications
3. Hibbeler., Structural Analysis, Pearson Education
4. Kinney S., Indeterminate Structural Analysis, Oxford & IBH
5. M.L. Gambhir, Fundamentals of structural Mechanics and analysis, Printice Hall India
6. Reddy C.S., Indeterminate Structural Analysis, Tata McGraw Hill
7. Timoshenko S.P.& Young D.H., Theory of Structures, McGraw Hill

CE204 CONSTRUCTION TECHNOLOGY

L-T-P

4-0-0

Credit 4

Course objectives:

- To study details regarding properties and testing of building materials,
- To study details regarding the construction of building components
- To study properties of concrete and concrete mix design
- To impart the basic concepts in functional requirements of building and building services.
- To develop understanding about framed construction and building failures

Course Outcomes:

The students will be able to

- Understand construction materials, their components and manufacturing process
- know the properties of concrete and different mix design methods
- Understand the details regarding the construction of building components
- Analyze and apply learning of materials, structure, servicing and construction of masonry
- Domestic buildings.
- Define and describe the concepts and design criteria of tall framed and load bearing buildings.

SYLLABUS

MODULE I

Properties of masonry materials – review of specifications; Mortar – Types – Sand – properties – uses. Timber products: properties and uses of plywood, fibre board, particle board. Iron and Steel –Reinforcing steel – types – specifications. Structural steel – specifications miscellaneous materials (only properties, classifications and their use in construction industry): Glass, Plastics, A.C. Sheets, Bitumen, Adhesives, Aluminium

MODULE II

Concrete – Aggregates – Mechanical & Physical properties and tests– Grading requirements –Water quality for concrete –Admixtures – types and uses – plasticizers – accelerators – retarders–water reducing agents Making of concrete - batching – mixing – types of mixers – transportation – placing – compacting – curing Properties of concrete – fresh concrete – workability – segregation and bleeding - factors affecting workability & strength – tests on workability – tests for strength of concrete in compression, tension& flexure Concrete quality control – statistical analysis of results – standard deviation –acceptance criteria – mix proportioning (B.I.S method) –nominal mixes.

MODULE III

Building construction - Preliminary considerations for shallow anddeep foundationsMasonry – Types of stone masonry – composite walls - cavity wallsand partition walls -Construction details and features – scaffoldingsIntroduction to Cost-effective construction - principles of fillerslab and rat-trap bond masonry

MODULE IV

Lintels and arches – types and construction details. Floors and flooring – different types of floors and floor coverings Roofs and roof coverings – different types of roofs – suitability – types and uses of roofing materials Doors, windows and ventilators – Types and construction

detailsFinishing works – Plastering, pointing, white washing, colourwashing, distempering, painting. Methods of providing DPC. Termiteproofing

MODULE V

Tall Buildings – Framed building – steel and concrete frame –structural systems –erection of steel work–concrete framed construction– formwork – construction and expansion. Joints Introduction to prefabricated construction – slip form construction Vertical transportation: Stairs – types - layout and planning-Elevators – types – terminology – passenger, service and goods elevators – handling capacity - arrangement and positioning of lifts Escalators – features –use of ramps

MODULE VI

Building failures – General reasons – classification – Causes of failures in RCC and Steel structures, Failure due to Fire, Wind andEarthquakes.Foundation failure – failures by alteration, improper maintenance,overloading.Retrofitting of structural components - beams, columns and slabs

Text books

1. Arora and Bindra, Building construction, Dhanpath Rai and Sons.
2. Punmia B. C, Building construction. Laxmi Publications
3. Rangwala S C., Engineering Materials, Charotar Publishers
4. Shetty M.S., Concrete Technology, S. Chand & company.

Reference Books

1. Adler R, Vertical Transportation for Building, American Elsevier Pub.
2. G C Sahu & Joygopal Jena., Building Materials and construction, McGraw Hill Education
3. Gambhir M L, Concrete Technology, Tata McGrawHill.
4. Krishna Raju N, Design of Concrete Mixes, CBS publishers.
5. Mcking T.M, Building Failures, Applied Science Pub.
6. National Building Code.
7. Neville A.M. and Brooks.J.J, Concrete Technology, Pearson Education.
8. Smith P & Julian W. Building services, Applied Science Pub.
9. Tall building systems & concepts, Monograph on planning and design of Tall building,

CE206 FLUID MECHANICS –II

L-T-P

3-0-0

Credit 3

Course objectives

- To study the Basic principles and laws governing fluid flow to open channel flow including hydraulic jump & gradually varied flow.
- To understand basic modeling laws in fluid mechanics and dimensional analysis.
- To apply the fundamental theories of fluid mechanics for the analysis and design ofHydraulic machines, Turbines, Pumps, Open channel flow, uniform flow, Hydraulic Jump,Gradually varied flow, Dimensional analysis and model testing.

Course Outcomes

The students will

- Become capable of analyzing open channel flows & designing open channels.
- Get an insight into the working of hydraulic machines.
- Become capable of studying advanced topics such as design of hydraulic structures.

SYLLABUS

MODULE I

Hydraulic Machines - Impulse momentum principle, impact of jets, force of a jet on fixed and moving vanes. Turbines- classification and comparison of velocity triangles for Pelton wheel and reaction turbines (Francis and Kaplan), work done and efficiency, specific speed, draft tube- different types, penstock, surge tank - types, cavitation in turbines (Concepts only).

MODULE II

Pumps- classification of pumps - Centrifugal pumps- types, work done, efficiency, minimum speed, velocity triangle for pumps, specific speed, priming, limitation of suction lift, net positive suction head, cavitation in centrifugal pump (Concepts only).

MODULE III

Introduction : Open channel flow and its relevance in Civil Engineering , Comparison of open channel flow and pipe flow .Flow in open channels-types of channels, types of flow, geometric elements of channel section, velocity distribution in open channels, uniform flow in channels, Chezy's equation, Kutter's and Manning's formula, Most economic section for rectangular and trapezoidal channels. Condition for maximum discharge and maximum velocity through circular channels, computations for uniform flow, normal depth, conveyance of a channel section, section factor for uniform flow.

MODULE IV

Specific energy, critical depth, discharge diagram, Computation of critical flow, Section factor for critical flow. Specific force, conjugate or sequent depths, hydraulic jump, expression for sequent depths and energy loss for a hydraulic jump in horizontal rectangular channels, types of jump, length of jump, height of jump, uses of hydraulic jump.

MODULE V

Gradually varied flow - dynamic equation for gradually varied flow, different forms of dynamic equation, Approximation for a wide rectangular channel, classification of surface profiles, Backwater and drawdown curves, characteristics of surface profiles in prismatic (Rectangular and trapezoidal only). Computation of length of surface profiles, direct step method. Design of lined open channels: trapezoidal cross-sections only

MODULE VI

Dimensional analysis and model studies - dimensions, dimensional homogeneity, methods of dimensional analysis, Rayleigh method, Buckingham method, dimensionless numbers, Similitude -geometric, kinematic and dynamic similarities. Model laws -Reynolds's and Froude model laws, scale ratios, types of models, Concepts of distorted and undistorted models.

Text Books:

1. Kumar D.S., Fluid Mechanics and Fluid power Engineering, S. K. Kataria & Sons, New
1. Delhi, 2013
2. Modi P. N. and S. M. Seth, Hydraulics and Fluid Mechanics (Including Hydraulic
3. Machines), Standard Book House, New Delhi, 2013.
4. Narayana Pillai,N. Principles of Fluid Mechanics and Fluid Machines, University Press,
5. 2011.

References:

1. Arora.K.R. Fluid Mechanics, Hydraulics and Hydraulic Machines, Standard Publishers,
1. 2005.
2. Bansal R. K., A Textbook of Fluid Mechanics and Hydraulic Machines, Laxmi Publications,
3. 2010.
4. C S P Ojha, P N Chandramouli and R Brendtsson, Fluid Mechanics and Machinery, Oxford
5. University Press , India , New Delhi
5. Hanif Choudhary, Open channel flow, Prentice Hall, 2010
6. Jain A. K., Fluid Mechanics, Khanna Publishers, Delhi, 1996.
7. Subramanya K., Open Channel Hydraulics, Tata McGraw Hill, 2009.
8. Ven Te Chow, Open channel Hydraulics, 2009.

CE208 GEOTECHNICAL ENGINEERING -I

L-T-P

3-0-0

Credit 3

Course objectives:

- To impart to the fundamentals of Soil Mechanics principles;
- To provide knowledge about the basic, index and engineering properties of soils.

Course Outcomes:

- The students will be able to understand the basic principles governing soil behavior.
- Understand the procedure, applicability and limitations of various soil testing methods.

SYLLABUS

MODULE I

Introduction to soil mechanics -Major soil deposits of India Basic soil properties - Void ratio, porosity, degree of saturation, air content, percentage air voids, moisture content, specific gravity, unit weight - Relationship between basic soil properties – Sensitivity – Thixotropy - numerical problems

MODULE II

Index properties - Sieve analysis – Well graded, poorly graded and gap graded soils - Stoke's law - Hydrometer analysis (no derivation required for percentage finer and diameter) - numerical problems- – Relative densityConsistency-Atterberg Limits - Practical Applications -numerical problems I.S. classification of soils.

MODULE III

Permeability of soils - Darcy's law – Factors affecting permeability - Practical Applications - Constant head and falling head permeability tests - Average permeability of stratified deposits (no derivation required) – numericalproblems.Principle of effective stress - Total, neutral and effective stress variation diagrams - Quick sand condition - Critical hydraulic gradient - - numerical problems– Definition of phreatic line and exit gradient.

MODULE IV

Shear strength of soils- Practical Applications - Mohr-Coulomb failure criterion – Mohr circle method for determination of principal planes and stresses- numerical problems – relationship between shear parameters and principal stresses [no derivation required}Brief discussion of direct shear test, tri-axial compression test, vane shear test and unconfined compression test –Applicability - numerical problems -UU and CD tests [Brief discussion only]- Concepts of Liquefaction

MODULE V

Compressibility and Consolidation - Void ratio versus pressure relationship - Coefficient of compressibility and volume compressibility – Compression index Practical Applications - Change in void ratio method - Height of solids method -Normally consolidated, under consolidated and over consolidated states - Estimation of pre consolidation pressure- Practical Applications - Estimation of magnitude of settlement of normally consolidated clays – Numerical problemsTerzaghi's theory of one-dimensional consolidation(no derivation required) - average degree of consolidation – Time factor - Coefficient of consolidation -

Practical Applications -Square root of time and logarithm of time fitting methods -Numerical problems

MODULE VI

Stability of finite slopes - Toe failure, base failure, slip failure- Swedish Circle Method- Friction circle method- Factor of safety with respect to cohesion and angle of internal friction -Stability number - Stability charts. Compaction of soils - Standard Proctor, Modified Proctor, I.S.light & Heavy Compaction Tests – OMC - Zero Air voids line- Control of compaction - numerical problems

Text Books:

1. Das B. M., Principles of Geotechnical Engineering, Cengage India Pvt. Ltd., 2010.
2. Ranjan G. and A. S. R. Rao, Basic and Applied Soil Mechanics, New Age
1. International, 2002.

References:

1. A V Narasimha Rao and C Venkatramaiah, Numerical Problems, Examples and
2. Objective questions in Geotechnical Engineering, Universities Press (India) Ltd.,
3. 2000
2. Arora K. R., Geotechnical Engineering, Standard Publishers, 2006.
3. Purushothamaraj P., Soil Mechanics and Foundation Engineering, Dorling
4. Kindersley(India) Pvt. Ltd., 2013
5. Taylor D.W., Fundamentals of Soil Mechanics, Asia Publishing House, 1948.
6. Terzaghi K. and R. B. Peck, Soil Mechanics in Engineering Practice, John Wiley,
7. 1967.
6. Venkatramaiah, Geotechnical Engg, Universities Press, 2000.

CE232 MATERIAL TESTING LAB -I

L-T-P

0-0-3

Credit 1

Course objectives:

- The experimental work involved in this laboratory should make the student understand the fundamental modes of loading of the structures and also make measurements of loads, displacements and strains.
- Relating these quantities, the student should be able to obtain the strength of the material and stiffness properties of structural elements.

Course Outcomes:

- The students will be able to undertake the testing of materials when subjected to different types of loading.

LIST OF EXPERIMENTS: (10 Experiments mandatory)

1. Tension test on Structural Materials: Mild Steel and Tor steel (HYSD bars) (Universal
7. Testing machine and suitable extensometer)
2. Shear test on mild steel rod (Compression Testing Machine and Shear Shackle)
3. Bending test on mild steel (I sections) (Universal Testing Machine)
4. Torsion test on Mild steel circular bars (Torsion Testing Machine)
5. Torsion test on Steel/Copper/ Aluminum wires
    a. Using Torsion Pendulum with Central disk
    b. Using Torsion Pendulum with distributed Mass
6. Impact test
    a. Izod test (Impact Testing Machine)
    b. Charpy test (Impact Testing Machine)
7. Hardness test
    a. Brinell Hardness test (Brinnel Hardenss Testing Machine)
    b. Rockwell Hardness test (Rockwell Hardness Testing Machine)
    c. Vickers Hardness test (Vickers Hardness Testing Machine)
8. Test On Springs
    a. Open coil (Spring Testing Machine)
    b. Close coil (Spring Testing Machine)
9. Bending Test on Timber (Universal Testing Machine and dial Gauge)
10. Bend & Rebend test on M S Rods
11. Verification of Clerk Maxwell's Theorem
12. Demonstration of Fatigue Test
13. Study/demonstration of Strain Gauges and load cells

Books/Manuals /References:-

1. Testing of Engineering Materials by George E Troxell, Harmer E Davis, G Hauck,McGraw-Hill,Newyor
2. Testing of Metallic Materials by Prof. A V K Suryanaraya, Prentice Hall, India, Pvt Ltd.
3. Mechanical Behavior of Materials, by N Dowling,Prentice Hall, 1993.

CE234 FLUID MECHANICS LABORATORY

L-T-P

0-0-3

Credit 1

Course objectives

- Students should be able to verify the principles studied in theory by performing the experiments in laboratory

Course Outcome

- The students will be able to understand the different flow measurement equipment's and their procedures.
- The students will be able to analyze the performance characteristics pumps/turbines.
- Able to develop the skill of experimentation techniques for the study of flow phenomena in channels/pipes.

LIST OF EXPERIMENTS(Minimum 12 nos. mandatory)

1. Study of taps, valves, pipe fittings, gauges, Pitot tubes, water meters and current meters.
2. Calibration of Pressure gauges
3. Determination of metacentric height and radius of gyration of floating bodies.
4. Verification of Bernoulli's theorem
5. Hydraulic coefficients of orifices and mouth pieces under constant head method and time ofemptying method.
6. Calibration of Venturimeter.
7. Calibration of Orifice meter
8. Calibration of water meter.
9. Calibration of rectangular and triangular notches.
10. Time of Emptying : unsteady flow
11. Determination of Darcy's and Chezy's constant for pipe flow.
12. Determination of Chezy's constant and Manning's number for open channel flow.
13. Plotting Specific Energy Curves in Open Channel flow
14. Study of Parameters of Hydraulic Jump in Open channel Flow.
15. Determination of friction co-efficient in pipes
16. Determination of loss co-efficient for pipe fittings
17. Performance characteristics of centrifugal pump.
18. Performance characteristics of Pelton wheel.
19. Performance characteristics of Francis turbine.
20. Performance characteristics of Kaplan turbine.

SEMESTER-V

CE301 DESIGN OF CONCRETE STRUCTURES I

L-T-P

3-1-0

Credit 4

Course objectives:

- To provide the students with the knowledge of the behavior of reinforced concrete structural elements in flexure, shear, compression and torsion
- To enable them to design essential elements such as beams, columns, slabs staircases and footings under various loads.

Course Outcomes:

The students will be able to:

- Apply the fundamental concepts of limit state method
- Use IS code of practice for the design of concrete elements
- Understand the structural behavior of reinforced concrete elements in bending, shear,compression and torsion.
- Design beams, slab, stairs, columns and draw the reinforcement details.
- Analyze and design for deflection and crack control of reinforced concrete members.

SYLLABUS

MODULE I

Introduction- Plain and Reinforced concrete- Properties of concreteand reinforcing steel-Objectives of design-Different designphilosophies- Working Stress and Limit State methods-Limit Statemethod of design-Introduction to BIS code- Types of limit states-characteristic and design values-partial safety factors-types of loads and their factors. Limit State of Collapse in Bending-assumptions-stress-strain relationship of steel and concrete- analysis of singly reinforced rectangular beams-balanced-under reinforced-over reinforced sections-moment of resistance Codal provisions

MODULE II

Limit state of collapse in shear and bond- shear stresses in beams-types of reinforcement-shear strength of RC beam-IS code recommendations for shear design-design of shear reinforcement-examples Bond and development length - anchorage for reinforcement bars - code recommendations regarding curtailment of reinforcement.

MODULE III

Design of Singly Reinforced Beams- basic rules for design- design example of simply supported beam- design of cantilever beam-detailing Analysis and design of doubly reinforced beams –detailing, T-beams- terminology- analysis of T beams- examples -Design for torsion-IS code approach- examples.

MODULE IV

Design of slabs- introduction- one-way and two-way action of slabs- load distribution in a slab- IS recommendations for design of slabs- design of one-way slab- cantilever slab-numerical problems– concepts of detailing of continuous slab –code coefficients.

MODULE V

Two- way slabs- simply supported and restrained slabs – design using IS Code coefficients Reinforcement detailing Limit State of Serviceability- limit state of deflection- short term and long term deflection-IS code recommendations- limit state of cracking- estimation of crack width- simple numerical examples

MODULE VI

Stair cases- Types-proportioning-loads- distribution of loads – Codalprovisions - design and detailing of dog legged stair- Concepts of tread-riser type stairs (detailing only)Columns- introduction –classification- effective length- short column - long column - reinforcement-IS specifications regarding columns- limit state of collapse: compression -design of axially loaded short columns-design examples with rectangular ties and helical reinforcement

Text Books / References:

1. Pillai S.U & Menon D – Reinforced Concrete Design, Tata McGraw Hill Publishing Co .,2005
1. Punmia, B. C, Jain A.K and, Jain A.K ,RCC Designs, Laxmi Publications Ltd., 10e, 2015
2. Varghese P.C, Limit State Design of Reinforced Concrete, Prentice Hall of India Pvt Ltd,,
3. 2008
4. Relevant IS codes (I.S 456, I.S 875, SP 34)

CE303 STRUCTURAL ANALYSIS -1I

L-T-P

3-0-0

Credit 3

Course objectives:

- To equip the students with the force and displacement methods of structural analysis with emphasis on analysis of rigid frames and trusses

Course Outcomes:

The students will be able to

- Analyze structures using force method
- Analyze structures using displacement method
- Analyze curved beams in plan
- Analyze structures using plastic theory

SYLLABUS

MODULE I

Clapeyrons Theorem (Three Moment Equation): Derivation of threemoment equation - application of three moment equation for analysis of continuous beams under the effect of applied loads and uneven support settlement.

MODULE II

Slope Deflection Method: Analysis of continuous beams- beams with overhang- analysis of rigid frames - frames without sway and with sway -different types of loads -settlement effects.

MODULE III

Moment Distribution Method: Moment Distribution method – analysisof beams and frames – non sway and sway analysis.

MODULE IV

Kani's Method: Kani's Method of analysis applied to continuous beams and single bay single storey rigid frames rigid frames – frames without sway and with sway.

MODULE V

Beams curved in plan: Analysis of cantilever beam curved in plan,analysis of circular beams over simple supports.

MODULE VI

Plastic Theory: Introduction – plastic hinge concepts – plastic modulus –shape factor – redistribution of moments – collapse mechanisms –Plastic analysis of beams and portal frames by equilibrium and mechanism methods. (Single Storey and Single bay Frames only).

Text Books:

1. Kenneth Leet, Chia M Uang & Anne M Gilbert., Fundamentals of Structural Analysis,McGraw Hill, 4e, 2010
2. R. Vaidyanathan and P. Perumal, Structural Analysis Volume I & II, Laxmi Publications(P) Ltd., 2017
3. Reddy. C.S., Basic Structural Analysis, Tata McGraw Hill, 3e, 2011

References:

1. Daniel L Schodak, Structures, Pearson Education, 7e, 2014
2. Hibbeler, RC, Structural analysis, Pearson Education, 2012
3. Kinney J. S., Indeterminate Structural Analysis, Oxford & IBH, 1966
4. Negi L. S. and Jangid R. S, Structural Analysis, Tata McGraw Hill, 1997
5. Rajasekaran S. and Sankarasubramanian G., Computational Structural Mechanics, PHI,2008
6. S.S. Bhavikatti, Structural Analysis II, Vikas Publication Houses (P) Ltd, 2016

7. SP:6 (6): Application of Plastic Theory in Design of Steel Structures, Bureau of Indian
1. Standards, 1972
8. Timoshenko S. P. and Young D. H., Theory of Structures, McGraw Hill, 2e, 1965
9. Utku S, Norris C. H & Wilbur J. B, Elementary Structural Analysis, McGraw Hill, 1990
10. Wang C. K., Intermediate Structural Analysis, Tata McGraw Hill, 1989

CE305 GEOTECHNICAL ENGINEERING - II

L-T-P

3-0-0

Credit 3

Course objectives:

- To impart to the students, in-depth knowledge about the basic concepts and theories offoundation engineering;
- To enable the students to acquire proper knowledge about various methods of foundationanalysis for different practical situations.

Course Outcomes:

The students will be able to understand:

- The basic concepts, theories and methods of analysis in foundation engineering;
- The field problems related to geotechnical engineering and to take appropriate engineering
- Decisions.

SYLLABUS

MODULE I

Stresses in soil due to loaded areas-Boussinesq's formula for point loads-assumptions (no derivation required)-Comments-numerical problems. Vertical stress beneath loaded areas of

strip, rectangular and circular shapes (no derivation required)-Newmark's chart (Construction procedure not required)-Isobars-Pressure bulbs-numerical problems.

MODULE II

Lateral earth pressure-At rest, active and passive earth pressures-Practical examples. Rankine's and Coulomb's theories (no derivation required)-Influence of surcharge, inclined backfill and water table on earth pressure-numerical problems Earth Pressure retaining walls with layered back fill-numerical problems

MODULE III

Bearing capacity of shallow foundations-Ultimate, safe and allowable bearing capacity-Failure mechanism, assumptions and equation of Terzaghi's bearing capacity theory for strip footing (no derivation required)-Terzaghi's formulae for circular and square footings numerical problems. Local and general shear failure-Factors affecting bearing capacity-Influence of water table-numerical problems. Total and differential settlement-Causes-Methods of reducing differential settlement-Brief discussion on soil improvement through installation of drains and preloading

MODULE IV

Combined footings-Rectangular and Trapezoidal combined footings-numerical problems. Raft foundations (Design concepts only)-Allowable Bearing capacity of Rafts on sands and clays-Floating foundation. Deep foundations-Elements of a well foundation-Problems encountered in well sinking-Methods to rectify tilts and shifts

MODULE V

Pile foundations-Point bearing and friction piles-Bearing capacity of single pile in clay and sand(I.S.Static formulae)-numerical problems. Dynamic formulae (Modified Hiley formulae only)-I.S.Pile Load Test(Conventional)-Negative skin friction-Numerical problems. Group action-Group efficiency-Capacity of Pile groups-numerical problems.

MODULE VI

Brief introduction to Machine foundation –Mass spring model forundammed free vibrations - Natural frequency – Coefficient ofuniform elastic compression – Methods of vibration isolation. Brief introduction to site investigation –Objectives - Guidelines forchoosing spacing and depth of borings [I.S. guidelines only] – Augerboring and wash boring methods - Standard Penetration Test –procedure, corrections and correlations.

Text Books:

1. Braja M. Das, "Principles of Foundation Engineering", Cengage Learning India Pvt. Ltd., Delhi, 2011.
2. K. R. Arora, Soil Mechanics and Foundation Engineering, Standard Publishers, 2011
3. Murthy V N S., "Advanced Foundation Engineering", CBS Publishers & Distributors Pvt.Ltd., New Delhi, 2007

References:

1. Alam Singh., "Soil Engineering in Theory and Practice", Vol.1, CBS Publishers &Distributors Pvt. Ltd., New Delhi. 2002
1. Gopal Ranjan and Rao A.S.R., "Basic and Applied Soil Mechanics", New AgeInternational (P) Limited, New Delhi, 2002.
2. Purushothamaraj P.,Soil Mechanics and Foundation Engineering, Dorling Kindersley(India)Pvt. Ltd., 2013
4. TengW.E., Foundation Design, Prentice Hall, New Jersey, 1962.
5. Venkataramiah, "Geotechnical Engineering", Universities Press (India) Limited, Hyderabad,2000.

CE307 GEOMATICS

L-T-P

3-0-0

Credit 3

Course objectives:

- To impart awareness on the advanced surveying techniques
- To understand the errors associated with survey measurements
- To provide a basic understanding on geospatial data acquisition and its process

Course Outcomes:

- The students will possess knowledge on the advanced methods of surveying, the instruments and the spatial representation of data.

SYLLABUS

MODULE I

Traverse Surveying - Methods of traversing, Checks in closed traverse, Traverse computations, balancing the traverse- methods.

MODULE II

Curve Surveying – Elements of simple and compound curves –Method of setting out– Elements of Reverse curve (Introduction only)– Transition curve – length of curve – Elements of transition curve - Vertical curve (introduction only).

MODULE III

Global Navigation Satellite System- Types, Global Positioning Systems-Components and Principles, Satellite ranging-calculating position, Satellite signal structure, code phase and carrier phase measurements, GPS errors and biases, Application of GPS.

MODULE IV

GPS Surveying methods-Static, Rapid static , Kinematic methods –DGPS, Phases of GPS Survey -Planning and preparation, Field operation-horizontal and vertical control, data sheet, visibility diagram, Processing and report preparation,

MODULE V

Remote Sensing : Definition- Electromagnetic spectrum-Energy interactions with atmosphere and earth surface features-spectral reflectance of vegetation, soil and water- Classification of sensors-Active and Passive, Resolution-spatial, spectral radiometric and Temporal resolution, Multi spectral scanning-Along track and across track scanning.

MODULE VI

Geographical Information System-components of GIS, GIS operations, Map projections-methods, Coordinate systems-Geographic and Projected coordinate systems, Data Types-Spatial and attribute data, Raster and vector data representation-Data Input methods-Geometric Transformation-RMS error, Vector data Analysis-buffering, overlay.

Text Books / References:

1. Dr. B.C. Punmia , Ashok Kumar Jain & Arun Kumar Jain - Surveying , Laxmi publications(P) Ltd , 2005
2. Prof. T.P. Kenetkar and Prof. S.V. Kulkarni - Surveying and Levelling, Pune Vidyarthi Griha Prakashan,2004
3. R.Agor - A Text book of Surveying and Levelling, Khanna Publishers, 2005
4. S.K. Duggal - Surveying Vol. II, Tata McGraw Hill Ltd, Reprint 2015

References:

1. Burrough P , Principles of Geographical Information systems, Oxford University Press, 1998
2. Chang,K , “Introduction to Geographic Information Systems”, Tata McGraw-Hill PublishingCo. Ltd, 2008
3. George Joseph, “Fundamentals of Remote Sensing”, University Press, 2003
4. Iliffe, C.J., Datums and Map Projections for Remote Sensing, GIS and Surveying, WhittlesPublishing, 2006.
5. James M Andersen, Edward M Mikhail, Surveying Theory and Practice, McGraw Hilleducation, 7e, 1998.
6. Kang-tsung Chang, Introduction to GIS, Tata McGraw-Hill Publishing Co. Ltd, 8e, 2016.

7. Lillesand M and Kiefer W, “Remote Sensing and Image Interpretation”. John Wiley andSons, Inc., 2000.

CE309 WATER RESOURCES ENGINEERING

L-T-P

3-0-0

Credit 3

Course objectives:

- To impart knowledge regarding the availability of water on hydrosphere, its distribution and quantification.
- To convey the knowledge on the scientific methods for computing irrigation water requirements.
- To communicate fundamental knowledge on reservoir engineering and river engineering

Course Outcomes:

Students will be able to:

- Describe the hydrologic cycle and estimate the different components
- Determine crop water requirements for design of irrigation systems
- Compute the yield of aquifers and wells.
- Know the features of various river training works
- Estimate the storage capacity of reservoirs and their useful life.

SYLLABUS

MODULE I

Hydrologic cycle-precipitation-mechanism, types and forms. Measurement of rainfall using rain gauges-optimum number of rain gauges. Estimation of missing precipitation. Representation of rainfall data-mass curve and hyetograph. Computation of mean precipitation over a catchment. Design rainfall - probable maximum rainfall. Infiltration-measurement by double ringinfiltrometer. Horton’s model. Evaporation-measurement by IMDland pan, control of evaporation.

MODULE II

Runoff-components of runoff-methods of estimation of runoff-infiltration indices, Hydrograph analysis-Hydrograph from isolated storm-Base flow separation. Unit hydrograph –uses. Assumptions and limitations of unit hydrograph theory. Computation of storm/flood hydrograph of different duration by method of superposition and by development of S–Hydrograph.

MODULE III

Irrigation– Necessity, Benefits and ill effects. Types: flow and lift irrigation - perennial and inundation irrigation. Methods: flooding, furrow, sprinkler and drip irrigation (concepts only, no design aspects/problems), Soil water plant relationships, soil moisture constants, Computation of crop water requirement: depth and frequency of Irrigation, Duty and delta, relationship, variation of duty, factors. Computation of design discharge of conveyance channels, Irrigation efficiencies. Consumptive use of water: concept of Evapotranspiration. (No detailed discussion on estimation procedures)

MODULE IV

Stream flow measurement: methods, Estimation of stream flow by area velocity method only, Stage discharge curve. Meandering of rivers, River training – objectives and classification, description of river training works.

MODULE V

Surface Water system: diversion and storage systems, necessity. River flow: Flow duration Curve, Firm yield. Reservoirs-types of reservoirs, zones of storage reservoir, reservoir planning-storage capacity and yield of reservoirs-analytical method and mass curve method. Reservoir sedimentation: trap efficiency, methods for control. Computation of useful life of reservoir.

MODULE VI

Ground water: vertical distribution of groundwater, classification of saturated formation, water table, Aquifer properties: Porosity, Specific yield, specific retention, Types of aquifers. Darcy's law,co-efficient of permeability, Transmissibility. Wells- Steady radial flow into a fully penetrating well in Confined and Unconfinedaquifers. Estimation of yield of an open well, pumping and recuperation tests. Tube wells – types.

Text Books:

1. Arora, K.R., "Irrigation, Water Power and Water Resources Engineering", Standard PublishersDistributors, New Delhi, 2009.
2. Garg S.K, Irrigation Engineering and Hydraulic Structures Khanna Publishers New Delhi 2006.
3. Modi. P. N. Irrigation, Water Resources and Water Power Engineering, S.B.H Publishers andDistributors New Delhi 2009.
4. Punmia B.C. Ashok K Jain, Arun K Jain, B. B. L Pande, Irrigation and Water PowerEngineering, Laxmi Publications (P) Ltd. 2010.

References:

1. Asawa. G.L. Irrigation and Water Resources Engineering, New Age International, 2000

2. Ojha.C.S.P., R.Berndtsson, P. Bhunya, Engineering Hydrology, Oxford university Press, 2015.
3. Patra. K.C., Hydrology and Water Resources Engineering, CRC Press, 2010.
4. Sahasrabudhe S.R., Irrigation Engineering & Hydraulic Structures, S.K. Kataria & Sons, 2013.
5. Subramanya. K., Engineering Hydrology, Tata Mc Graw Hill, 2011
6. Todd D. K., Ground Water Hydrology, Wiley, 2005.
7. Ven Te Chow, David R Maidment, L.W Mays., Applied Hydrology, McGraw Hill, 1988
8. Warren Viessman, G.L. Lewis, Introduction to Hydrology, Pearson Education, 2003.

CE361 ADVANCED CONCRETE TECHNOLOGY

L-T-P

3-0-0

Credit 3

Course objectives:

- To understand the behaviour of fresh and hardened concrete.
- To make aware the recent developments in concrete technology
- To understand factors affecting the strength, workability and durability of concrete
- To impart the methods of proportioning of concrete mixtures

Course Outcomes:

The students will be able to:

- Understand the testing of concrete materials as per IS code
- Know the procedure to determine the properties of fresh and hardened of concrete
- Design the concrete mix using ACI and IS code methods
- Select and Design special concretes depending on their specific applications
- Gain ideas on non-destructive testing of concrete

SYLLABUS

MODULE I

Aggregates: Review of types; sampling and testing; effects on properties of concrete, production of artificial aggregates. Cements: Review of types of cements, chemical composition; properties and tests, chemical and physical process of hydration. Blended cements.

MODULE II

Properties of fresh concrete - basics regarding fresh concrete –mixing, workability, placement, consolidation, and curing, segregation and bleeding Chemical Admixtures: types and classification; actions and interactions; usage; effects on properties of concrete.

MODULE III

Mineral Admixtures: Fly ash, ground granulated blast furnace slag, metakaolin, rice-husk ash and silica fume; chemical composition; physical characteristics; effects on properties of concrete; advantages and disadvantages. Proportioning of concrete mixtures: Factors considered in the design of mix. BIS Method, ACI method.

MODULE IV

Properties of hardened concrete: Strength- compressive tensile and flexure - Elastic properties - Modulus of elasticity - Creep-factors affecting creep, effect of creep - shrinkage-factors affecting shrinkage, plastic shrinkage, drying shrinkage, autogeneousshrinkage, carbonation shrinkage

MODULE V

Durability of concrete: Durability concept; factors affecting, reinforcement corrosion; fire resistance; frost damage; sulfate attack; alkali silica reaction; concrete in sea water, statistical quality control, acceptance criteria as per BIS code.Non-destructive testing of concrete: Surface Hardness, Ultrasonic, Penetration resistance, Pull-out test, chemical testing for chloride and carbonation- core cutting - measuring reinforcement cover.

MODULE VI

Special concretes - Lightweight concrete- description of various types -High strength concrete - Self compacting concrete -Roller compacted concrete – Ready mixed concrete – Fibre reinforced concrete - polymer concrete Special processes and technology for particular types of structure - Sprayed concrete; underwater concrete, mass concrete; slip form construction, Prefabrication technology

Text books:

1. Neville A.M.,"Properties of Concrete", Trans-Atlantic Publications, Inc.; 5e, 2012
2. Job Thomas., " Concrete Technology", Cenage learning,
3. R. Santhakumar „ Concrete Technology", Oxford Universities Press, 2006
4. Shetty M. S., Concrete Technology", S. Chand & Co., 2006

References:

1. Mehta and Monteiro, „Concrete-Micro structure, Properties and Materials", McGraw Hill
1. Professional
2. Neville A. M. and Brooks J. J., Concrete Technology, Pearson Education, 2010
3. Lea, Chemistry of Cement and Concrete", Butterworth-Heinemann Ltd, 5e, 2017
4. Bungey, Millard, Grantham – Testing of Concrete in Structures- Taylor and Francis, 2006

CE341 DESIGN PROJECT

L-T-P

0-1-2

Credit 2

Course Objectives:

- To understand the engineering aspects of design with reference to simple products
- To foster innovation in design of products, processes or systems
- To develop design that add value to products and solve technical problems

Course Outcomes:

The students will be able to

- Think innovatively on the development of components, products, processes ortechnologies in the engineering field
- Analyze the problem requirements and arrive workable design solutions

SYLLABUS

Study: Take minimum three simple products, processes or techniques in the area ofspecialization, study, analyze and present them. The analysis shall be focused on functionality, strength, material, manufacture/construction, quality, reliability, aesthetics, ergonomics, safety, maintenance, handling, sustainability, cost etc. whichever are applicable. Each student in the group has to present individually; choosing different products, processes or techniques.

Design: The project team shall identify an innovative product, process or technology and proceed with detailed design. At the end, the team has to document it properly and present and defend it. The design is expected to concentrate on functionality, design for strength is not expected.

Note: The one hour/week allotted for tutorial shall be used for discussions and presentations. The project team (not exceeding four) can be students from different branches, if the design problem is multidisciplinary.

Reference:

1. Michael Luchs, Scott Swan, Abbie Griffin, 2015.
2. Design Thinking. 405 pages, John Wiley & Sons, Inc

CE331 MATERIAL TESTING LAB -II

L-T-P

0-0-3

Credit 1

Course objectives:

- To enable experimental evaluation of properties of the materials used for concrete
- To obtain the characteristics of the materials.

LIST OF EXPERIMENTS:

1. Determination of the Specific Gravity and Soundness of cement
2. Determination of the Standard Consistency, Initial and Final Setting Times of Cement andthe compressive strength of Cement.
3. Tests on fine aggregate – specific gravity, bulking, sieve analysis, fineness modules, moisturecontent , bulk density
4. Tests on coarse aggregate - specific gravity, sieve analysis, fineness modulus, bulk density.
5. Tests on Fresh Concrete: Workability : Slump, Vee-Bee, Compaction factor tests ,flow test
6. Determination of the Compressive Strength of Concrete by Cube and Cylinder.
7. Carrying out the Split Tensile and Flexural strength of Concrete.
8. Compressive strength of Brick as per IS
9. Transverse strength of tiles
10. Demonstration of Mix Design of Concrete by IS methods
11. Non-destructive tests (rebound hammer & ultrasonic pulse velocity)

Books/Manuals /References:-

1. Concrete Lab Manual, TTTI Chandigarh
2. M.L. Gambhir, Concrete Manual, Dhanpat Rai & Sons, Delhi.
3. M.S.Shetty , Concrete Technology, Theory and Practice , S.Chand& Company, 2014
4. Relevant latest IS codes on Aggregates, Cement & Concrete [269, 383, 2386, 10262(2009),SP23]

CE333 GEOTECHNICAL ENGINEERING LAB

L-T-P

0-0-3

Credit 1

Course objectives:

- To understand the laboratory tests used for determination of physical, index and Engineering properties of soil.

Course Outcomes:

The students will

- Have thorough knowledge about the procedures of laboratory tests used for determination ofPhysical, index and engineering properties of soils
- Have the capability to classify soils based on test results and interpret engineering behavior based on test results
- Be able to evaluate the permeability and shear strength of soils
- Be able to evaluate settlement characteristics of soils
- Be able to evaluate compaction characteristics required for field application

LIST OF EXPERIMENTS:

1. Determination of Water Content, Specific Gravity and Shrinkage Limit
2. Field Density determination and Sieve Analysis
3. Atterberg Limits (Liquid Limit and Plastic Limit)
4. Hydrometer Analysis
5. Direct Shear test
6. Standard Proctor Compaction Test
7. Permeability Test and Unconfined Compression Test
8. Consolidation Test
9. Swelling Test
10. Heavy compaction
11. California Bearing Ratio Test.

Text Books / References:

1. IS codes relevant to each test
2. C. Venkatramaiah, Geotechnical Engineering, New Age International publishers, 2012
3. Gopal Ranjan and A. S. R. Rao, Basic and Applied Soil Mechanics, New Age InternationalPublishers, 2012
4. K. R. Arora, Soil Mechanics and Foundation Engineering, Standard Publishers, 2011

SEMESTER-VI

CE302 DESIGN OF HYDRAULIC STRUCTURES

L-T-P

4-0-0

Credit 4

Course objectives:

- To impart knowledge regarding the design of the various minor irrigation structures
- To convey the knowledge on the causes of failure, design criteria and stability analysis of different types of dams

Course Outcomes:

The students will be able to:

- Perform the stability analysis of gravity dams
- Explain the causes of failure of different types of dams and their design criteria
- Design minor irrigation structures such as regulators, cross drainage works and canal falls

SYLLABUS

MODULE I

Diversion head works- layout and functions of components, Weir and barrage- Causes of failure of weirs on permeable soils -Bligh's theory. Design of vertical drop weir. Khosla's theory of independent variables- Khosla's corrections-Use of **Khosla's charts.**

MODULE II

Irrigation canals, canal alignment- cross section of unlined canals Design of canals through alluvial soils-Kennedy's theory andLacey's theory. Cross drainage works-Types, selection of suitable type, Type ofaqueducts.Regulation Works - Canal falls-necessity, classification. Canal regulators- Regulator cum road bridge- Head regulators and cross regulators.

MODULE III

Design and Drawing of the following hydraulic structures:

1. Aqueduct (Type III)

2. Syphon Aqueduct (Type III)

3. Canal Fall (Trapezoidal Notch type)

4. Siphon Well Drop

5. Sarda Type Fall (High Discharge only)

6. Cross Regulator (Using Khosla's Theory)

MODULE IV

Dams-Types, Gravity dam – selection of site- forces acting -stability analysis and modes of failure – Principal and shear stresses Problems - Elementary profile –limiting height of gravity dams high and low dams- Practical profiles, Functions of various components shafts, keys, water stops, and different types of gallery, Grouting. Instrumentation in dams (Concept only).

MODULE V

Arch dams-types, methods for design (list only)-Thin cylinder theory. Earth dams-types, causes for failure and design criteria. Spillways-Types. Effective length of spillway- Ogee type spillway profile. Energy dissipation below spillways - Stilling basins

Text Books:

1. Garg S.K, Irrigation Engineering and Hydraulic Structures, Khanna Publishers, 2006.
2. Modi. P. N., Irrigation Water Resources and Water Power Engineering, Standard Book House, 2009.
3. Punmia B.C. Ashok K Jain, Arun K Jain, B. B. L Pande, Irrigation and Water PowerEngineering, Laxmi Publications (P) Ltd. 2010.

References:

1. Arora, K.R., "Irrigation, Water Power and Water Resources Engineering", Standard PublishersDistributors, 2010.
2. Asawa. G.L. Irrigation and Water Resources Engineering, New Age International, 2000
3. Sahasrabudhe S.R., Irrigation Engineering & Hydraulic Structures, S.K. Kataria & Sons, 2013
4. Sathyanarayana M. C. Water Resources Engineering-Principles and Practice, New AgeInternational Publishers. 2009
5. Varshney, R.S. Theory & Design of Irrigation Structures - Vol III, Nem Chand & Bros., Roorkee.

CE304 DESIGN OF CONCRETE STRUCTURES - II

L-T-P

3-0-0

Credit 3

Course objectives:

- To provide knowledge in the structural design of selected advanced structures of concrete and enable them to design reinforced concrete structures for real-world applications.

Course Outcomes:

The students will be able to:

- Design eccentrically loaded and slender columns using SP 16 design charts and different types of foundations
- Design and detail cantilever retaining wall and understand the design principles of Counterfort retaining wall
- Design and detail circular slabs and domes
- Design rectangular and circular water tanks using IS code coefficients (IS 3370).
- Gain knowledge of prestressed concrete fundamentals and analyze pre and post tensioned beams.

SYLLABUS

MODULE I

Analysis and design of short columns under eccentric loading Columns subjected to compression and uniaxial bending- design using SP16 charts for limit state Columns subjected to combined axial load and biaxial bending moments-code procedure for design-design using SP16 charts for limit state Slender columns- behavior of slender columns-braced and unbraced columns-design procedure- design using SP16 charts for limit state

MODULE II

Foundations- classification-IS code provisions for design of isolated footings- design principles of rectangular footings- Design of rectangular footings-uniform thickness and sloped- eccentrically loaded rectangular footing of uniform thickness-detailing. Combined footings (design principles only)- analysis of combined footings-rectangular and trapezoidal.

MODULE III

Retaining walls-Types- Cantilever retaining wall- earth pressure and forces acting-stability-proportioning-structural behavior of components -design example of cantilever retaining wall

withoutsurcharge-detailing Counterfort retaining wall- design principles of components and detailing (design not required)

MODULE IV

Circular slabs- stresses- reinforcements- simply supported, fixed and partially fixed subjected to uniformly distributed loads Design and detailing of spherical and conical domes

MODULE V

Introduction to design of water tanks-design philosophy and requirements-joints- IS code recommendations Design of rectangular water tanks using IS code coefficients (IS3370).Design of circular water tanks using- IS code coefficients (IS 3370)

MODULE VI

Introduction to Pre-stressed concrete: Concept of pre-stressing Materials-High strength concrete and high tensile steel. Analysis of pre-stressed beams (Rectangular and I-sections) at stages of transfer and service. Losses in Prestress

Text Books / References:

1. N. Krishnaraju, Prestressed Concrete, Tata McGraw- Hill, 5e, 2012
2. Pillai S.U & Menon D – Reinforced Concrete Design, Tata McGraw Hill Book Co., 2009
3. Punmia, B. C, Jain A.K and, Jain A.K, R C C Designs, Laxmi Publications Ltd., 10e, 2015
4. Relevant IS codes (IS 456, IS 875IS 1343, IS 3370, SP 16, SP 34)

CE306 COMPUTER PROGRAMMING ANDCOMPUTATIONAL TECHNIQUES

L-T-P

3-0-0

Credit 3

Course Objectives:

- To provide adequate knowledge for coding in C++ language
- To give awareness about the different computational methods and their implementation to analyze basic Engineering problems

Course Outcome:

- The students will be able to develop computer programs and implement numerical techniques for solving basic engineering problems using C++ language.

SYLLABUS

MODULE I

Introduction to C++: Structure of C++ program; Character set; Keywords; Identifiers; Data types – integer, real, character, string, Boolean, Enumerated data types, Constants and Variables; Operators – assignment, arithmetic, relational, logical, increment, decrement and conditional operators; Statements – simple & compound, declaration statements. Input and output streams. Selection statements: if, if-else, switch statements

MODULE II

Looping statements - for, while, do-while statements, Jump statements – break, continue, goto, exit (). Arrays - single and multi-dimensional arrays, initializing array elements, pointers & arrays, Character arrays, string functions, Unformatted console I/O functions, Unformatted Stream I/Ofunctions.Preparation of programs for evaluation of factorial of a number, Infinite series, Sorting, Searching and Matrix manipulations.

MODULE III

User defined functions – Arguments, return values, call by value, call by reference, functions calling functions, functions and arrays - Global variables, automatic, static and register variables, recursive functions.

MODULE IV

Structures - functions and structures - Arrays of structures -structures within structures, Structures containing arrays. Files - Input & Output, sequential & random access. Basic concepts of object oriented programming - class, objects, constructors and destructors, inheritance (Programsnot required)

MODULE V

Roots of Transcendental equations - Successive approximations, Regular - Falsi, Newton Raphson Methods, Interpolation-Lagrange interpolation method.

MODULE VI

Functional approximation - Fitting straight line & parabola, Numerical Integration - Trapezoidal, Simpson's rule &Gauss quadrature Method. Solution of simultaneous linear algebraic equations – Gauss elimination method. Solution of Partial differential Equation - Finite Difference Method

Text Books:

1. Balaguruswamy, Object Oriented programming with C++. Tata Mcgraw Hill., 2008
2. Gerald C. F. and P. O. Wheatley, Applied Numerical Analysis, Pearson Edu., 2004
3. Robert Lafore ., C++ Programming., Sams publishers.,4th Edition, 2001

Reference Books:

1. Barkakati N., Object Oriented Programming in C++, SAMS, 1991.
2. Kamthane A. M., Object Oriented Programming with ANSI & Turbo C++, PearsonEducation, 2009.
3. Lippman S. B. and J. Lajoie, C++ Primer, Pearson Education, 2005.
4. Maria Litvin.and Gary Litvin, C++ for You++, Skylight Publishing, 1998.
5. Ravichandran D., Programming with C++, Tata McGraw Hill, 2007.

CE308 TRANSPORTATION ENGINEERING - I

L-T-P

3-0-0

Credit 3

Course objectives:

- To introduce the principles and practice of Highway engineering and Airport Engineering.

- To enable students to have a strong analytical and practical knowledge of geometric design of highways.
- To introduce pavement design concepts, material properties, construction methods and to design highway pavements.
- To understand the principles of traffic engineering and apply this for efficient management of transportation facilities.

Course Outcomes:

The students will be able to:

- Design various geometric elements of a highway
- Determine the characteristics of pavement materials and design flexible pavements
- Conduct traffic engineering studies and analyze data for efficient management of roadway facilities, Plan and design basic airport facilities

SYLLABUS

MODULE I

Introduction to Transportation Engineering, Classification of roads, Typical cross sections of roads in urban and rural area, Requirements and factors controlling alignment of roads, Engineering surveys for highway location- Introduction to geometric design of highways, Design controls and criteria, Design of highway cross section elements.

MODULE II

Sight distance, stopping sight distance, Overtaking sight distance, Design of horizontal alignment and Vertical alignment

MODULE III

Introduction to highway materials, design and construction, Desirable properties and testing of road aggregates, bituminous materials and sub grade soil. Flexible and rigid pavements, Factors influencing the design of pavements, CBR method and IRC guidelines for flexible pavements

MODULE IV

Introduction to performance grading and superpave, Construction of bituminous pavements, Types and causes of failures in flexible and rigid pavements, Highway drainage. Introduction to Traffic Engineering, Traffic characteristics, Traffic studies and their applications.

MODULE V

Types of road intersections, Traffic control devices, Traffic signs, Road markings and Traffic signals, Design of isolated signals by Webster'smethod.Introduction to Airport Engineering, Aircraft characteristics and their influence on planning of airports, Components of airport, Selection of site for airport

MODULE VI

Runway orientation, basic runway length and corrections required, Geometric design of runways, Design of taxiways and aprons, Terminal area planning, Airport markings, Lighting of runway approaches, taxiways and aprons, Air traffic control

Text Books:

1. Khanna, S.K. & Justo E.G., Highway Engineering, Nem Chand & Bros., 2000
2. Kadiyali, L. R., Principles of Highway Engineering, Khanna Publishers, 2001
3. Khanna, S. K. & Arora. M. G., Airport Planning and Design, Nemchand& Bros.

References:

1. Horonjeff R. & McKelvy, F., Planning and Design of Airports, McGraw Hill, 5e, 2010
2. IRC: 37-2001, Guidelines for the Design of Flexible Pavements, IRC 2001, New Delhi
3. IRC:37-2012, Tentative Guidelines for the Design of Flexible Pavements
4. O' Flaherty, C.A (Ed.)., Transport Planning and Traffic Engineering, Elsevier, 1997
5. Rangwala, S. C., Airport Engg. Charotar Publishing Co., 16e, 2016
6. Yoder, E. J & Witezak, M. W, Principles of Pavement Design, John Wiley & Sons, 1991

HS300 PRINCIPLES OF MANAGEMENT

L-T-P

3-0-0

Credit 3

Course Objectives:

- To develop ability to critically analyze and evaluate a variety of management practices in the contemporary context;
- To understand and apply a variety of management and organizational theories in practice;
- To be able to mirror existing practices or to generate their own innovative management competencies, required for today's complex and global workplace;
- To be able to critically reflect on ethical theories and social responsibility ideologies to create sustainable organizations.

Course Outcome:

A student who has undergone this course would be able to:

- Manage People and Organizations
- Ii. Critically Analyze and Evaluate Management Theories and Practices
- Iii. Plan and Make Decisions for Organizations
- Iv. Do Staffing and Related Hrd Functions

SYLLABUS

MODULE I

Introduction to Management: definitions, managerial roles andfunctions; Science or Art perspectives- External environmentglobal, innovative and entrepreneurial perspectives ofManagement – Managing people and organizations inthe context of New Era- Managing for competitive advantage -the Challenges of Management

MODULE II

Early Contributions and Ethics in Management: ScientificManagement- contributions of Taylor, Gilbreths, HumanRelations approach-contributions of Mayo, McGregor'sTheory, Ouchi's Theory Z (3 Hrs.) Systems Approach, theContingency Approach, the Mckinsey 7-S FrameworkCorporate Social responsibility- Managerial Ethics. (3 Hrs)

MODULE III

Planning: Nature and importance of planning, -types of plans- Steps in planning, Levels of planning - The PlanningProcess. – MBO.

MODULE IV

Organising for decision making: Nature of organizing,organization levels and span of control in managementOrganisational design and structure –departmentation, line and

staff concepts.Limitations of decision makingEvaluation and selecting from alternatives-programmed andnon programmed decisions - decision under certainty,uncertainty and risk-creative process and innovation.

MODULE V

Staffing and related HRD Functions: definition,Empowerment, staff – delegation, decentralization andrecentralisation of authority – Effective Organizing andculture-responsive organizations –Global and entrepreneurialorganizing.Manager inventory chart-matching person

with the job-system approach to selection .Job designskills and personal characteristics needed in managersselection process, techniques and instruments.

MODULE VI

Leading and Controlling: Leading Vs Managing – Traitapproach and Contingency approaches to leadership -Dimensions of Leadership.- Leadership Behavior andstyles – Transactional and Transformational Leadership.Basic control process- control as a feedback system –Feed Forward Control – Requirements for effective control –control techniques – Overall controls and preventive controls –Global controlling.

Text Book:

1. Harold Koontz and Heinz Weihrich, Essentials of Management, McGraw Hill Companies, 10th Edition.

References:

1. Daft, New era Management, 11th Edition, Cengage Learning
2. Griffin, Management Principles and Applications, 10th Edition, Cengage Learning
3. Heinz Weirich, Mark V Cannice and Harold Koontz, Management: a Global,
2. Innovative and Entrepreneurial Perspective, McGraw Hill Education, 14th Edition
3. Peter F Drucker, The Practice of Management, McGraw Hill, New York
4. Robbins and Coulter, Management, 13th Edition, 2016, Pearson Education

CE362 GROUND IMPROVEMENT TECHNIQUES

L-T-P

3-0-0

Credit 3

Course objectives:

- To impart fundamental knowledge of Ground Improvement Techniques
- To make capable of choosing and designing the appropriate method of Ground Improvement according to site conditions and requirement

Syllabus:

Course Outcomes:

- An understanding about types of ground improvement techniques and soil distribution in India
- Knowledge about various types of grouts and their applications
- Knowledge about types of chemical stabilization and their construction method
- Understanding about Ground Anchors, Rock Bolts and Soil Nailing
- Knowledge about Compaction of soil
- Understanding about various methods of dewatering of soil

MODULE I

Introduction to Engineering Ground Modification- Classification of Ground Modification Techniques- Soil distribution in India Reclaimed soils- Ground Improvement Potential.

MODULE II

Grouting – Aspects – Groutability, Grouting materials, Suspension grouts and solution grouts, Compaction grouting. Procedure and applications of grouting.

MODULE III

Chemical stabilization – Granular admixtures, Cement, Lime, Calcium Chloride, Fly Ash, Bitumen, Chemical admixtures. Construction Methods.

MODULE IV

Ground Anchors – Applications, types and components, Anchor tests. Rock bolts – Applications and types- Rock bolt action around an excavation. Soil Nailing – construction sequence –analysis of nailed soil

MODULE V

Compaction- Moisture Density relationship. Shallow surface compaction-Rollers – operational aspects. Deep Compaction –Explosion- heavy tamping- vibro-compaction and vibroreplacement. Properties of compacted soil, Compaction control tests.

MODULE VI

Hydraulic modification- Methods of dewatering- open sumps and ditches, Well point systems, deep well drainage, Vacuum dewatering, Electro osmosis. Design of dewatering for excavations.

Text Books / References:

1. Manfred. R. Hausmann, Engineering Principles of Ground Modification, McGraw Hill,1989
1. P. Purushothamaraj, Ground Improvement Techniques ,University Science Press, 2005

SEMESTER-VII

CE401 DESIGN OF STEEL STRUCTURES

L-T-P

4-0-0

Credit 4

Course objectives:

- To introduce the limit state design of steel structural components subjected to bending, compression and tensile loads including the connections
- To enable design of structural components using timber

Course Outcomes:

The students will be able to:

- Design bolted and welded connections
- Design tension members and beams using the is specifications
- Design columns under axial loads using is specifications
- Design beams and plate girders
- Assess loads on truss and design purlins
- Design structural components using timber.

SYLLABUS

MODULE I

Introduction to steel and steel structures, properties of steel,structural steel sections. Introduction to design: Design loads andload combinations, limit state design concepts. Connections bolted and welded (direct loads)

MODULE II

Tension members-Types of sections – net area- design of tension members- concept of shear lag-use of lug angle-connections intension members

MODULE III

Compression members- design of struts- solid and built up columns for axial loads-- design of lacings and battens-column bases- slab base – gusseted base

MODULE IV

Design of beams- laterally restrained and unrestrained – simple and compound beams- plate girders subjected to uniformly distributed loads – design of stiffeners.

MODULE V

Design of roof trusses- types-design loads and load combinations-assessment of wind loads-design of purlins. Moment resistant/Eccentric connections (in plane and out of plane)

MODULE VI

Design of timber structures: types of timber - classification -allowable stresses-design of beams-flexure, shear, bearing and deflection considerations-Design of columns. Design of composite beam sections with timber and steel.

Text Books:

1. L S Jayagopal, D Tensing., Design of steel structures, S Chand & Company, 2015
2. S K Duggal., Limit State design of steel structures, Tata McGraw Hill, 2010
3. Subramanian N, Design of steel Structures, Oxford University Press, 2011

References:

1. P. Dayaratnam., Design of Steel Structures ,Wheeler Publishing, 2003
2. Punmia B. C., Jain A. K. and Jain A. K., Design of Steel Structures, Laxmi Publications (P)Ltd, 2017
3. Raghupathi, Steel Structures, Tata McGraw Hill, 2006
4. Ramchandra S and Virendra Gehlot, Design of Steel Structures Vol. II, Standard BookHouse, 2007
5. V L Shah & Veena Gore, Limit State Design of steel Structures , Structures Publications,2009

6. William T Segui., Steel Design , Cenage Learning, 6e, 2017
7. IS 800 – 2007, Code of practice for Structural steel design, BIS

CE403 STRUCTURL ANALYSIS - III

L-T-P

3-0-0

Credit 3

Course objectives:

- To enable the students to have a comprehensive idea of matrix structural analysis with emphasis on the relative advantages of the flexibility method and the stiffness method
- To enable the students to visualize structural dynamics problems with a proper blend of structural analysis and vibration theory

SYLLABUS

Course Outcomes:

The students will be able to

- Analyze structures using approximate method
- Analyze trusses, continuous beams and rigid frames using flexibility method
- Analyze trusses, continuous beams and rigid frames by stiffness method
- Conceive finite element procedures by direct stiffness method
- Use the basics of structural dynamics and analyze the response of systems

MODULE I

Approximate Methods of Analysis of Multistoried Frames: Analysis for vertical loads-substitute frames-loading condition for maximum hogging and sagging moments in beams

and maximum bending moment in columns- wind load analysis of multistoried frames – portal method and cantilever method for lateral load analysis.

MODULE II

Matrix analysis of structures: static and kinematic indeterminacy-force and displacement method of analysis-definition of flexibility and stiffness influence coefficients Concepts of physical approach

MODULE III

Flexibility method: flexibility matrices for truss and frame elements-load transformation matrix-development of total flexibility matrix of the structure-analysis of simple structures-plane truss and plane frame-nodal loads and element loads-lack of fit and temperature effects

MODULE IV

Stiffness method: Development of stiffness matrices by physical approach-stiffness matrices for truss and frame elements-displacement transformation matrix-analysis of simple structures-plane truss and plane frame-nodal loads and element loads-lack of fit and temperature effects

MODULE V

Introduction to direct stiffness method-Rotation of axes in two dimensions, stiffness matrix of elements in global co- ordinates from element co-ordinates- assembly of load vector and stiffness matrix, solution of two span continuous beam-single bay singlestorey portal frame.

MODULE VI

Structural dynamics-introduction-degrees of freedom-single degree of freedom subjected to harmonic load -linear systems- equation of motion, D'Alembert's principle-damping- free response of damped and undamped systems- logarithmic decrement- transient andsteady state responses, Dynamic magnification factor – Vibration isolation –Concept of two degree of freedom systems (No derivation and numerical problems)

Text Books:

1. G S Pandit and S P Gupta, Structural analysis a Matrix approach, McGraw Hill Education(India), 2e, 2008
2. Gere, J.M. and William Weaver, Matrix Analysis of framed structures, CBS Publishers, 1990
3. Kenneth M Leet, Chia Ming Uang, Anne M Gilbert, Fundamentals of structural analysis, TataMcGraw Hill Pvt Ltd., 4e, 2010
4. Reddy C.S., Basic structural analysis, Tata McGraw Hill, third edition, 3e, 2012

References:

1. Anil. K. Chopra, Dynamics of structures, Pearson Education/ Prentice Hall India, 5e, 2016
2. Clough R.W. and Penzein, J., Dynamics of structures, Tata McGraw Hill, 1995
3. Madhujith Mukhopadhyay and Abdul Hamid Sheikh, Matrix and Finite Element Analysis ofStructures, Ane Books India, 2009
4. Mario Paz , Structural Dynamics: Theory & Computation, 2e, CBS Publishers, 2004
5. Rajasekharan. S. and Sankarasubramanian G., Computational structural Mechanics, PHI, 2009
6. Wang C.K., Matrix method of structural analysis, International Text book company, 1970

CE405 ENVIRONMENTAL ENGINEERING- I

L-T-P

3-0-0

Credit 3

Course objectives:

- To study the significance of water resources and the factors affecting the quality and quantity of water
- To study the various types of treatment techniques adopted for a public water supply system

Course Outcomes:

The students will

- Become aware of the various pollutants affecting water quality
- Know about the different treatment units available in a water treatment plant and their design procedures

SYLLABUS

MODULE I

Introduction of environment- sources of water supply-Water demand, quantification of water demand through population forecasting -Factors affecting consumption-Fluctuations in demand

MODULE II

Types of intakes-Conveyors, pumps and location of pumping station-Quality of water - Drinking water standards - Physical, chemical and biological analysis.

MODULE III

Treatment of water-Theory and principles of Sedimentation tanks-Stoke's law-Types of settling (Type I & Type II only)-Coagulation-Mixing-Flocculation, Design of Sedimentation tanks (circular and rectangular)-Clariflocculators

MODULE IV

Filtration-Types of filters- Working and Design of Rapid and Slow sand filters. Loss of head in filters, Pressure filters

MODULE V

Disinfection of water - Methods, Chlorination-Types, Factors affecting - Chlorine demands. Miscellaneous treatment-Ion exchange, Lime-soda process, Electro dialysis - Colour, Taste and Odourremoval-Adsorption-Aeration-Fluoridation-Defluoridation

MODULE VI

Lay out of water distribution network-Methods of distribution-Hardy cross method-Equivalent pipe method-Pipe appurtenances.

Text Books:

1. B.C Punmia, "Water Supply Engineering", Laxmi Publications Pvt. Ltd., 2016
2. G S Birdie, Water Supply and Engineering, Dhanapat Rai Publishing Company, 2014
3. P.N. Modi, "Water Supply Engineering", Standard Book House, NewDelhi
4. Peavy H S, Rowe, D.R. Tchobanaglous "Environmental Engineering" Mc GrawHillEducation, 1984
5. S.K.Garg, "Water Supply Engineering", Khanna Publishers. 2010

References

1. K N Dugal, Elements of Environmental Engineering, S Chand and Company Pvt Ltd, 2007
2. Mackenzie L Davis, Introduction to Environmental Engineering, McGrawhill Education(India), 2012
3. Metcalf & Eddy , "Waste Water Engineering", Tata Mc Grawhill Publishing Co Ltd, 2003
4. P Venugopala Rao, Environmental Engineering, PHI Learning Pvt Ltd, 2002
5. Subhash Verma, Varinder Kanwar, Siby John, Water supply Engineering, Vikash Publishing,2015

CE407 TRANSPORTATION ENGINEERING - II

L-T-P

3-0-0

Credit 3

Course Objectives:

- To set a solid and firm foundation in Railway engineering, including the history development, modern trends, maintenance, geometric design and safety of railways.
- To introduce dock, Harbour and tunneling

Course Outcome:

- This course will enable students to gain knowledge in railway and water transportation.

SYLLABUS

MODULE I

Introduction to Railways in India: Role of Indian Railways in NationalDevelopment – Railways for Urban Transportation – Moderndevelopments- LRT & MRTS, tube railways, high speed tracks.Alignment- basic requirements and factors affecting selection, Componentparts of a railway track - requirements and functions - Typical cross-section

MODULE II

Permanent Way: Components and their Functions: Rails - Types of Rails,Rail Fastenings, Concept of Gauges, Coning of Wheels, Creeps and kinks .Sleepers – Functions, Materials, Density , Ballast less Tracks. Geometric design of railway track: Horizontal curves, radius – superelevation -cant deficiency - transition curves - gradients - different types -Compensation of gradients.

MODULE III

Railway operation and control: Points and Crossings – Design features of a turnout – Details of station yards and marshalling yards – Signaling, interlocking of signals and points -

Principles of track circuiting – Control systems of train movements – ATC, CTC – track circuiting

MODULE IV

Maintenance:- Introduction to track maintenance, Items of track maintenance, packing and over hauling, screening Railway accidents: Human and system contribution to catastrophic accidents, Human Factors in Transport Safety.

MODULE V

Tunnel Engineering: Tunnel - sections - classification - tunnel surveying-alignment, transferring Centre, grade into tunnel – tunnel driving procedure- shield method of tunneling, compressed air method, tunnel boring machine, Tunnel lining, ventilation - lighting and drainage of tunnels.

MODULE VI

Harbours– classification, features, requirements, winds and waves in the location and design of harbours.Break waters - necessity and functions, classification, alignment, design principles, forces acting on break water – construction, general study of quays, piers, wharves, jetties, transit sheds and warehouses - navigational aids - light houses, signals - types - Moorings Docks – Functions and types - dry docks, wet docks – form and arrangement of basins and docks

Text Books:

1. Mundrey J. S, Railway Track Engineering, Tata McGraw Hill, 2009
2. Rangawala, S.C. , Railway Engineering, Charotor Publishing House
3. Rao G. V, Principles of Transportation and Highway Engineering, Tata McGrawHill, 1996
4. Srinivasan,R., Harbour, Dock & Tunnel Engineering, Charotor Publishing House, 28e,2016

References:

1. Bindra, S.P., A course in Docks and Harbour Engineering, Dhanpat Rai& Sons
2. Chandra, S. and Agarwal, M.M. ,Railway Engineering, Oxford University Press, NewDelhi, 2008
3. Saxena, S. C and Arora, S. P, Railway Engineering, Dhanpat Rai& Sons, 7e, 2010
4. Subhash C. Saxena, Railway Engineering, Dhanpat Rai& Sons

CE409 QUANTITY SURVEYING AND VALUATION

L-T-P

3-0-0

Credit 3

Course objectives:

- To have an awareness regarding specifications, analysis of rates, valuation etc. in connection with construction
- To prepare detailed estimates, bar bending schedules of various items of work

Course Outcomes:

The students will be able to:

- Work out the quantities of materials and labour required for different types of civil works
- Prepare schedule of rates for various items of work

SYLLABUS

MODULE I

General Introduction- Quantity Surveying- Basic principles-Types of Estimates - Specifications- purposes and basic principles-general specifications - Detailed specifications- Method of measurement of various items of work. Analysis of rates- Introduction to the use of CPWD data book and schedule of rates- conveyance and conveyance statement -

MODULE II

Preparation of data and analysis of rates for various items of work connected with building construction and other civil engineering structures with reference to Indian Standard Specification.

MODULE III

Detailed estimate including quantities, abstract and preparation ofvarious items of works- buildings- centerline method and long wall short wall method- sanitary and water supply

works- soak pits, septic tanks, overhead tanks, culverts, Retaining walls, road construction. Bar-bending schedule-preparation of bar-bending schedule for RCCworks connected with building construction, culverts and minor irrigation works.

MODULE IV

Valuation - Explanation of terms, types of values, sinking fund, years purchase, Depreciation - Straight line method, constant percentage method, S.F method .Obsolescence. Valuation of real properties-rental method, profit based method, depreciation method. Valuation of landed properties -belting method, development method, hypothecated building scheme method. Rent calculation. Lease and Lease hold property

Text Books

1. B N Dutta, Estimating and costing in Civil Engineering, USB publishers and distributers Ltd.New Delhi
2. D D Kohli, RC Kohli, A textbook of Estimating and costing, S Chand Publishing, 2011
3. Dr. S. Seetharaman, M. Chinnasamy, Estimation and Quantity Surveying, AnuradhaPublications, Chennai.

References:

1. BS Patil, Civil Engineering contracts and estimates, Universities press
2. V N Vazirani & S P Chandola, Civil engineering Estimating and Costing, Khanna Publishers.
3. IS 1200-1968; Methods of measurement of Building & Civil Engineering works.
4. CPWD data book and schedule of rates.

CE469 ENVIRONMENTAL IMPACT ASSESSMENT

L-T-P

3-0-0

Credit 3

Course objectives:

- To know the various types of environmental pollution
- To make aware the impact due to various types of pollutants and their assessment technique

Course Outcomes:

- The students will gain basic knowledge of various pollution sources and their impacts

SYLLABUS

MODULE I

INTRODUCTION: Classification of Pollution and Pollutants, –Evolution of EIA (Global and Indian Scenario)- Elements of EIA— Screening – Scoping - Public Consultation - Environmental Clearance process in India - Key Elements in 2006 EIA(Govt. of India) Notification

MODULE II

AIR POLLUTION: Primary and Secondary Types of Pollutants, sulfur dioxide- nitrogen dioxide, carbon monoxide, WATERPOLLUTION: Point and Non-point Source of Pollution, Major Pollutants of Water, Impact of pollutants

MODULE III

SOLID WASTE: Classification and sources of Solid Waste, Characteristics, effects, e waste, : Effects of urbanization on land degradation, pesticide pollution NOISE POLLUTION: Sources of Noise, Effects of Noise,Control measures

MODULE IV

Impacts of pollutants, types, scale of impact-Global, local pollutants. Climate change, Ozone layer depletion, Deforestation, land degradation, Impact of development on vegetation and wild life

MODULE V

Socio-economic impacts - Impact assessment Methodologies-Overlays, Checklist, Matrices, Fault Tree Analysis, Event Tree Analysis- Role of an Environmental Engineer- Public Participation

MODULE VI

Standards for Water, Air and Noise Quality - Environmental Management Plan- EIA- Case studies of EIA

Text Books / References:

1. A K Srivastava, Environment impact Assessment, APH Publishing, 2014
2. John Glasson, Riki Therivel & S Andrew Chadwick "Introduction to EIA" UniversityCollege London Press Limited, 2011
3. Larry W Canter, "Environmental Impact Assessment", McGraw Hill Inc., New York, 1995.
4. Ministry of Environment & Forests, Govt. of India 2006 EIA Notification
5. Rau G J and Wooten C.D "EIA Analysis Hand Book" Mc Graw Hill
6. Robert A Corbett "Standard Handbook of Environmental Engineering" McGraw Hill, 1999.

CE431 ENVIRONMENTAL ENGINEERING LAB

L-T-P

0-0-3

Credit 1

Course objectives:

- To equip the students in doing analysis of water and wastewater samples

Course Outcomes:

- The students will be able to assess quality of water for various purposes

LIST OF EXPERIMENTS:(Minimum 10 experiments are mandatory)

1. To analyze the physical characteristics viz. colour, turbidity, and conductivity of a given water sample and to determine its suitability for drinking purposes
2. To analyze the chemical characteristics of a given water sample viz. pH, acidity, alkalinity for assessing its potability
3. To analyze the chemical characteristics of a given water sample viz. chlorides and sulphates content to assess its suitability for drinking purposes and building construction
4. To determine the Dissolved Oxygen content of a given water sample for checking its potability
5. To determine the available chlorine in a sample of bleaching powder
6. To analyze the various types of solids in a given water sample
7. To determine the BOD of a given wastewater sample
8. To determine the COD of a given wastewater sample
9. To determine the optimum dosage of alum using Jar test
10. To determine the Nitrates / Phosphates in a water sample
11. To determine the iron content of a water sample
12. To determine the MPN content in a water sample and assess the suitability for potability

CE 451 SEMINAR AND PROJECT PRELIMINARY

L-T-P

0-1-4

Credit 2

Course Objectives

- To develop skills in doing literature survey, technical presentation and report preparation.
- To enable project identification and execution of preliminary works on final semester project

Course Outcome.

The students will be able to:

- Analyze a current topic of professional interest and present it before an audience
- Identify an engineering problem, analyze it and propose a work plan to solve it.

SYLLABUS

Seminar: Each student shall identify a topic of current relevance in his/her branch of engineering, get approval of faculty concerned, collect sufficient literature on the topic, study it thoroughly, prepare own report and present in the class.

Project preliminary: Identify suitable project relevant to the branch of study. Form project team (not exceeding fourstudents). The students can do the project individually also. Identify a project supervisor. Presentthe project proposal before the assessment board (excluding the external expert) and get itapproved by the board.

The preliminary work to be completed: (1) Literature survey (2) Formulation of objectives (3)Formulation of hypothesis/design/methodology (4) Formulation of work plan (5) Seeking funds(6) Preparation of preliminary report

Note: The same project should be continued in the eighth semester by the same project team.

Evaluation

Seminar: 50 marks

Distribution of marks for the seminar is as follows:

1) Presentation : 40%
2) Ability to answer questions : 30%
3) Report: 30%)

Project preliminary: 50 marks(Progress evaluation by the supervisor: 40% andprogress evaluation by the assessment board excluding external expert: 60%. Two progressevaluations, mid semester and end semester, are mandatory.)

SEMESTER-VIII

CE402 ENVIRONMENTAL ENGINEERING – II

L-T-P

3-0-0

Credit 3

Course objectives:

- To understand the various sources and characteristics of wastewater
- To know the various treatment methods available for wastewater treatment

Course Outcomes:

The students will:

- Have an understanding of the various types of treatment methods for wastewater
- Know the design aspects of various treatment units in a wastewater treatment plant.

SYLLABUS

MODULE I

Wastewater- Sources and flow rates, Domestic wastewater, Estimation of quantity of wastewater, Dry weather flow, storm water flow, Time of concentration Sewers, Design of circular sewers under full and partial flow

MODULE II

Sewer appurtenances-Man holes, Catch basin, flushing devices, inverted siphon. Ventilation of sewers. Sewage, Sewerage, Systems of sewerage Sewage characteristics- Physical, chemical and biological parameters, Biological oxygen demand, first stage BOD, Chemical oxygen demand, Relative stability, Population equivalent.

MODULE III

Waste water disposal systems- Self-purification of streams, Dilution -Oxygen sag curve, Streeter Phelp's Equation, land treatment , Treatment of sewage-Preliminary and Primary treatment -Theory and design of Screen, Grit chamber, Detritus chamber, Flow equalization tank and Sedimentation tank.

MODULE IV

Secondary treatment methods-Contact bed, Intermittent sand filter, Theory and design of Trickling filter, Activated sludge process, Trickling filter-High rate, standard. Rotating biological contactor

MODULE V

Design of Septic tank and Imhoff tank, Principle and working of Oxidation ditch and oxidation ponds. Aerated lagoons, Design of up flow anaerobic sludge blanket reactors 8 20 VI Sludge treatment and disposal-Methods of thickening, Sludge digestion- Anaerobic digestion, Design of sludge digestion tanks and Sludge drying beds, methods of sludge disposal

Text Books

1. B.C Punmia , "Waste Water Engineering", Laxmi Publications Pvt. Ltd, 2012
2. Howard S Peavy, Donald R Rowe, George Tchobanoglous, Environmental Engineering, Mc Graw Hill Education, 1984
3. P N Modi, "Sewage Treatment & Disposal and Waste water Engineering", Standard Book House, NewDelhi, 2e, 2008.
4. S.K. Garg , "Sewage disposal and Air pollution Engineering", Khanna Publishers, 2008
5. G S Birdie, Water Supply and Engineering, Dhanpat Rai Publishing Company, 2014

References

1. G. L. Karia, R.A. Christian, Wastewater treatment: Concepts And Design Approach, PHI learning Pvt Ltd, 2013
2. J. Arceivala, Shyam R. Asolekar, Wastewater Treatment for Pollution Control and Reuse, McGrawhill Education, 2007
3. K N Duggal, Elements of Environmental Engineering, S Chand Publications, 2007
4. Mackenzie L Davis, Introduction to Environmental Engineering, McGraw Hill Education (India), 5e, 2012
5. Metcalf and Eddy, "Waste Water Engineering", Tata McGraw Hill publishing Co Ltd, 2003

CE404 CIVIL ENGINEERING PROJECT MANAGEMENT

L-T-P

3-0-0

Credit 3

Course objectives:

- To impart knowledge on principles of planning and scheduling projects, with emphasis on construction.
- To understand the uses and suitability of various construction equipment,
- To study the legal and ethical issues related to construction projects
- To become familiar with TQM and similar concepts related to quality
- To impart knowledge in the principles of safe construction practices
- To understand the need of ethical considerations in construction.

Course Outcomes:

The students will be able to:

- Plan and schedule a construction project.
- Select an appropriate construction equipment for a specific job
- Familiarize the legal procedures in construction contracts
- Formulate suitable quality management plan for construction
- Familiarize the safety practices and procedures.
- Apply principles of ethics in decision making.

SYLLABUS

MODULE I

Unique features of construction projects ; Identification of components –Principles of preparing DPR- Construction planning and scheduling - I – Bar charts, Network Techniques, Use of CPM and PERT for planning – Drawing network diagrams – time estimates – slack – critical path-Examples

MODULE II

Crashing and time –cost trade off, Resource smoothing and resources levelling - Construction, equipment, material and labour schedules. Preparation of job layout. Codification of the planning system: Codification approach- Work package and activities identification code – Resource codes – Cost and Finance accounting codes – Technical document codes

MODULE III

Construction disputes and settlement: Types of disputes – Modes of settlement of disputes – Arbitration- Arbitrator - Advantages and disadvantages of arbitration – Arbitration Award. Construction cost and budget: Construction cost – Classification of construction cost – Unit rate costing of resources- Budget – Types of budget – Project Master Budget.

MODULE IV

Concept of ethics – Professional ethics – ethical problems – provisions of a professional code – Role of professional bodies. Project management information system- Concept – Information system computerization – Acquiring a system – Problems in information system management - Benefits of computerized information system.

MODULE V

Concept of materials management – inventory – inventory control – Economic order quantity- ABC analysis. Safety in construction – Safety measures in different stages of construction – implementation of safety programme.

MODULE VI

Construction procedures: different methods of construction – types of contract – Tenders – prequalification procedure - earnest money deposit – contract document – General and important conditions of contract - measurement and measurement book - Inspection and quality control - need, principles and stages. Basics of Total Quality Management

Text Books:

1. Kumar Neeraj Jha, Construction Project Management, Pearson, Dorling Kindersley (India) pvt. Lt
2. L.S. Srinath – PERT and CPM –Principles and Applications, Affiliated East-West Press, 2001
3. Peurifoy and Schexnayder – Construction Planning, Equipment, and Methods, Tata McGraw Hill, 2010

Reference Books

1. B.C.Punmia & K K Khandelwal, Project Planning with CPM and PERT, Laxmi Publication, New Delhi, 2016
2. Charles D Fledderman, Engineering Ethics, Prentice Hall, 2012
3. F. Harris, Modern Construction and Ground Engineering Equipment and Methods, Prentice Hall, 1994
4. Gahlot and Dhir, Construction Planning and Management, New Age International, 1992
5. K KChitkara, Construction Project Management, McGraw Hill Education Pvt Ltd., 2000
6. Khanna, O.P., Industrial Engineering and Management., Dhanapat Rai Publications, 1980National Building Code, BIS
7. P.P. Dharwadkar, Management in Construction Industry, Oxford and IBH
8. Shrivastava, Construction Planning and Management, Galgotia Publications, 2000

CE474 MUNICIPAL SOLID WASTE MANAGEMENT

L-T-P

3-0-0

Credit 3

Course objectives:

- To create an awareness of different types of solid waste generated in our environment and their ill effects
- To study the various methods of collection, processing and disposal of solid wastes

Course Outcomes:

- Students will have an awareness of the ill effects of increasing solid wastes
- Students will be able to understand the various methods available for managing solid wastes generated

SYLLABUS

MODULE I

Wastes-Sources and characteristics - Categories of wastes Municipal, Industrial, Medical, Universal, Construction and demolition debris, Radioactive, Mining, e wastes, Agricultural waste.

MODULE II

Waste generation-Methods of estimation of Generation rateMeasure of quantities, Composition- Physical and chemical (simple problems). Storage of solid waste

MODULE III

Collection – collection services- collection systems, collection routes-Need for transfer operation. Resource conservation and recovery

MODULE IV

Processing techniques- Mechanical volume and size reduction, chemical volume reduction, component separation, drying (simple problems)

MODULE V

Disposal of solid waste; sanitary land fill- area method, trench method-advantages and disadvantages, Incineration- types of incinerators -parts of an incinerator-incinerator effluent gas composition

MODULE VI

Composting- types of composting-Indore process, Bangaloreprocess (advantages and disadvantages).Anaerobic digestion of wastes, Biogas digesters

Text Books

1. George Tchobanoglous, Frank Kreith et al “Hand book of solid waste management.” Mc Graw hill publications -Newyork.
2. William A Worrell, Aarne Vesilind, Solid waste Engineering, Cengage learning

3. Howard S Peavy, Donald R Rowe, George Tchobanoglous,"Environmental Engineering" McGrawhill Education

References:

1. John Pichtel " Waste management Practices" Taylor& Francis publishers
2. David. A. Cornwell, Mackenzie. L .Davis "Introduction to Environmental Engineering" Mc Graw Hill International Edition.
3. Daniel. B. Botkin, Edward .A. Keller "Environmental Science" (Earth as a living plant) IV Edition, John wiley& Sons Inc.
4. Robert. A. Corbitt "Hand Book of Environmental Engineering" Mc Graw hill publishing Company

MT482 INDUSTRIAL SAFETY

L-T-P

3-0-0

Credit 3

Course Objective

- To understand the impact of safe industrial operations, its benefits and safety legalization.

Course Outcomes:

The students will

- Gain a general concept of safety,
- Become aware of safety responsibilities of various agencies,
- Know the occupational health hazards and human factors contributing to industrial accidents,
- Learn the concepts of safety management,
- Understand the need for timely maintenance of equipment, the need and measures for industrial safety control
- Become familiar with the general legal rules for an industrial safety practitioner.

SYLLABUS

MODULE I.

Introduction to industrial safety Concept of Safety, Goals of safety engineering, Need for safety engineering, definitions of Accident, injury, unsafe actions &Conditions. Responsibility of Safety - Society, Govt., Management, Union & employees. Duties of safety officer. Safety Committee - Membership, Functions & Scope of Safety committee.

MODULE II

Safety and Health Management: Occupational Health Hazards, Promoting Safety, Safety and Health training, Stress and Safety. Ergonomics - Introduction, Definition, Objectives, Advantages. Ergonomics Hazards - Musculoskeletal Disorders and Cumulative Trauma Disorders. Importance of Industrial safety, role of safety department, Safety committee and Function.

MODULE III

Safety Awareness & Training: Training for Safety: Assessment of needs. Design & development of training programme. Training methods and strategies. Training of manager, supervisors & workers. Evaluation of training Programmes. Human behaviour and safety: Human factors contributing to accidents.

MODULE IV

Safety Assessment and Control Safety Management: Role of management in Industrial Safety. Safety Management- Principles & Practices. Safety Organization: Role of safety committee and its formation, Safety awareness programme: motivation, education and training, Appraisal of plant safety and measurement of safety performance, Total loss control concept, Introduction to productivity, Quality, Reliability, and Safety (PQRS) theory. Concept of workplace and its design. Improving safety and productivity through work place design control measures. Technical and engineering control measures. Control measures against human error. Preventive maintenance. Role of Preventive maintenance in safety and health. Standards and code of practices for plant and equipment.

MODULE V

Industrial Safety and Control of Physical Hazards: (Purpose of lighting. Advantages of good illumination. Lighting and safety. Lighting and the work. Control of Chemical Hazards Hazardous properties of chemicals and appreciation of information provided in Material safety data sheets. Classification of dangerous materials with pictorial symbols, common hazard and common precautions for each class Control of Electrical Hazards Dangers from electricity. Safe limits of amperages, Voltages Safe distance from lines. Capacity and

protection of conductors, Joints and connections, Means of cutting of power overload and short circuit protection. Statutory provisions regarding fire safety. Factors contributing towards fire. Chemistry of fire. Classification of fires. Common causes of industrial fires.

MODULE VI

Safety Legalization Legal Provisions regarding safety, Accident prevention & Compensation to affected employees as under Factories Act-1948, Factories Act(Amendment)1987, Maharashtra Factories Rule in 1963,The Mines Act-1952,Maharashtra Safety Officers Rule1982,The Workmen CompensationAct-1923,ESI Act, Public Liabilities Insurance Act-1991,Fatal Accident Act.

TEXT BOOKS/REFERENCES

1. Frank P. Lees, Loss of prevention in Process Industries, Vol. 1 and 2, ButterworthHeinemann Ltd., London (1991).
2. Grimaldi and Simonds , Safety Management, AITBS Publishers, New Delhi (2001)
3. Industrial Safety -National Safety Council of India.
4. R.K.Jain and Sunil S.Rao, Industrial Safety, Health and Environment Management Systems, Khanna Publishers, New Delhi (2006)
5. Slote.L. Handbook of Occupational Safety and Health, John Willey and Sons, New York
6. The Factories Act with amendments 1987, Govt. of India Publications DGFASLI, Mumbai

CE 492-PROJECT

Credit 6

Course Objectives:

- To apply engineering knowledge in practical problem solving
- To foster innovation in design of products, processes or systems
- To develop creative thinking in finding viable solutions to engineering problems

Course Outcomes:

The students will be able to:

- Think innovatively on the development of components, products, processes or technologies in the engineering field
- Apply knowledge gained in solving real life engineering problems

SYLLABUS

In depth study of the topic assigned in the light of the preliminary report prepared in the seventh semester Review and finalization of the approach to the problem relating to the assigned topic Preparing a detailed action plan for conducting the investigation, including team work Detailed Analysis/Modelling/Simulation/Design/Problem Solving/Experiment as needed Final development of product/process, testing, results, conclusions and future directions Preparing a paper for Conference presentation/Publication in Journals, if possible Preparing a report in the standard format for being evaluated by the dept. assessment board Final project presentation and viva voce by the assessment board including external expert

Evaluation Maximum Marks: 100

1. Two progress assessments 20% by the faculty supervisor(s)
2. Final project report 30% by the assessment board
3. Project presentation and viva voce 50% by the assessment board

Note: All the three evaluations are mandatory for course completion and for awarding the final grade.

SCHEME AND SYLLABUS FOR M.TECH (FULL TIME) DEGREE COURSE
in
CIVIL ENGINEERING (2015 Scheme)
(Specialization: Structural Engineering and Construction Management)
(Faculty of Engineering)
at
ALAPPUZHA / PATHANAMTHITTA CLUSTER
of the
KERALA TECHNOLOGICAL UNIVERSITY
M.Tech (Full Time) Degree Course in CIVIL ENGINEERING

SEMESTER I

03CE6001 STRUCTURAL DYNAMICS

L-T-P-Credits

4-0-0-4

Course Objectives:

- The objective of this course is to make students to learn principles of Structural Dynamics,

- To implement these principles through different methods and to apply the same for free and forced vibration of structures.
- To evaluate the dynamic characteristics of the structures.

Learning Outcomes:

On completion of this course, students are able to

- Achieve Knowledge of design and development of problem solving skills.
- Understand the principles of Structural Dynamics
- Design and develop analytical skills.
- Summarize the Solution techniques for dynamics of Multi-degree freedom systems
- Understand the concepts of damping in structures.

SYLLABUS

MODULE I

Introduction – Objectives -Types of dynamic problems –Nature and types of dynamic loading-Degree of freedom - types - D'Alembert's principle– principles of virtual displacement. Free vibration- Undamped system with free vibration - Mathematical models- Equation of motion- Natural frequency- Time period- Free vibration response

MODULE II

Dynamics of Single degree of freedom system-– Damping - Methods of evaluation of damping -Types- Damped system with free vibration- Equation of motion- Response- Logarithmic decrement-forced vibration- Response of Undamped and damped system to harmonic loading, periodic loading, impulsive loading and general loading-Support motion- Vibration isolation- Transmissibility - Vibration measuring instruments-Seismometer-accelerometer-Numerical solution of single degree of freedom system-Duhamel's integral-Central difference method- Newmark-β method.

MODULE III

Dynamics of Multi degree of freedom system- Shear building concept-Undamped and damped system with free vibration –Mathematical models- Equation of motion-Natural frequencies and mode shapes by solution of characteristic equation- Coordinate coupling-Orthogonality and Normality properties of modes- Forced vibration analysis- Mode superposition method-Approximate methods- Dunkerley's method- Stodola-Vianello method

MODULE IV

Continuous systems- Differential equation of motion-Free longitudinal vibration of bars-Flexural vibration of single span beams with different end conditions- Evaluation of frequencies and mode shapes- Beam flexure including shear deformation and rotary inertia-Forced vibration of Single span beams

References:

1. M Mukhopadhyay, Structural Dynamics, CRC Press
2. Mario Paz, Structural Dynamics, CBS publishers.
3. Clough & Penzien, Structural Dynamics: TMH .
4. VP Singh, Mechanical Vibrations, Dhanpatrai Publications
5. Anil K. Chopra, Dynamics of Structures – Theory and Application to Earthquake Engineering"- 2nd ed, Pearson Education
6. Vinod Hosur, Earthquake Resistant Design of Building Structures, WILEY (india)
7. S.R Damodaraswamy and S kavitha, Basics of Structural Dynamics and Aseismic Design- -PHI Learning Pvt.ltd
8. Timoshenko, S, Vibration Problems in Engineering, Van-Nostrand Co
9. G K Grover, Mechanical Vibrations, Nem Chand, 2009

03CE6011 ADVANCED THEORY AND DESIGN OF RC STRUCTURES

L-T-P-Credits

4-0-0-4

Course Objectives:

This course is designed to:

- Provide the ability in analysis and design of basic reinforced concrete components
- Study of advanced topics including theory and design of reinforced concrete structures

Learning Outcomes:

- Understand the theory and design of the main elements in reinforced concrete structures
- Understand the behaviour of reinforced concrete structures
- Carry out calculations on safety verification of reinforced concrete members
- Understand the design of special reinforced concrete members and components

SYLLABUS

MODULE I

Introduction – Review on Basic theory and design philosophies-Advanced theory in Stress-strain characteristics of concrete under uniaxial and multiaxial states of stress - confined concrete- Effect of cyclic loading on concrete and reinforcing steel. Stress block parameters-Failure criteria for concrete. Design concepts-Limit state method-comparison of different

Codal regulations- design of reinforced concrete members in flexure, flexural shear, torsion-combined with flexure and flexural shear. Analysis and design of compression members-slender columns, including biaxial bending, eccentric tension. Moment redistribution in continuous beams, Load Combinations

MODULE II

Estimation of deflection- immediate and long term deflection- control of cracking, estimation of crack width in RC members, Codal procedures on crack width computations. Yield line analysis of slabs, yield line mechanisms: equilibrium and virtual work method, Hillerborg's strip method. Limitations of yield line theory.

MODULE III

Design of special RC members- Analysis of shear walls- distribution of lateral loads in uncoupled shear walls, Shear wall frame interactions. Design of concrete corbels, deep beams, ribbed slabs, pile caps.

MODULE IV

Strut and Tie Models- Development- Design methodology- selecting dimensions for struts-ACI Provisions- Applications. RCC beam – column joints- classification – shear strength-design of exterior and interior joints- wide beam joints.

References

1. Arthur. H. Nilson, David Darwin and Charles W Dolan, Design of Concrete Structures, Tata McGraw Hill, 2004
2. Park, R. and Pauley, T., "Reinforced Concrete Structures", John Wiley. 1976
3. Pillai ,S.U. and Menon, D., "Reinforced Concrete Design", Tata McGraw-Hill.2003
4. Varghese,P.C., "Limit State Design of Reinforced Concrete", Prentice-Hall. 2005
5. IS 456 –2000, Indian Standard for Plain and Reinforced Concrete- Code of Practice, New Delhi

03CE6021 THEORY OF ELASTICITY

L-T-P-Credits

4-0-0-4

Course Objectives:

- To understand the behaviour of linear elastic solids under loads
- Provide a firm foundation for more advanced courses, for research and practice in civil engineering fields
- To provide the student with various solution strategies while applying them to practical cases

Learning Outcomes:

- Understand concepts, principles and governing equations in dealing with elastic solids
- Understand the methods for solving elastic boundary value problems
- To obtain skill and capability in civil engineering in analyzing and solving problems

SYLLABUS

MODULE I

Analysis of stress and strain in 3D: Definition of stress at point – Stress tensor – Equilibrium equations – Stress on arbitrarily oriented plane – Transformation of stress – Principal stress - Stress invariants – Octahedral stresses – Traction boundary conditions, Hydrostatic and Deviatoric Stress Tensors. Strain tensor – Strain displacement relations for small deformations – Compatibility conditions – Strain transformations – Principal strains – Strain invariants.

MODULE II

Measurement of Strain: Electrical resistance strain gauges - Gauge materials - gauge construction –gauge factor; Vibrating wire strain gauges; strain gauge bridges – Potentiometric and Wheatstone bridge – sensitivity Stress Strain relations: Generalized Hooke's law – Reduction in number of elastic constants for orthotropic, transversely isotropic and isotropic media. Boundary value problems of elasticity – Displacement, Traction and Mixed types. Saint Venant's principle.

MODULE III

Two dimensional problems in Rectangular coordinates: Plane stress and plane strain problems – Airy's stress function - Solution by polynomials – Bending of cantilever loaded at free end. Bending of simply supported beam with UDL. Two dimensional problems in polar coordinates: General equations- Equilibrium equations, Strain displacement relations and Stress strain relations.Biharmonic equations and Airy's stress functions. Problems of axisymmetric stress distributions - Thick cylinders

MODULE IV

Torsion of prismatic bars: Saint Venant's Semi inverse and Prandtl's stress function approach – Torsion of Straight bars – Elliptic and Equilateral triangular cross section. Torsion of thin walled open and closed tubes, Membrane Analogy

References:

1. Timoshenko.S.P and Goodier. J.N., Theory of Elasticity, McGraw Hill, 2010
2. Srinath.L.S., Advanced Mechanics of Solids, Tata Mc Graw Hill, 2008
3. Sokolnikoff. I.S., Mathematical theory of Elasticity, Tata Mc Graw Hill
4. Ameen.M., Computational Elasticity, Narosa Publishing House, 2005
5. Boresi.A.P., Schimidt.R.J., Advanced Mechanics of Materials,John Wiley, 2002
6. T.G.Sitharam ., Applied Elasticity, Interline publishing, 2008
7. Phillips, Durelli and Tsao, Analysis of Stress and Strain, McGraw Hill Book.
8. Dr. Sadhu Singh, Theory of Elasticity, Khanna Publishers

03CE6071 CONSTRUCTION MANAGEMENT AND PLANNING

L-T-P-Credits

3-0-0-3

Course Objectives:

- Provide the student with an in-depth knowledge in construction planning
- Study of advanced topics in construction economics, contracts and project planning and control

Course Objectives:

- Provide the student with an in-depth knowledge in construction planning
- Study of advanced topics in construction economics, contracts and project planning and control

SYLLABUS

MODULE I

Construction project management – types of projects – life cycle of a construction project – computer applications in management – techno-economic feasibility study – construction economics – time value of money – cash flow diagrams – using interest tables – sources of funding – comparing alternative proposals – break-even analysis – depreciation - cost benefit analysis – rate of return analysis – replacement analysis

MODULE II

Construction contract – bidding process – types of contracts – contract documents – important clauses in construction contracts –mistakes in bids – breach of the contract – contract changes – differing site conditions – delays, suspensions and terminations – liquidated damages, force majeure and time extensions – CPWD contract conditions – FIDIC form of contract agreement – dispute resolution

MODULE III

Project planning and control – Gantt charts – work breakdown structures – network representation – activity on arrow – activity on node - critical path method (CPM) – network analysis (CPM) – network crashing – resource planning – earned value analysis – PERT – introduction to lean construction

MODULE IV

Organization and use of Project Implementation: Types of Project Information – Accuracy and Use of Information – Organizing Information in Databases – Relational Model of Databases – Other Conceptual Models of Databases – Centralized Databases Management Systems – Databases and Applications Programs – Information Transfer and Flow.

References:

1. Kumar Neeraj Jha,Construction Project Management Theory & Practice , Pearson
2. Courtland A Collier, William B Ledbetter,Engineering Cost Analysis, Harper and Row Publishers, New York
3. Punmia B C,Project Planning and Control with PERT and CPM, Laxmi Publications
4. Srinath L.S.,PERT and CPM - Principles and Applications, Third edition ,Affiliated East-West Press Pvt. Ltd., New Delhi
5. Jerome D. Wiest and Ferdinand K. Levy,A Management Guide to PERT / CPM withGERT/ PDM / DCPM and other networks, Second edition , Prentice Hall of India Pvt.Ltd., New Delhi
6. B. Sengupta and H.Guha,Construction Management and Planning,Tata McGraw Hill, New Delhi
7. Construction Project Management Planning Scheduling & Controlling K KChitkara, Tata McGraw Hill,New Delhi
8. Stuart H. Bartholomew Construction Contracting: Business and Legal Principles (2nd Edition) , Prentice Hall

03CE6091 SHORING, SCAFFOLDING AND FORMWORK

L-T-P-Credits

3-0-0-3

Course Objectives:

This course is designed to:

- To study and understand the overall and detailed planning of formwork, plant and site equipment.
- To understand the Design and erection of forms for various elements such as slabs, beams, columns, walls, shells and tunnels.
- To know the latest methods of form construction.

Learning Outcomes:

- On completion of this course the students will be able to know the detailed planning of Framework, design of forms and erection of form work.

SYLLABUS

MODULE I

Introduction -Forms for foundations, columns, beams walls etc., general objectives of formwork building -Standard units -Corner units -Pass units -Calculation of labour constants -Formwork hours -Labour Requirement -Overall programme -Detailed programme -Costing -Planning crane arrangements -Site layout plan -Transporting plant -Formwork beams -Scaffold frames -Framed panel formwork -Formwork accessories.

MODULE II

Lumber -Types -Finish -Sheathing boards working stresses -Repetitive member stress -Plywood -Types and grades -Jointing Boarding -Textured surfaces and strength -Reconstituted wood - Steel -Aluminum -Hardware and fasteners -Nails in Plywood -Allowable withdrawal load and lateral load. Pressures on formwork -Examples -Vertical loads for design of slab forms - Uplift on shores -Laterals loads on slabs and walls.

MODULE III

Basic simplification -Beam formulae - Allowable stresses -Deflection, Bending -Lateral stability - Shear, Bearing -Design of Wall forms -Slab forms -Beam forms -Column forms – Examples in each. Simple wood stresses -Slenderness ratio - Allowable load vs length behaviour of wood shores -Form lining Design Tables for Wall formwork -Slab Formwork -

Column Formwork - Slab props-Stacking Towers -Free standing and restrained -Rosett Shoring -Shoring Tower - Heavy Duty props.

MODULE IV

Carpentry Shop and job mill -Forms for Footings -Wall footings -Column footings -Sloped footing forms -Strap footing -Stepped footing -Slab form systems -Sky deck and Multiflex-Customized slab table -Standard Table module forms -Swivel head and uniportal head-Assembly sequence -Cycling with lifting fork -Moving with table trolley and table prop. Various causes of failures -ACI -Design deficiencies -Permitted and gradual irregularities.

References:

1. Austin, C.K., Formwork for Concrete, Cleaver -Hume Press Ltd., London, 1996.

2. Hurd, M.K., Formwork for Concrete, Special Publication No.4, American Concrete Institute, Detroit, 1996

3. Michael P. Hurst, Construction Press, London and New York, 2003.

4. Robert L. Peurifoy and Garold D. Oberlender, Formwork for Concrete Structures.

03RM6001 RESEARCH METHODOLOGY

L-T-P-Credits

1-1-0-2

Course Objectives:

- This course is designed to familiarize the student with the research process, problem identification strategies and formulation of a research plan by doing case studies

Learning Outcomes:

- Students will be able to write a review paper after critically evaluating the state of the art development in a topic of interest
- Students will acquire capability to write a research proposal in the form of a technical paper which could lead the student towards his / her final thesis topic
- No formal end semester examination is intended – Evaluation is based on internal oral presentations and a Technical Report or a Research Plan or a Review Paper

SYLLABUS

MODULE I

Introduction –Need for research- objectives and motivations in research-Significance of research - -need for interaction between academic institutions, industrial and research establishments – research and innovation. Research Formulation- Identifying a research problem- - literature review– confirming to a research problem based on literature review.

MODULE II

Research Ethics – Environmental impacts – Ethical issues - Intellectual Property Rights – Patents – legal formalities in filing patent in India – Copy right– plagiarism – citation and acknowledgement.

MODULE III

Research design –Prepare research plan. Report writing – types of report – research report, research proposal, funding agencies for research concerned to the specialization, significance of peer reviewed articles and technical paper- - simple exercises - oral presentation

MODULE IV

Case Studies: The student is expected to prepare a research plan relating to a topic of current interest in the concerned specialization, which has appeared in a recent journal. A minimum of 20 related referred articles should be critically studied. On the basis of this, the student is expected to prepare a review report/paper of publishable quality.This paper has to be presented for open defense before the departmental committee. (This would carry 50% marks)

References:

1. R. Paneersalvam, “Research Methodology”,Prentice Hall of India Pvt. Ltd.,2011

2. Mike Martin, Roland Schinzinger, “Ethics in Engineering”,McGraw Hill Education, Fourth Edition,.2014

3. Vinod V Sople,” Managing Intellectual Property-The Strategic Imperative, EDA”, Prentice of Hall Pvt. Ltd., 2014

4. Kothari C R &Gaurav Garg – “Research Methodology- Methods and Techniques”,New Age International(P) Ltd Publications,2006

5. Day A Robert,”How to write and publish a scientific paper”,Cambridge University,UK,2012

6. Leedy P D,”Practical Research-Planning and Design”, Prentice Hall of India Pvt. Ltd.

03CE6901 SEMINAR I

L-T-P-Credits

0-0-2-2

SYLLABUS

The student has to present a seminar in one of the current topics in the stream of specialization. The student will undertake a detailed study based on current published papers, journals, books on the chosen subject. A detailed write-up on the topic of the seminar is to be prepared in the prescribed format given by the Department. The seminar shall be of 30 minutes duration and a committee with the Head of the department as the chairman and two faculty members from the department as members shall evaluate the seminar based on the coverage of the topic, presentation and ability to answer the questions put forward by the committee

Distribution of marks

Seminar Report Evaluation – 40 marks

Seminar Presentation – 60 marks

03CE6811 STRUCTURAL ENGINEERING LAB

L-T-P-Credits

0-0-2-1

Course Objectives:

- Practical training for conducting experiments related to structural engineering.
- Capability to use soft wares for analysis of experimental data.

Learning Outcomes:

- Acquire capacity to organize experiments for project and thesis works.
- Ability to analytically study the experimental results.

DETAILS OF EXPERIMENTS:

1. Review of testing methods of cement, coarse aggregate and fine aggregate as per Indian Standards.
2. Study of various instruments used for determining the material properties of concrete, steel, SCC etc
3. Design of concrete mixes.
4. Study of instruments used for determining the durability of materials
5. Calibration of various instruments and equipment used in the lab
6. Experimental study of behaviour of
    a) RCC structural elements
    b) Steel structural elements
7. Accelerated curing experiments for concrete.
8. Non- destructive testing of concrete
    a) Rebound hammer
    b) Core cutting
    c) Ultrasonic pulse velocity
    d) Pullout test
    e) Detection of embedded reinforcements
9. Study of computing techniques for numerical analysis of experimental data, error analysis and curve fitting.

SEMESTER II

03 CE 6002 FINITE ELEMENT METHOD

L-T-P-Credits

4-0-0-4

Course Objectives:

- To provide an understanding of fundamental knowledge and technique of FEM
- To develop tools to analyze engineering problems using FEM and typical commercial FEA package.

Learning Outcomes:

- Will be able to analyze and build FEA model for various engineering problems.
- Can be extended to the dynamic analysis of structures

SYLLABUS
MODULE I

Basics of elasticity- Equations of equilibrium- Strain-displacement relation- stress-strain (constitutive) relation- Energy principles- Principle of virtual work- Principle of stationary potential energy- Variational formulation- Rayleigh-Ritz method- Introduction to weighted residual methods- Evolution of FEM- Review of direct stiffness method- Outline of the FE procedure.

MODULE II

Element properties- Displacement functions- convergence requirements- equilibrium and compatibility in the solution- Development of equilibrium equation- Types of finite elements- Development of shape functions for truss, beam and frame elements- CST, LST- Lagrange and Serendipity elements

MODULE III

Development of consistent nodal load vector- patch test- static condensation- Concept of isoparametric formulation- Line element- Plane bilinear element- Subparametric and superparametric elements- Plane stress and plane strain problems

MODULE IV

Gauss quadrature technique- Development of stiffness matrix for truss and beam elements. Assembly procedure and storage techniques of stiffness matrix, Application of boundary conditions- Solution techniques of equilibrium equation- Introduction to plate and shell elements- Types of 3D elements; Discussion of finite element packages.

References:

1. Cook R D et al., Concepts and Applications of Finite Element Analysis, John Wiley & Sons, Singapore.
2. Krishnamoorthy C S, Finite Element Analysis- Theory and Programming, Tata McGraw Hill, New Delhi.
3. Bathe K J, Finite Element Procedures in Engineering Analysis, Prentice Hall, New Delhi.
4. Zienkiewicz O C and Taylor R W., Finite Element Method, Elsevier Butterworth-Heinemann, UK.
5. Rajasekharan S, Finite Element Analysis in Engineering Design, Wheeler, New Delhi.
6. Chandrupatla T R and Belegundu A D, Introduction to Finite Elements in Engineering, Pearson Education, New Delhi.

7. Hutton D V, Fundamentals of Finite Element Analysis, Tata McGraw Hill Education Private Ltd.New Delhi.
8. Mukhopadhyay M and Abdul Hamid Sheikh, Matrix and Finite Element Analyses of Structures, Ane Books Pvt. Ltd., New Delhi.

03 CE 6012 ADVANCED DESIGN OF EARTHQUAKE RESISTANT STRUCTURES

L-T-P-Credits

3-0-0-3

Course Objectives:

- To impart awareness about the effect of earthquakes on structures.
- To study IS code provisions for the analysis, design and detailing of earthquake resistantStructures

Learning Outcomes:

- Understand various aspects of earthquake engineering
- Capable of design and detailing of earthquake resistant structures
- Awareness about disaster management due to earthquakes.

SYLLABUS

MODULE I

Elements of earthquake engineering: Geological aspects; Basic terminology definitions- characteristics of ground motion – earthquake intensity and magnitude- recording instruments -seismic zoning- earthquake effects on different types of structures- Effect of architectural features and structural irregularities-Liquefaction- review of damages during past earthquakes

MODULE II

Principles and guidelines for earthquake resistant design of structures- Design lateral forces- Static analysis – Dynamic analysis- Shear walls

MODULE III

IS Code provision for design and detailing for earthquake resistance- reinforcement detailing for members and joints- design examples

MODULE IV

Steel structures-Semi Rigid Connections – Different approach – Frye Morris model, Component model; Analysis of structures with semi rigid connections (Theory only)

Repair and rehabilitation of damaged structures-different methods - methods for disaster mitigation

References:

1. IS: 1893-2002, Indian Standard criteria for Earthquake Resistant Design of Structures,
1. Bureau of Indian Standards, New Delhi
2. IS: 4326-1993, Indian Standard code for practice for Earthquake Resistant Design and Construction of Buildings, Bureau of Indian Standards, New Delhi.
3. IS: 13920-1993, Indian Standard Ductile Detailing of RCC Structures subjected to seismic forces- Code of practice, Bureau of Indian Standards, New Delhi
4. SP: 22-1982, Explanatory Handbook on codes of Earthquake Engineering, Bureau of Indian Standards, New Delhi
5. Pankaj Agarwal and Manish Shrikhande, Earthquake Resistant Design of Structures, Prentice- Hall of India, New Delhi.
6. Anil K Chopra, Dynamics of Structures, Prentice- Hall of India, New Delhi.
7. S. K. Duggal-Earthquake Resistant Design of Structures-Oxford University Press-2007

03 CE 6092 PROJECT FORMULATION AND APPRAISAL

L-T-P-Credits

3-0-0-3

Course Objectives:

This course is designed to

- To study elements of project formulation and appraisal
- To study the costing and financial aspects of projects.
- To study the implications of private sector participation in construction projects

Learning Outcomes:

- On completion of this course the students will be able to know the formulations of projects, projects costing, appraisal and financing.

SYLLABUS

MODULE I

Project –Concepts –Capital investments -Generation and Screening of Project Ideas - Project identification –Preliminary Analysis, Market, Technical, Financial, Economic and Ecological

-Pre-Feasibility Report and its Clearance, Project Estimates and Techno-Economic Feasibility Report, Detailed Project Report –Different Project Clearances required.

MODULE II

Project Cash Flows –Time Value of Money –Cost of Capital-Project Appraisal -NPV –BCR –IRR –ARR –Urgency –Pay Back Period –Assessment of Various Methods –Indian Practice of Investment Appraisal –International Practice of Appraisal –Analysis of Risk –Different Methods –Selection of a Project and Risk Analysis in Practice

MODULE III

Project Financing –Means of Finance –Financial Institutions –Special Schemes –Key Financial Indicators –Ratios. Private sector participation in Infrastructure Development Projects -BOT, BOLT, BOOT -Technology Transfer and Foreign Collaboration -Scope of Technology Transfer.

MODULE IV

Costs Associated with Constructed Facilities -Approaches to Cost Estimation -Type of Construction Cost Estimates -Effects of Scale on Construction Cost -Unit Cost Method of Estimation-Methods for Allocation of Joint Costs -cost of Capital- Risk Analysis, Sources and Measures of risk-Methods of risk analysis-Analysis of standalone risk, Analysis of contextual risk -special schemes

References:

1. Barcus, S.W. and Wilkinson.J.W., Hand Book of Management Consulting Services, McGraw Hill, New York, 1986.
2. Joy P.K., Total Project Management -The Indian Context, New Delhi, Macmillan India Ltd., 1992
3. Prasanna Chandra, Projects –Planning, Analysis, Selection, Implementation Review, McGraw Hill Publishing Company Ltd., New Delhi. 2006.
4. United Nations Industrial Development Organisation (UNIDO) Manual for the Preparation of Industrial Feasibility Studies, (IDBI Reproduction) Bombay.

03 CE 6032 ADVANCED PRE-STRESS CONCRETE DESIGN

L-T-P-Credits

3-0-0-3

Course Objectives:

- To impart to students the knowledge of methods of Prestressing, analysis and design of various prestressed concrete elements under relevant Codal provisions

Learning Outcomes:

- Understand and use suitably the different concepts of Prestressing.
- Comprehend the design of various prestressed concrete members used in practice

SYLLABUS

MODULE I

Basic concepts and brief history of Prestressing, advantages and limitations of Prestressing, types of Prestressing, Prestressing systems and devices, concrete and steel used in prestressed concrete

MODULE II

Losses in Prestress, analysis of members under flexure, shear and torsion.

MODULE III

Design of flexural members – Type I and Type II sections, limiting zone, design of end block, design for axial tension, shear and torsion, calculation of deflection and crack width, detailing of reinforcement, design of one way and two way slabs, analysis of continuous beams.

MODULE IV

Composite construction: Types, analysis and design. Concept of partial Prestressing. Circular Prestressing: Analysis and design of pipes and water tanks, Design of prestressed concrete bridge decks.

References:

1. Krishna Raju N., Prestressed concrete, Tata McGraw Hill Company, New Delhi 1998.
2. Mallick S.K. and Gupta A.P., Prestressed concrete, Oxford and IBH publishing Co. Pvt. Ltd.
1. 1997.
2. Rajagopalan, N, Prestressed Concrete, Alpha Science, 2002
3. Ramaswamy G.S., Modern prestressed concrete design, Arnold Heinimen, New Delhi, 1990
4. Lin T.Y. Design of prestressed concrete structures, Asia Publishing House, Bombay 1995.
5. IS 1343: 1980 Indian Standard Code of Practice for Prestressed Concrete
6. IS 456: 2000 Indian Standard Code of Practice for Plain and Reinforced Concrete

03 CE 6082 DESIGN OF BRIDGES

L-T-P-Credits

3-0-0-3

Course Objectives:

- To understand the theory and design methods of various forms of bridges

Learning Outcomes:

- Students should be able to select a particular form of bridge to suit the requirements andanalyze, design the same.

SYLLABUS

MODULE I

Classification and components of bridge. Review of road and railway bridge specifications and IRC provisions. Bridge decks-Grid analysis- Courbons method-Orthotropic plate theory. C. Bridges: Design of R. C bridge decks-slab bridges- Design of T beam bridges – Design principles of balanced Cantilever bridges.

MODULE II

Foundation and substructure: Types of foundations, Piers and abutments- Forces on piers and abutments, Design of piers and abutments, bed blocks. Bearings: Concrete, steel and neoprene bearings, Design of elastomeric pad bearings. Introduction to – continuous girder bridges, box girder bridges and arch bridges

MODULE III

Pre- stressed Concrete Bridges: Design of single span bridges- Introduction to various forms- Slab bridges-girder bridges-box girder bridges Steel bridges: Design of plate girder- Introduction to suspension bridges and cable stayed bridges.

MODULE IV

Construction: Present construction- handling and erection, connection formwork for in situ construction, Construction joints, Strengthening of bridges, Aesthetical treatments.

References

1. Johnson Victor D., Essentials of Bridge Engineering, Oxford & IBH Pub. Co.,198
2. Vazirani V. N., Design of Concrete Bridges,Khanna publishers,2004
3. Jagadeesh T.R and Jayaram M.A, Design of Bridge Structures, Prentice Hall,2004
4. Krishnaraju. N, Design of Bridges, Oxford & IBH Pub. Co.,2010
5. Krishnaraju.N,Prestressed Concrete bridges,CBS Publishers,2010
6. IRC 6-2000,IRC 21-2000,IS 800-2007,IRC 18-1985,IRC 24-2001,IRC 83-1987

03 CE 6902 MINI PROJECT

L-T-P-Credits

0-0-4-2

SYLLABUS

In Mini Project, the student shall develop a Mini Project of one semester duration. The mini project is designed to develop practical ability and knowledge about tools/techniques in order to solve actual problems related to industry, academic institutions or in similar areas. Students can take up any application level/system level project. Projects can be chosen either from the list provided by the faculty or from the area of interest of the student.

- Publishing the work in Conference Proceedings/ Journals with National/ International status with the consent of the guide will carry an additional weightage in the review process
- Two level evaluation should be conducted.
- Level one evaluation is based on literature survey, methodology and problem identification.
- Level two evaluation at the end of semester. The scholars should submit a report in IEEE format.

Mark distribution

1. Level one evaluation by the internal guide : 30 Marks
2. Level two evaluation duly constituted by the departmental committee : 70 Marks

03 CE 6812 DYNAMIC RESPONSE LAB

L-T-P-Credits

0-0-2-1

Course Objectives:

- Ability to identify the response of structures subjected to dynamic loading
- Provide a firm foundation for research and practice in civil engineering
- Ability to solve dynamic problems numerically

Learning Outcomes:

- Understand concepts and principles involved in structural dynamics
- To train the students to perform experimental work for project and thesis

DETAILS OF EXPERIMENTS:

1. Free Vibration of Cantilever beam.
2. Dynamics of simply supported beam subjected to harmonic load.
3. Dynamics of a three storied building frame subjected to harmonic base motion
4. Dynamics of a single storied building frame with planar asymmetry subjected to harmonic base motion
5. Vibration isolation of a secondary system
6. Dynamics of a vibration absorber
7. Dynamics of a four storied building frame with and without an open ground floor
8. Dynamics of a single span and two span beams
9. Dynamics of free standing rigid bodies under base motion (Demonstration only)
10. Earthquake induced waves in rectangular water tanks (Demonstration only)

Note: Results obtained from experiments may be numerically verified wherever possible.

SEMESTER III

03 CE 7063 DESIGN OF STEEL CONCRETE COMPOSITE STRUCTURES

L-T-P-Credits

3-0-0-3

Course Objectives:

- To understand the behaviour of steel concrete composite structures.
- Provide ability in design of composite structures and connections.

Learning Outcomes:

- Understand the theory and design of steel concrete composite structures.
- Understand the behaviour of composite structures.
- Understand the different types of connections in composite structures and their design.

SYLLABUS

MODULE I

Introduction to steel - Concrete composite construction - Theory of composite structures - Introduction to steel - Concrete - Steel sandwich construction.

MODULE II

Design of composite members: Behavior of composite beams - Columns - Design of composite beams - Steel - Concrete composite columns - Design of composite trusses.

MODULE III

Design of connections: Types of connections - Design of connections in the composite structures - Shear connections - Design of connections in composite trusses.

MODULE IV

Composite box girder bridges: Introduction - Behaviour of box girder bridges - Design concepts - Case studies on steel - Concrete composite construction in buildings - Seismic behaviour of composite structures.

References:

1. Johnson R.P., Composite structures of steel and concrete, Blackwell Scientific Publications (Second Edition), UK, 1994.
2. Owens, G.W. and Knowels.P. Steel Designers manual (Fifth edition), Steel Concrete Institute (UK), Oxford Blackwell Scientific Publications, 1992.
3. Workshop on Steel Concrete Composite Structures, conducted at Anna University, 2000.

03 CE 7083 STRUCTURAL DESIGN OF FOUNDATIONS

L-T-P-Credits

3-0-0-3

Course Objectives:

- Ability to identify the soil-structure interaction
- Ability to select suitable foundation for different types of structures
- Should be able to analyze and design substructures

Learning Outcomes:

- Basic understanding of type and selection of foundations
- To analyze and design foundations

SYLLABUS

MODULE I

Introduction to soil-structure interaction - Soil-structure interaction problems. Contact pressure distribution beneath rigid and flexible footings on sand and clay - Contact pressure distribution beneath raft. Selection of foundations. Structural design of spread footing, combined Footing and raft foundation.

MODULE II

Pile foundation: Introduction - Estimation of pile capacity by static and dynamic formulae - Settlement of single pile - Laterally loaded piles - Brom's method - Ultimate lateral resistance of piles -Pile groups - Consideration regarding spacing - Efficiency of pile groups – Pile Cap- Structural Design of Pile and pile cap

MODULE III

Retaining Walls-Types - Stability analysis of cantilever retaining walls against overturning and sliding-Bearing capacity considerations- Structural design of retaining walls

MODULE IV

Introduction to well foundations – Elements of well foundations – Types;

Sinking stresses in wells –Design of well cap, Well steining, well curb, cutting edge and bottom plug

References:

1. Swami Saran, Analysis and design of substructures, Oxford and IBH Publishing Company Pvt. Ltd.
2. Donald P. Coduto, Foundation Design: Principles and Practices, Dorling Kinderseley (India) Pvt.Ltd., 2012
3. Bowles J.E., Foundation Analysis and Design (4th Ed.), Mc.Graw-Hill Book Company, NY, 1988.
4. Varghese P.C, Foundation Engineering,Prentice Hall india ,NewDelhi 2005

03 CE 7093 MANAGEMENT QUALITY AND SAFETY IN CONSTRUCTION

L-T-P-Credits

3-0-0-3

Course Objectives:

This course is designed to:

- Provide the student with an in-depth knowledge in quality management To impart knowledge about importance of safety in construction

Learning Outcomes:

- Understand the various tools of quality and apply it to construction
- Understand the importance of quality and safety and to develop manuals

SYLLABUS

MODULE I

Quality management – Definitions and objectives – Construction quality– definitions – inspection, quality assurance and quality control - Factor influencing construction quality - Responsibilities and authority - Quality plan - Quality Management Guidelines – Quality circles- total quality management concepts – PDCA cycle - quality gurus and their teachings - Deming, Juran and Crosby's philosophies

MODULE II

Fundamental statistical concepts - Tools of quality – statistical quality control – control charts acceptance sampling - specifications and tolerances – costs of poor quality – six sigma concepts – introduction to ISO 9001: 2000 – quality manuals-Preparing Quality System Documents –Quality related training – Implementing a Quality system – Third party Certification.

MODULE III

Accident theories – statistics and safety – cost of accidents – problem areas in construction safety – fall protection – safety incentives – safety program components – zero accident concepts – safety audits and safety laws.

MODULE IV

OHSAS - occupational health issues in construction – importance of ergonomics – analysis of safety manuals-Safety Culture – Safe Workers – Safety and First Line Supervisors – Safety and Middle Managers – Top Management Practices, Company Activities and Safety – Safety Personnel –Workers Compensation

References:

1. Construction Project Management Theory & Practice – Kumar NeerajJha, Pearson India
2. Managing For Total Quality – From Deming to Taguchi and Statistical Process Control,
1. N. Logothetis, Prentice Hall of India Pvt Ltd.
2. Construction Quality Management, S L Tang, Syed M Ahmed, Raymond T Aoieong, S
3. W Poon, Hong Kong University Press, 2005
4. Quality Management in Construction Projects – Abdul RazzakRumane, CRC Press, Taylor & Francis Group
5. Construction Management and Planning – B. Sengupta and H. Guha (Tata McGrawHill Publishing company Pvt Ltd. , New Delhi)
6. Construction Safety – Jimmie Hinze, Prentice Hall Inc, 1997
7. Richard J. Coble, Jimmie Hinze and Theo C. Haupt, Construction Safety and Health Management, Prentice Hall Inc., 2001
8. Principles of Construction Safety – Allan St John Holt, Blackwell Sciences Ltd.
9. Jimmy W. Hinze, Construction Safety, Prentice Hall Inc., 1997.

03 CE 7103 CONSTRUCTION METHODS AND EQUIPMENT

L-T-P-Credits

3-0-0-3

Course Objectives:

- This course introduces students to construction equipment and selected construction methods. This includes economy, selection, and technical fundamentals of common construction equipment and construction procedures for civil construction.

Learning Outcomes:

- Students will be aware of the latest developments in construction methods and use of suitable equipment.

SYLLABUS

MODULE I

Identification – Planning - Equipment Management in Projects - Maintenance Management Replacement - Cost Control of Equipment – Safety Management -Factors affecting selection of equipment and methods -Technical and economic-construction-engineering fundamentals-analysis of production output and costs.

MODULE II

Modular co-ordination-standardization-mass production and transportation-elements of pre cast and prefabricated construction-Prestressing-conventional and modern techniques of construction

MODULE III

Planning and selection of equipment, for earthmoving, hauling, hoisting, conveying, pneumatic, pumping, aggregate production, concrete production, pile driving, tunneling and road construction applications-Equipment for Compaction - Erection Equipment - Equipment for Dewatering and Grouting – Equipment for Demolition.

MODULE IV

Concrete construction- batching, mixing, transport, placement, finishing, formwork, scaffolding. Steel construction- fabrication and erection-Forklifts and related equipment - Portable Material Bins

References:

1. Construction Planning, Equipment, and Methods: by Robert L. Peurifoy; Clifford J.Schexnayder; AviadShapira, and Robert L. Schmitt, 8th Edition, McGraw-Hill
2. Fundamentals of Construction Management and Organization by Kwaku A. Tenah& Jose M. Guevara - Reston Publishing Co. Inc.
3. Construction Engineering & Management by Dr. S. Seetharaman – Umesh Publications
4. Construction Equipments and its Planning & Applications by Dr. Mahesh Verma Metropolitan Publishing Co.

5. Construction Equipment & Management by S.C. Khanna - Khanna Publishers.

03 CE 7903 SEMINAR II

L-T-P-Credits

0-0-2-2

SYLLABUS

The student has to present a seminar in one of the current topics in the stream of specialization. The student will undertake a detailed study based on current published papers,

journals, books on the chosen subject, present the seminar and submit seminar report at the end of the semester.

Distribution of marks

1. Seminar Report Evaluation – 40 marks
2. Seminar Presentation – 60 marks

03 CE 7913 PROJECT PHASE I

L-T-P-Credits

0-0-2-6

SYLLABUS

For the Thesis-Preliminary part I the student is expected to start the preliminary background studies towards the Thesis by conducting a literature survey in the relevant field. He/she

should broadly identify the area of the Thesis work, familiarize with the design and analysis tools required for the Thesis work and plan the experimental platform, if any, required for Thesis work. The evaluation consists of two seminars and submission of thesis –preliminary report. The first seminar would highlight the topic, objectives and literature review. The second seminar will be a presentation of methodology and the work they have completed till the third semester and the scope of the work which is to be accomplished in the fourth semester, mentioning the expected results.

- Project progress evaluation by the Project Supervisor : 20 Marks
- Presentation and Evaluation by the Committee : 30 Marks

SEMESTER IV

03 CE 7914 PROJECT PHASE II

L-T-P-Credits

0-0-2-12

SYLLABUS

The student has to continue the Thesis work done in third semester. There will be an interim presentation at the first half of the semester to evaluate the progress of the work. At the end of the semester there will be a Pre-Submission seminar before the Evaluation committee for assessing the quality and quantum of work. This would be the qualifying exercise for the students for getting approval from the Department Committee for the submission of Thesis.

At least once technical paper is to be prepared for possible publication in Journals/Conferences. The final evaluation of the Thesis would be conducted by evaluation panel.

The evaluation panel consists of an internal project guide and an examiner outside the college.

- Project evaluation by the Project Supervisor : 30 Marks
- Presentation and Evaluation by the Committee : 40 Marks
- Evaluation by the External Expert (End Semester) : 30 Marks