1st Semester

Course No.	Subject	L	T	P/D	Hours	Credit
BS-111	Engineering Maths - I	3	1	0	4	4
BS-103	Engineering Chemistry	3	1	0	4	4
BS-105	Material Science	3	1	0	4	4
ES-103	Basic Electronics	3	1	0	4	4
ES-104	Basic Thermodynamics	3	1	0	4	4
TA-101	Engineering Graphics	1	0	4	5	3
BS-103 (P)	Engineering Chemistry Lab	0	0	3	3	2
BS-105 (P)	Material Science Lab	0	0	2	2	1
ES-103 (P)	Basic Electronics Engg. Lab	0	0	2	2	1
WP-122	Workshop Practice-II	1	0	3	4	3
	Total				36	30

BS - 111 **ENGINEERING MATHS – 1**

L	T	P
3	1	0

1. **Algebra (infinite series):** Convergence and divergence of Infinite series, Geometric series test, Positive term series, p-series test, [Comparison test, D'Alembert's ratio test, Cauchy's root test (Radical test), Integral test, Raabe's test, Logarithmic test, Gauss's test] (without proofs), Alternating series and Leibnitz's rule, Power series, Radius and Interval of convergence.

2. **Differential calculus:** Introduction to limits and indeterminate forms, Partial Differentiation and Its geometrical interpretation. Homogenous function, Euler's theorem and its extension. Total differentials, Composite function, Jacoblan, Errors and Increments, Taylor's and Maclaurln's Infinite series, Curve tracing (Cissiod, Astroid, Cycloid, Folium of Descartes', Cardiod and Equiangular spiral), Maxima and minima of functions of two variables, Method of undetermined multipliers.

3. **Integral calculus:** Quadrature, Rectification, Surface and Volume of revolution for simple curves, Double Integrals and their applications, Change of order of Integration, Triple Integrals and their applications, Change of variables.

4. **Vector calculus:** Differentiation of vectors, curves in space, velocity and acceleration, relative velocity and acceleration, Scalar and vector point functions, Vector operator del, gradient, divergence and curl with their physical Interpretations, Formulae Involving gradient, divergence and curl, Line, surface and volume Integrals, Theorems of Green, Stokes and Gauss (without proofs) and their verifications and applications, Irrotational and Solenoidal fields.

Books:

1. Advanced Engineering Mathematics : Erwin Kreyszig
2. Advanced Engineering Mathematics : R.K. Jain & S. R. K lyengar
3. Advanced Engineering Mathematics : C. R. Wylle & L. C. Barrett
4. Differential & Integral Calculus : N. Plskunov

BS - 103 **ENGINEERING CHEMISTRY**

L	T	P
3	1	3

1. **Lubricants:** Introduction, Mechanisms of lubrication, Types and selection of lubricants, properties and different methods for testing of lubricating oils and greases

2. **Corrosion and its Control:** Introduction, Types of corrosion, Mechanisms of corrosion, factors affecting corrosion & different techniques for corrosion control

3. **Polymers:** Introduction, Effect of polymer structure on properties, Moulding of plastics into articles, Conducting polymers: preparation, types, properties and applications

4. **Composite Materials:** Introduction, Classification, constituents of composites, preparation of phenolic composites and their characterization, Fiber reinforced composites, Important types and failures of fiber reinforced composites, Advantages and applications of composites.

5. **Fuels and Combustion:** Introduction, classification, Coal: classification and analysis, Nuclear fuels: sources, mass-defect, Breeder reactor, Fuel Cells

6. **Water and its treatment:** Introduction, water softening, domestic / industrial water treatment, Purification of water through Ion-exchange method, BOD, COD and treatment of Sewage

7. **Instrumentation Techniques:** Introduction to UV-VIS & IR spectrophotometry, NMR & MS spectroscopy, SEM, X-RD, TGA/DTA and GC

Books:

1. Engineering Chemistry : P C Jain & Monika Jain
2. A Text Book of Engineering Chemistry : Shashi Chawla
3. Organic Chemistry : R T Morrison and Boyd
4. Advanced Organic Chemistry : Jerry March
5. Applications of absorption spectroscopy of organic compounds : J R Dyer
6. Spectroscopic methods : Williams and Fleming

BS - 105 **MATERIAL SCIENCE**

L	T	P
2	1	2

1. **Structure of materials:** Space lattices and unit cells, crystal systems, structures of common metallic, semiconductor ceramic and superconductor materials, Miller indices, Representation of Directions and Planes, Packing Fractions, Structure Determination using X-ray diffraction, Bragg's law, and lattice parameter determination. Bonding in solids, coordination number, ceramics, silicates and clay structures, glass transition temperature, non-crystalline materials.

2. **Imperfection in solids:** Point defects: impurities, dislocations: edge and screw dislocation, stacking faults, grain boundaries, twins/twist boundaries, volume defects, concentrations of point defects, effect of defects on material properties.

3. **Phases diagrams and phase transformation:** Definition of diffusivity, concept of activation energy, Pick's laws of diffusion, diffusion mechanism and their applications, diffusion process Solid solutions, intermediate phases and inter-metallic compounds, phase, phase rule, unary, binary phase diagrams, phase diagrams of some important metals and ceramics, microstructure changes during cooling, lever rule, invariant reactions, iron-iron carbide phase diagram. Nucleation and growth of phases, Introduction to TTT curves, heat treatment processes, annealing, hardening, tempering, normalization, embrittlement, characterization of materials.

4. **Mechanical behavior:** Elastic behavior of materials, Concept of engineering and true stress and true strain, Tensile property, Yield Point phenomenon, Elastic Modulus, work hardening, strengthening mechanism, fracture, creep and fatigue, hardness. Atomic model of elastic behavior, plastic deformation in single and polycrystalline crystal, mechanism of slip, critical resolved shear stress, ductile and brittle failure, Griffith's theory of brittle fracture.

5. **Magnetic and dielectric properties of materials:** Origin of magnetism, dia, para, ferro, antiferro and ferrimagnetism, soft and hard magnetic materials, dielectric properties, piezo, pyro and ferroelectricity.

6. **Electrical and electronics properties:** Electricity conductivity, Free electron theory, density of states, Fermi energy, Fermi-Dirac Statistics, Band theory of solids, metals, semiconductors, insulators, Semiconductors: intrinsic and extrinsic semiconductors, structure of elements and compounds, conductivity as a function of temperature, doping, Hall effect, carrier concentration of semiconductors.

Books:

1 Materials Science and Engineering : William D Callister Jr
2 Elements of Materials Science & Engineering : L. H. Van Vlack.
3 The Science and Engineering of Materials : D.R. Askeland and P. P. Phule
4 Solid State Physics: Properties of Materials : M.A. Wahab
5 Fundamentals of Materials Science & Engineering : William F Smith

ES - 103 **BASIC ELECTRONICS**

L	T	P
3	1	0

1. **Semiconductors, diodes and diode circuits**: Insulators, semiconductors and metals, Mobility and conductivity, Intrinsic and extrinsic semiconductors and charge densities in semiconductors, current components in semiconductors, continuity equation. PN Junction diode – characteristic and analysis, Types of diodes – Zener diodes, Photodiodes, Light emitting diodes (LED's), Varactor diodes and tunnel diodes. Rectifiers and filter circuit: Half wave, full wave and Bridge rectifier circuits and their analysis, L, C and Pi filters, Basic regulator supply using zener diode. Working of Switched Mode Power Supply
2. **Transistors**: Construction and characteristics of bipolar junction, transistors (BJT's)-Comm. Base, Comm. emitter, Comm. Collector configuration. Transistor at low frequencies – small signal low frequency transistor model (h-parameters). Analysis of transistor amplifier circuit using h-parameters, transistor biasing and bias stabilization: - the operating point, stability factor, analysis of fixed base bias, collector to base bias, Emitter resistance bias circuit and self bias circuit. Bias compensation techniques.
3. **Field effect transistor:** construction and characteristics of JFET. JFET biasing, circuit JFET amplifier MOSFET construction and characteristics.
4. **Amplifiers and oscillators**: Classification of amplifiers, concept of feed back, general characteristics of feed back amplifiers, Single stage RC coupled amplifier. Oscillators – Criterion for Oscillation, type of oscillators: Hartley oscillator, Colpitt Oscillator & RC Phase shift oscillator.
5. **Operational amplifiers**: Introduction to Op-amp, Inverting and non-inverting configuration, Applications – adder, subtractor, integrator, differentiator and comparator, practical op - amps.
6. **Electronic instruments**: Role and importance of general purpose test instruments, Electronic Millimeter, Cathode Ray Oscilloscope, Measurement of amplitude, frequency and phase using CRO

Books

1. Electronics Devices and circuits :Millman & Halkias.
2. Electronics devices and circuit theory by :Robert Boylestad
3. Electronics Devices and circuits :P.John Paul
4. Electronics Devices and circuits :Y.N.Bapat.
5. Electronics devices and circuit :G.K. Mittal

ES - 104 **BASIC THERMODYNAMICS**

L	T	P
3	1	0

1. **Basic concept:-** Dimensions and units, thermodynamic systems, thermodynamic properties and process, thermodynamic equilibrium, energy-kinetic, potential and internal, heat and work, zeroth law, concept of temperature, temperature scale, definition of ideal gas, laws and properties of ideal gas.

2. **First law of thermodynamics:-** First law for control mass (closed system), internal energy as a property, enthalpy, specific heats, non-flow processes of idea1 gases, cyclic process, first law for control volume (open system), general energy equation, one dimensional steady flow, examples of control mass and control volume energy analysis, simple problems.

3. **Second law of thermodynamics:-** Limitations of first law of thermodynamics, Kelvin-Planck and Clausius statements, their equivalence, reversible processes, reversible cycles, and carnot cycle, corollaries of the second law, thermodynamics temperature scale, Clausius inequality, entropy, principle of increase of entropy, availability and irreversibility.

4. **Properties of steam:-** Phase transformation, phase diagram, generation of steam, condition of steam- saturated steam, dry-saturated steam, wet steam, superheated steam, dryness fraction, property of steam, steam tables, methods of determination of dryness fraction of steam, use of Mollier charts , process of vapours and various process.

5. **Gas and vapour power cycle: -** General terms, Otto cycle, diesel cycle, dual cycle, working of 4 stroke petrol & diesel engines, working of 2 stroke petrol engine. Brayton cycle, Rankine cycle.

6. **Mixtures of gases and vapour:-** Introduction, Ideal gas mixures, The Gibbs Dalton law, General relationships, illustrative examples, volumetric and Gravimetric analysis, Mixture of gas and vapour, Psychometric terms, Thermodynamic Wet Bulb temperature, Temperature of adiabatic Saturation, Enthalpy of moist air.

Books :

1. Engineering Thermodynamics : P.K. Nag
2. Engineering Thermodynamics : Gupta & Prakash
3. Heat Engineering : Vasandani and D.S.Kumar

TA-101 **ENGINEERING GRAPHICS**

L	T	P
1	0	4

1. **Introduction**: Importance, Significance and Scope of Engineering Graphics. General Introduction to Drawing Instruments and their Use. Principle of Dimensioning and Scaling, Lettering: Single Stroke Vertical and inclined Letter. Orthographic Projections.

2. **Projection of points and lines**: Projection of Points and Lines in Different Quadrants, Traces, Inclinations, True Lengths of Lines, Projections on Auxiliary Planes, Shortest Distance. Intersecting and Non-Intersecting Lines. Planes other than Reference Planes: Perpendicular and Oblique Planes, Their Traces, Inclinations etc. Projections of Points and Lines lying in the planes. Conversion of Oblique Plane into Auxiliary Plane and Solution of Related Problems.

3. **Projection of planes**: Traces of Planes, Types of Planes, Different cases of plane Figures making different angles with one or both Reference Planes and Lines Lying in the Plane Figures making different given angles with one or both Reference Planes, Obtaining True Shape of the Plane Figure by Projection.

4. **Projection of solids**: Simple cases when Solid is placed in different positions, Solids of Revolution, Axis perpendicular to a plane, Axis Parallel to one Plane and Inclined to the other, Axis Inclined to Both the Planes.

5. **Development of surfaces**: Development of Prism, Pyramid, Cylinder, Cones only.

6. **Projections**: Perspective, Orthographic, Isometric and Oblique Projections, Sketching of Orthographic views from Pictorial views, Isometric Projections of Planes, Prisms, Pyramids, Cylinders and Cones, Orthographic views of simple machine parts with and without sectioning.

7. **Graphics**: Determination of various Reactions in Beams and Trusses by Graphical Methods (Funicular and Maxwell diagrams).

8. **Machine drawing**: Basic Concepts; IS Drawing Conventions, Line Symbols, Kinds of Lines, Bolted Joints. Locking arrangement for Nuts, Foundation Bolts.

9. **Computer graphics**: Basic Concepts and Use, Drawings of Objects in computer Aided Drafting Software's like AUTO-CAD. Data plotting.

Books:

1. Engineering Drawing : N.D. Bhatt
2. Engineering Drawing : P. Bali
3. Machine Drawing : N.D. Bhatt and Panchali

ES – 103 (P) **BASIC ELECTRONICS ENGG. LAB**

L	T	P
0	0	2

1. Familiarization of electronics component and equipments like C.R.O, Function generator and power supplies etc.
2. To study the V-I characteristics of PN junction diode and determine static resistance and dynamic resistance.
3. To study the characteristics of zener diode and hence determine the dynamic resistance from the characteristics.
4. Determine the voltage regulation of zener diode stabilizer.
5. To study and plot the wave form of half wave and full wave rectifier with and without capacitor filter.
6. To study and plot the input and output characteristics of common emitter transistor and calculate its input and output resistance.
7. To study and plot the input and output characteristics of common base transistor and calculate its input and output resistance.
8. To study the characteristics of FET (Field effect transistor) and hence calculate dynamic (r_d) , mutual conductance (g_m) and amplification factor(μ).
9. To study the frequency response of single stage CE amplifier and hence calculate the band width (3dbBW).

2nd Semester

Course No.	Subject	L	T	P/D	Hours	Credit
BS-104	Engineering Physics	3	1	0	4	4
BS-122	Engineering Maths-II	3	1	0	4	4
ES-101	Engineering Mechanics	4	2	0	6	5
ES-102	Basic Electrical Engg	3	1	0	4	4
HU-101	Communication Skills	2	1	0	3	3
TA-102	Computer Fundamental and Programming	3	1	0	4	4
BS-104 (P)	Engg. Physics Lab	0	0	2	2	1
ES-102 (P)	Basic Electrical Engg Lab	0	0	2	2	1
HU-101 (P)	Communication Skills Lab	0	0	2	2	1
TA-102 (P)	Computer Fundamental and Programming Lab	0	0	2	2	1
WP-111	Workshop Practice-I	1	0	3	4	3
	Total				37	31

BS - 104 **ENGINEERING PHYSICS**

L	T	P
3	1	2

1. **Lasers** : Concept of masers and laser, spontaneous and stimulated emission, elementary idea about lasers, basic principles involved in laser, three and four level laser system, coherence, characteristics of laser light, types of lasers: Ruby, He-Ne, CO2 and semiconductor lasers, application of lasers.

2. **Fiber Optics**: Optical fiber, physical structure and basic theory, modes in optical fibers, step index and graded index fibers, losses in optical fibers, sources and sensors for optical fibers, applications of optical fibers in communication.

3. **Electrostatics and Electrodynamics**: Gauss's law in dielectric medium, Equation of continuity, displacement currents, Maxwell's equations, wave equation for electromagnetic radiation, electromagnetic wave propagation in free space and isotropic dielectric medium, Poynting theorem & Poynting vector, Vector potential, Lorentz gauge.

4. **Mechanics and Theory of Relativity** : Displacement, velocity and acceleration in polar and spherical coordinate systems, inertial and non-inertial frames, Michelson and Morley experiment, postulates of special theory of relativity, Lorentz's space - time transformations and their consequences, velocity transformations, mass variation with velocity, mass energy equivalence, momentum and energy transformations.

5. **Quantum Mechanics** : Need of quantum mechanics, Compton effect, Born's concept of wave function, eigen function and eigen values, operators in quantum mechanics, expectation values, time independent and time - dependent Schrodinger's wave equations and its applications viz., particle in one dimensional potential well, particle in three dimensional well, rectangular potential barrier, quantum mechanical tunneling and its applications

6. **Superconductivity**: Introduction and discovery of superconductivity, superconducting materials, Meissner effect, critical magnetic field and critical current, type-I and type-II superconductors, Isotope effect, theory of superconductivity, flux quantization, SQUIDS, applications of superconductivity.

7. **Ultrasonic**: Ultrasonic waves, methods of their generation & detection, properties and applications of ultrasonic waves.

Books

1. A Text Book of Engineering Physics : M. N. Avadhanulu and P. G. Kashirsagar
2. Engineering Physics : Satya Prakash and Vibhav Saluja
3. Modern Engineering Physics : A. S. Vasudeva
4. Optical Electronics : AK Ghatak and Thyagarajan
5. Electromagnetic Theory and Electrodynamics : Satya Prakash
7. Introduction to Electrodynamics : David J Griffithsi
8. Concepts of Modern Physics : Arthur and Beiser
9. Optical Fibers Communication and Technology : D.K.Mynbaev and L.L.Scheiner

BS - 122 **ENGINEERING MATHS - II**

L	T	P
3	1	0

1. **Fouries series :** Euler's formula, Conditions for a Fourier expansion, Functions having points of discontinuity, Change of interval, Odd and even periodic functions, Expansion of odd and even periodic functions, Half-range series, Typical wave-forms, Parseval's formula, Practical harmonic analysis.

2. **Matrices :** Matrices, Related matrices, Complex matrices (Hermitian and skew-Hermitian matrices, Unitary matrix), Solution of linear system of equations, Rank of a matrix, Gauss-Jordan method, Normal form of a matrix, Vectors, Linear dependence, Consistency of a linear system of equations, Rouche's theorem, System of linear homogeneous equations, Linear and orthogonal transformations, Characteristic equation, Eigen values, Eigen vectors, Properties of eigen values, Cayley-Hamilton theorem, Reduction to diagonal form, Quadratic form and their reduction to canonical form.

3. **Ordinary differential equations of first order and their applications :** Brief review of ordinary differential equations, Exact equations, Equations reducible to exact equations, Equations of the first order and higher degree, Clairaut's equation, Applications of differential equations of first order (Orthogonal trajectories, Physical applications, Simple electric circuits).

4. **Complex numbers :** Applications of De Moivre's theorem, Exponential, Circular, Hyperbolic and Logarithmic functions of a complex variable, Inverse Hyperbolic functions, Real and imaginary parts of Circular and Hyperbolic functions, Summation of the series- C+iS' method.

5. **Functions of complex variable:** Limit and derivative of complex functions, Cauchy-Riemann equations, Analytic functions and its applications, Geometrical representation of complex function, Conformal mapping and standard transformations, Complex integration, Cauchy's theorem, Cauchy's integral formula, Series of complex terms, Taylor's and Laurent's series, Cauchy's residue theorem and its application for the evaluation of real definite integrals.

Books

1 Advanced Engineering Mathematics : Erwin Kreyszig
2 Advanced Engineering Mathematics : R. K. Jain and S. R. K lyengar.
3 Advanced Engineering Mathematics : C. R. Wylie & L C. Barrett
4 Vector Calculus : C. E. Weatherburnork
5 Complex variables and Applications : R. V. Churchill, T. J. Brown and R. F. Verhey
6 Differential Equations : Shepley L. Ross

ES - 101 **ENGINEERING MECHANICS**

L	T	P
4	2	0

1. **Force, moment, c. G & moment of inertia:** Idealisation of Mechanics, Concept of Rigid Body and Elastic Body, Laws of Mechanics, Forces & System of Forces, Composition, Resolution & resultant of Forces, Laws of Forces, Lami's Theorem, Moment & Couples, Varignon's Theorem, Free Body Diagram, Centre of Gravity of a Lamina, Centroids of various Geometric Shapes, Moment of Inertia, Radius of Gyration, Parallel and Perpendicular Axis Theorem.
2. **Frames and trusses:** Introduction, Perfect Frame, Redundant Frame, Reactions of Supports, Plane Trusses, Space Trusses, Method of Joints, Method of Section, Graphical Method-Maxwell Diagram.
3. **Shear force and bending moment:** Introduction, Types of Load – Concentrated, uniformly distributed, uniformly varying load and Combination of loads. Types of beams – Cantilever beam, simply supported beam, overhanging beam; Shear force and bending moment diagrams for the above beams with one type of loading and combination of loading. Point of contra flexure Relationship between load, Shear force and bending moment.
4. **Rectilinear and curvilinear translation:** Kinematics and Kinetics of Rectilinear Motion, Differential Equation of Rectilinear Motion, Motion of a Particle acted upon by a constant and continuously varying Force, Impulse and Momentum, Work and Energy, Differential Equation of Curvilinear Motion, Moment of Momentum, Work and Energy in Curvilinear Motion, D'Alembert's Principle.
5. **Rotation of a rigid body about a fixed axis:** Kinematics of Rotation, Equation of Motion for a Rigid Body Rotating about a Fixed axis, Rotation under the Action of Constant Moment, Resultant, Inertia Force in Rotation, The Principle of Angular Momentum in Rotation, Energy Equation for Rotating Bodies.
6. **Plain motion of a rigid body and relative motion:** Kinematics of Plain Motion, Instantaneous Centre, Equation of Plain Motion, D'Alembert's Principle in Plain Motion, Principle of Angular Momentum in Plain Motion, Energy Equation for Plain Motion, Kinematics of Relative Motion, Equation of Relative Motion, D'Alembert's Principle in Relative Motion.
7. **Simple stresses and strains**: Stress & strain; Types of stresses and strains Elastic limit; Hooks law; Stress – strain diagram for ductile and brittle material, Factor of safety; Poisson's Ratio; Elastic constants; Young's modulus, Shear modulus & Bulk modulus. Relationship between elastic constants-Derivation, Thermal Stress & Strain.
8. **Torsion of circular shaft**: Pure Torsion, Theory of Pure torsion, Derivation of Torsion equation for a circular shaft subject to torsion, assumptions, Maximum torque transmitted by a Solid shaft and hollow shaft-derivations, Polar modulus, torsion rigidity, Shear stress produced in the members, Comparison of hollow and solid shaft, Power transmitted by a shaft, Close coiled helical spring subjected to axial load and axial torque.

Books

1. Engineering Mechanics : Timoshenko & Young, Mc Graw Hill
2. Applied Mechanics : I B Prasad, Khanna Publishers. New Delhi.
3. Engineering Mechanics : Bhavikatti & Rajshekhrappa.
4. Engineering Mechanics : D. P. Mandal, SK Kataria & sons, Delhi.
5. Strength of Materials : R.K.Bansal
6. Strength of Materials : : Gupta &. Malhotra
7. Strength of Materials : : Sadhu Singh
8. Engineering Mechanics : Meriam.
9. Engineering Mechanics :Beer p Johnson.
10. Engineering Mechnnics :E. J. Hearn. ;Schaum Series Publications
11. Engineering Mechanics :R. K. Bansal, Luxmi Publications. Delhi.
12. Engineering Mechanics : Basu -Tata Mc Graw Hill

ES - 102 **BASIC ELECTRICAL ENGINEERING**

L	T	P
3	1	2

1. **Electric circuits** : Introduction to linear and non linear circuit, eireuit elements, various sources and source transformation, solution of D.C. circuits vising Kirchoff s laws signal wave forms and passive elements specifications, generation of A.C. sinusoidal voltage and currents, average and r.m.s. values, Form factor and peak factor, phasor representation, phasor in polar, rectangular and exponential forms, terminal relationship for pure passive elements and their combination in series and parallel. Analysis of single phase series, parallel and series-parallel circuits. Active and reactive power, p.f. and volt-ampares, frequency response and Q-factor. Analysis of balanced three phase a.c. circuits - Introductory concept, voltage, current and power in three phase balanced circuits. Introducing to Electric Wiling.

2. **Electromagnetics & Transformer:** Magnetic circuit concept, B-H curves characteristics of magnetic materials, practical magnetic circuits, magnetic circuits with D.C. and A.C. excitation, hysteresis and eddy current losses. Principle of Transformer operation, construction & circuit of transformer. Magnetic force, self and mutual inductances, Faraday's laws, Lenz's Law, statically and dynamically induced emfs, energy stored in magnetic fields.

3. **Measuring Instruments:** Introduction to galvanometer (Moving coil and moving iron) Ammeter, voltmeter, wattmeter, energy meter, vise of shunt and multiplier.

4. **Electrical Machines**: Fundamentals of D.C. and A.C. machines.

Books:

1. Electrical Technology : H. Cotton
2. Principle of Electrical Engg. : Del Toro.
3. Basic Electrical Engineering : Fitzgerald
4. Electrical Estimating and Costing : N Alagappan

HU - 101 **COMMUNICATION SKILLS**

L	T	P
2	1	2

Course objectives:

1. To increase the student's ability to improve and utilize the skills necessary to be a competent interpersonal communicator.
2. To increase the student's understanding of his or her own communication behavior.
3. To increase the student's understanding of others communication behaviors.
4. To improve the student's communication skills in both social and professional contexts.
5. To improve the student's ability to demonstrate effective conflict resolution skills.

1. **Essentials of communication:** The process of communication, Communication competence, Communication and the self-concept, Personal SWOT Analysis, Role of emotion In communication, Interpersonal Communication, Nonverbal communication.

2. **Written communication:** Enriching vocabulary, Using vocabulary in different contexts, Essentials of strong writing skills, Language and style, Logical reasoning, Paragraph Writing, Developing perspective.

3. **Speaking:** Public speaking, Fear of Public speaking and remedies, Elocution, Extempore Speeches, Group Discussions, Multi-perspective debates, How to write and present papers.

4. **Reading comprehension:** Precis Writing, Comprehension, Discussion on the basis of reading of novel/story.

5. **Technical communication:** Analyzing audience, Report Writing, Importance, structure, style and drafting of reports.

6. **Assignments**
    1. *Questionnaires/Surveys:* You will be asked to complete questionnaires, Questionnaires are designed to assess your communication skills, you will be asked to write a review on each questionnaire assignment.
    2. *Self Concept Paper*: A paper to assess your self concept (approximate length 5 pages).
    3. *Class Seminar*: Extempore/ Pre-decided.
    4. *Survey Report/ Project Reports:*

Text books

1. An Approach to Communication Skills : Indrajit Bhattacharya
2. Business Correspondence and Report Writing : R. C. Sharma and Krishna Mohan
3. Technical Communication : Meenakshi Raman and Sangeeta Sharma
4. Developing Communication Skills : Krishna Mohan and Meera Bannerji

TA-102 COMPUTER FUNDAMENTALS AND PROGRAMMING

L	T	P
3	1	3

Programming fundamentals: Introduction to computer ,block diagram and organization of computer, number system and binary arithmetic, processing data, hardware, software, firmware, types of programming language-Machine language, ALL, HLL, source file, object file, translators-assembler, compiler, interpreter, translation of source code into object code, library files, linking, loading process and executable code, testing and debugging software maintenance, hardware maintenance.

Programming Techniques: Steps in program development, algorithm, flowchart, psuedocode, evolution and classification of programming languages.

'C' as Structured programming language:

'C' Character set, literals, keywords, identifiers, data types and size, variable declaration, expression, labels, statements, formatted input output statements, types of operators, data type conversion, mixed mode arithmetic, control structures.

'C' Functions,library functions, parameter passing,recursion, storage classes, scope rules and visibility,arrays –declaration,initialization and usage,pointers,dynamic storage allocation, structures and unions,self-referential structures.

'C' Files,function for file handling,'C' pre-processors and command line arguments,macros and conditional compiler directives.

Books:

1. Computer fundamental : P.K.Sinha.
2. Programming with C : Byron GottFried
3. Let us C : Yashwant Kanetkar
4. The Spirit of C : Munish cooper
5. C Programming language : Jernighan and Ritchie

3rd Semester

Course No.	Subject	L	T	P/D	Hours	Credit
BS-236	Differential Equations, Probability and Statistics	3	1	0	4	4
HU-232	Engineering Economics	4	0	0	4	4
CE-231	Strength of Material	3	1	0	4	4
CE-232	Fluid Mechanics	3	1	0	4	4
CE-233	Civil Engineering Materials and Building Construction	3	0	0	3	3
CE-232 (P)	Fluid Mechanics Lab	0	0	2	2	1
CE-233 (P)	Civil Engineering Material and Building Construction Lab	0	0	2	2	1
ECA-231	Extra Curricular Activity-I	0	0	2	2	1
	Total				**25**	**22**

BS - 236 DIFFERENTIAL EQUATIONS, PROBABILITY AND STATISTICS

L	T	P
3	1	0

1. **Linear differential equations**: linear differential equations with constant co-efficient, complimentary functions and particular integral, method of variation of parameters, equations reducible to linear equations with constant co-efficients (Cauchy's and Legendre's linear equations), Simultaneous linear equations with constant co-efficient, Applications of linear differential equations in simple harmonic motion, Oscillations of a spring, simple pendulum, Oscillatory electric circuits, Deflection of beams. Applications of simultaneous linear differential equations to projectiles with resistance and electric circuits.

2. **Partial differential equations**: Formation and solutions of partial differential equations, Lagrange's Linear equation of the first order, Non linear equations, Charpit's method, Homogeneous linear equations with constant co-efficients, Non-homogeneous linear equations, Non linear equations of the second order (Monge's method).

3. **Probability and statistics** : Probability, conditional probability, random variables, Expected Value, Specific discrete and continuous distributions, e.g. binomial, Poisson, geometric, Pascal, hyper geometric, Uniform, exponential and normal, Poission process, Multidimensional random variables, Multinomial and bivariate normal distributions, Moment generating function, Law of large numbers and central limit theorem, Sampling distributions, Point and interval estimation, Testing of hypothesis, goodness of fit and contingency tables, Linear regression.

Books:

1. Advanced Engineering Mathematics : Erwin Kreyszig
2. Advanced Engineering Mathematics : Crwylie and L.C. Barrett
3. Partial Differential Equations for engineers and scientists : J.N. Sharma and K Singh
4. Differential Equations : L. Shepley
5. Probability and Statistics with reliability and queuing and computer science application : K.S. Trivedi

HU - 232 **ENGINEERING ECONOMICS**

L	T	P
4	0	0

1. **Basic economic concepts:** Stock and Flow, Static and Dynamic economics, Micro economics and Macroeconomics, National Income concepts.

2. **Market demand** : Demand, meaning and types, Law of demand, exceptions to the law of demand, Elasticity of Demand, Methods of measuring elasticity of demand, Marginal utility Analysis.

3. **Production analysis**: Production functions, law of returns, least cost combination, cost and cost curves, choice of plant size in the long run.

4. **Supply:** Law of supply, elasticity of supply.

5. **Cost concepts and estimation**: Cost elements, economic vs. accounting concepts of costs and Revenues, Standard Cost, Actual Cost, Over head Cost, Cost control, Break-Even-Analysis.

6. **Economic appraisal techniques**: Long- Range and Short range Budgeting, Criteria for Project Appraisal, Social benefit-cost analysis, Depreciation: concepts and Techniques.

7. **Monetary System:** Money and its functions, Functions of the Commercial Bank and Central Bank, Monetary Policy.

8. **Inflation and business cycles**: Causes, effects and methods to Control Inflation, Concepts of Business Cycles.

9. **Accounting**: Book keeping single and double entry system, Journal and ledger, Trading account, Profit and loss account, Balance sheet.

Books:

1. A Text Book of Economic Theory : Stonier and Hauge.
2. Modern Economic Theory : K.K.Dewett
3. Engineering Economics : Degramo.
4. A Text Book of Economic Theory : Sammuelson.
5. International Economics : Bo Sodersten
6. Principles of Macroeconomics : Rangarajan and Dholakia.
7. Monetary Economics : Suraj B. Gupta
8. Cost Accounting : Jawahar Lal
9. Project Planning Analysis, Selection Implementation and Review : Prasanna Chandra

CE – 231 **STRENGTH OF MATERIAL**

L	T	P
3	1	0

1. **Introduction**: Elasticity, Plasticity, Ductility, Brittleness, Strength, etc.

2. **Simple stresses and strains**: Types of stresses and strains, stress strain diagram, Hookes law, Principle of superposition, bars of varying section of different materials, compound bars, temperature stresses etc.

3. **Elastic Constants**: Modulus of elasticity, Poison's Ratio, Modulus of Rigidity and bulk modulus, and their relationships.

4. **Principal Stresses**: Stresses induced due to uniaxial stress, stresses induced by state of simple shear, stresses induced due to biaxial stress, Mohr Circle, Ellipse of stress, principal stresses and principal planes, maximum shear stresses, Principal strains. Theory of Failures.

5. **Strains Energy, Resilience and Impact loading**: Load deflection diagram: Strain energy of prismatic bars with varying section, for non-prismatic bars with stresses under gradual, sudden and impact loadings, shear resilience, Relation between Elastic moduli and strain energy.

6. **Shear Force and Bending Moment**: Types of structures, loading, supporting conditions, structural actions, equation of equilibrium, SFD and BMD under different loads for determinate beams, frames and arches.

7. **Stresses of Beam**: Theory of simple bending, Distribution of bending stresses, distribution of shear stresses.

8. **Columns and Struts**: Concept of structural stability, analysis of long and short columns by Euler's, Rankine's and Secant formulae, analysis of eccentrically and laterally loaded columns.

Books:

1. Strength of materials : R.C. Hibbler
2. Strength of materials : B.C. Punmia, AK Jain
3. Strength of materials and Mechanism of structures : R.S. Lehri
4. Strength of materials : Timoshenko and Young.

CE - 232 **FLUID MECHANICS**

L	T	P
3	1	0

1. **Fluid statics**: Basic equations, pressure and its relationship with height, pressure diagram, hydrostatic forces on submerged bodies, buoyancy and floatation, liquids in relative equilibrium.

2. **Fluid kinematics**: Flow characteristics, continuity equation, acceleration of fluid particles, rotational and irrotational motion, circulation and vorticity, velocity potential and stream function, streamlines, equipotential lines, flow net - method, use and limitations.

3. **Fluid dynamics**: Euler's equation, energy equation and Bernoulli's equation, application of Bernoulli's equation-orifice meter, venture meter, pivot tube etc., flow through orifice, mouth piece, weir and notches, impulse momentum equation and its application, pipe junction, bends, stationary flat and curved vanes, moment of momentum equation.

4. **Flow through pipes**: Reynolds' experiment, laws of fluid friction, Darcy-Weisbach equation, energy losses, equivalent pipe, pipes in series and parallel, branched pipes, time of emptying a reservoir through pipe, pipe networks.

5. **Laminar flow**: Laminar flow through circular pipes, parallel plates, open channel, Porous media, couette flow, Stokes law, measurement of viscosity, transition from laminar to turbulent flow.

6. **Dimensional analysis and similitude**: Dimensional homogeneity, Non Diomensional parameter, ∏ theorem, dimensional analysis-chice of variables, Reyleigh methods, examples-Rise in capillary tube, head characteristics of a pump, drag on a ship, Fall velocity of a sphere, velocity in an open channel, pipe orifice, discharge over a sharpedge weir, celerity of a gravity wave. Model analysis-similitude, types of similarities, force ratios, similarity laws, model classification, scale effects.

7. **Boundary layer theory**: Types, boundary layer thickness and equations, momentum integral equation boundary layer on rough surfaces, total drag on flat plate due to laminar and turbulent boundary layer, boundary layer separation and its control.

8. **Turbulent flow:** Shear stresses, establishment of flow, types of boundaries, mixing length concept, velocity distribution, mean velocity and resistance to flow in smooth and rough pipes, friction in non-circular conduits.

9. **Flow measurement**: Measurement of pressure-static, dynamic and total pressure, Piezometric head, Measurement of velocity-Pitot tube and prandtll tube. Measure flow through orifice, mouth piece, weir and notches, measurement of discharge-orifice, mouthpiece weir and notches, orifice meter, Flow nozzle, Venturi flume.

10. **Flow through open channels**: Classification of flow, Uniform flow, Prismatic and non prismatic channel, Hydraulically efficient channel cross sections, specific energy, specific energy curves, critical flow in rectangular channels.

Books:

1. Fluid Mechanics and Fluid Power Engineering : Dr R.S.Kumar
2. Hydraulics and Fluid Mechanics : P.N.Modi and S.M.Seth
3. Fluid Mechanics : R.J.Garde and A.G.Mirajgaoker
4. Experimental Fluid Mechanics : G.L.Asawa

CE-233 CIVIL ENGINEERING MATERIALS AND BUILDING CONSTRUCTION

L	T	P
3	0	0

1. **Building materials**:

Stones: Classification, requirements of good materials, Querying of stones, common building stones.

Bricks: Classification of bricks-constituent of a good brick earth, harmful ingredients, manufacturing of bricks, testing of bricks.

Tiles, Terra - cotta: Manufacturing of tiles and terra-cotta, types of terra-cotta, uses of terra cotta.

Lime: Classification, manufactures of lime, artificial hydraulic lime, pozzuolana, field-testing of lime.

Cements: Composition, manufactures of Portland cement, field-testing of cement, special types of cements, storage of cement.

Steel: Types of steel, marketable forms, stress- strain behaviour.

Cement concrete: Various constituents, preparation and properties of concrete in fresh state, factors affecting workability, durability and strength, characteristic strength, stress- strain behaviour, acceptance criteria, mix- design and physical tests.

Timber: Classification of timber, structure of timber, seasoning of timber, defects in timber, important Indian timbers.

Paints and varnishes: Constituents of paints, types of paints, types, constituents and characteristics of varnishes, miscellaneous.

Introduction to polymers: Polymetric materials, PVC, Polyester, HDPE, CDPE etc. Classification, properties and applications in civil engineering.

2. **Building Construction**:

Brick and stone masonry: Various terms used, types, tools used, bonds in brick work, dressing of stones, applications for lifting stones.

Partition and cavity walls: Types of non bearing partition- brick partitions, clay block partitions, timber partitions and glass partitions, construction of a masonry cavity walls.

Damp prevention: Sources of dampness, effects of dampness, prevention of dampness, materials used in damp proofing course.

Roofs: Types, terms used in sloping roof, king post truss, queen post truss, simple steel roof trusses.

Floors: Components of floor, brick floors, cement concrete floors, terrazzo flooring, mosaic floorings, tiled flooring.

Doors and Windows: Locations, sizes general types of door movement, various types of doors and windows.

Books:

a) Building materials:

1. Properties of concrete : A.M. Neville
2. Engineering Materials : Surinder Singh
3. Civil Engineering Materials : Kulkarni et.el.
4. Relevant I.S. Codes

b) Building construction:

1. Building Construction : B.C. Punmia
2. Building Construction : Sharma and Kaul
3. Building Drawing : Shah Kale and Patki

CE – 232(P) **FLUID MECHANICS LAB**

L	T	P
0	0	2

List of experiments:

1. To determine the metacentric height of a ship model
2. Verification of Bernoulli's theorem
3. To calibrate a venturimeter and to determine its coefficient of discharge
4. To calibrate an orifice meter and study the variation of the coefficient of discharge with the Reynolds number
5. To study the flow over v notch (weir) and to find the coefficient of discharge
6. To determine the hydraulic coefficient of discharge of a mouth piece.
7. To verify the momentum equation experimentally
8. To determine the coefficient of friction of pipes of different diameters.
9. To determine the form losses in a pipe line
10. To obtain the surface profile on the total heads distribution of a forced vortex
11. Viscous flow analogy (Hele-Shaw apparatus) for flow net.
12. Electrical analogy for flow net.
13. Study of flow measurement devices through rotameter apparatus

CE-233(P) CIVIL ENGINEERING MATERIALS AND BUILDING CONSTRUCTION LAB

L	T	P
0	0	2

List of experiments:

1. To determine the fineness of cement using (i) dry blank sieving (ii) blaine's air permeability method.

2. To determine the standard consistency, initial and final setting time of cement sample using Vicat's apparatus.

3. To determine the soundness of given sample of cement and lime by

   (i) Le-Chatelier test, (ii) autoclave test.

4. To determine the compressive strength of cement sample.

5. To determine the specific gravity and water absorption of coarse aggregate.

6. To determine the fineness modulus and particle size distribution of coarse, fine, and all in aggregates.

7. To determine the percentage bulking of a fine aggregate sample.

8. To determine the consistency of freshly mixed concrete of given proportion by slump test.

9. To determine the workability of freshly mixed concrete of given proportion by compaction factor test.

10. To determine the cube strength and cylinder strength of concrete of given proportion and given water cement ratio.

11. To determine the water absorption and porosity of given stone sample.

12. To determine the compressive strength of a stone sample.

13. To determine the water absorption of burnt clay bricks.

14. To assess the liability of blank burnt clay to efflorescence.

15. To determine the compressive strength of burnt clay bricks.

4th Semester

Course No.	Subject	L	T	P/D	Hours	Credit
TA-243	Numerical Analysis	3	1	0	4	4
CE-241	Theory of Structure	4	1	0	5	5
CE-242	Soil Mechanics	3	1	0	4	4
CE-243	Surveying	3	1	0	4	4
CE-244	Engineering Geology	3	0	0	3	3
CE-242 (P)	Soil Mechanics Lab	0	0	2	2	1
CE-243 (P)	Surveying Lab	0	0	3	3	2
ECA-242	Extra Curricular Activity-II	0	0	2	2	1
	Total				**27**	**24**

- Survey camp of 3 to 4 weeks duration after 4th Semester

TA - 243 **NUMERICAL ANALYSIS**

L	T	P
3	1	0

1. N**umerical computations and errors analysis** : Introduction, Numbers and their accuracy, Floating point arithmetic, errors in numbers, Computational methods for error estimation, General error formulae-approximation of a function, series approximations and error propagation in computation.

2. **Algebraic and transcendental equations:** Revision of some basic concepts on polynomial equations, Bisection method, iterative method, Regula-falsi method, Newton-Raphson method, Secant method, Generalized Newton's method for multiple roots, solution of non-linear simultaneous equations and finding complex roots by Newton-Raphson method.

3. **System of simultaneous algebraic equations**: Revision of basic properties of matrices and determinants, Matrix inversion and solution of transcendental and system of algebraic equations-Gauss elimination method, Jacobi's method and Gauss-Seidal method, Eigen values and eigen vectors-Power method, Jacobi's method and Householder method.

4. **Interpolation and function approximations**: Least square curve fit and trigonometric approximations, Approximations by trigonometric polynomials and quality of approximations, Finite differences and difference operators, Newtons interpolation formulae, Gauss forward and backward formulae, Sterling, Bessel's and Evertte's formulae, Interpolation with unevenly spaced data points-Lagrange's interpolation.

5. N**umerical differentiation and integration**: Numerical differentiation, errors in numerical differentiation, Maximum and minimum values of a tabulated function, Numerical integration-Trapezoidal, Simpson's 1/3 and 3/8 rules, Boole's and Weddle's rules, Romberg integration-recursive formulae, Evaluation of double integrals by Trapezoidal and Simpson's rules.

6. **Ordinary differential equations**: Taylor's series method, Picard's method, Euler's method, Modified Euler's method, Runge- Kutta methods of 2^{nd} and 4^{th} order, Adams- Moltan and Miline methods, Solution of simultaneous and higher order equations.

Books :

1. Numerical Methods for Engineers and Scientists : J.N. Sharma
2. Numerical Analysis : F. B. Hildbrand
3. Numerical Method for Engineers and Scientists : M. K. Jain, S.R.K. Lyngar and R. K. Jain
4. Introductory Methods of Numerical Analysis : S.S. Sastry

CE-241 **THEORY OF STRUCTURES**

L	T	P
4	1	0

1. **Introduction**: Classification of structures, equations of equilibrium, stability, static and kinematics indeterminacies, principle of superposition.

2. **Slopes and deflections in determinate beams and frames**: Double integration, Macaulay's moment area and conjugate beam methods, deflection from strain energy, Castigliano's theorem and its applications, unit load method, deflection of pin-jointed frames, Maxwell's reciprocal theorem.

3. **Moving loads and influence lines**: Analysis of statically determinate structures subjected to moving loads, calculation of maximum and absolute maximum B.M. and S.F., Influence line Diagram for reaction, S.F. and B.M. in beams trusses and 3-hinged arches.

4. **Analysis of indeterminate beams and frames**: Force and displacement approaches in analysis of indeterminate structures, Method of consistent deformation, principle of minimum strain energy, slope deflection method, moment distribution method, Muller-Breslau Principle and analysis of indeterminate pin jointed frames.

5. **Plastic analysis**: Introduction, plastic hinge concept, plastic modulus, shape factor, upper and lower hound theorems, collapse mechanisms, combined mechanism, plastic analysis of beams and portal frames by equilibrium and mechanism methods.

Books :

1.	Basic Structural Analysis	: C.S.Reddy
2.	Indeterminate Structural Analysis	: C.K.Wang
3.	Elementary structural analysis	: J.B.Willbur, C.H. Norris and Utku
4.	Plastic methods of Structural analysis	: B.G. Neal
5.	Theory of Structures	: B.C.Punmia, Ashok Jain, Arun Jain

CE-242 **SOIL MECHANICS**

L	T	P
3	1	0

1. **Introduction**: Definition of soil, rock, soil mechanics and foundation engineering, soil formation, soil structure, soil map of India.

2. **Soil properties**: Basic definitions, phase diagram, water content, specific gravity, void ratio, porosity, unit weight, weight volume relationships, index properties of soil and their determination, classification of soils, degree of saturation, density index.

3. **Permeability and seepage** : Darcy's law and its validity, seepage velocity, discharge velocity, constant and variable head permea-meter, pumping in and out tests, permeability of stratified soils, factors affecting permeability, Laplace's equation, flow potential flow net and its properties, different methods of drawing flownets, seepage pressure, quick sand, exit gradient, piping, design of filter, principle of total and effective stresses, capillarity conditions in soil, effective and pore pressures.

4. **Stresses in soils**: Need for finding stress distribution in soil, assumptions in elastic theories, Boussinesq's equation for point, line, circular and rectangular loads, Westergaad's formula for point load, comparison of Boussinesq's and Westergaard's equation, concept and use of pressure bulbs, principle and use of New mark's influence chart, contact pressure.

5. **Compaction:** Mechanism of compaction, objective of compaction, measurement of compaction, factors affecting compaction, optimum moisture content, Standarad Proctor test, Modified Proctor test, effect of moisture content and compactive effort on dry density, zero air void curve, compaction of cohesionless soils, field compaction, field control of compaction.

6. **Consolidation**: Mechanism of consolidation, e-log (p) curves, basic definitions, estimation of preconsolidation pressure, normally consolidation and over consolidation ratio, Terzaghi's theory of one dimensional consolidation, assumptions, governing equation, standard solution, laboratory determination of consolidation properties of soil, magnitude and rate of consolidation, settlements, secondary consolidation, compression characteristics of clays and settlement analysis.

7. **Shear strength** : Normal, shear and principal stresses, Columb's equation, Mohr's stress circle, Mohr-Columb failure criteria, laboratory determination of shear parameters of soil by direct shear tests, triaxial test, unconfined compression test, Vane shear test, Consolidated drained, consolidated undrained and unconsolidated undrained shear test, pore pressure parameters, Lambe's p-q diagram.

Books :

1. Geotechnical Engineering : S.K.Ghulati and Manoj Dutta
2. Geotechnical Engineering : C. Venkatramaiah

CE-243 **SURVEYING**

L	T	P
3	1	0

1. **Introduction to Chain and Compass Surveying**: Introduction, Definition of surveying, primary divisions of surveying, object and classification of surveying, principles of surveying, approximate methods of chine and tape surveying, unfolding and folding of a chain, instruments for chaining and taping, measurement by tape and chain, errors in tape measurements and their corrections, testing and adjusting of a chain, chaining on flat and sloping ground, obstacle in chaining, direct and indirect methods of ranging, methods of traversing, principle basic definitions, bearings and meridians, prismatic compass, surveyors compass, azimuthal and quadrantal bearing systems, true north and magnetic north, magnetic declination, local attraction and its correction.

2. **Leveling and contouring:** Definition of terms, principles of leveling, types of levels, leveling staffs, booking and reduction in field book, balancing of sights, errors curvature and refraction, distance of visible horizon, reciprocal leveling, and its merits, contour, contour interval, horizontal equivalent, contour gradient, factors affecting contour interval, characteristics of contours, direct and indirect methods of contouring, uses of contour maps.

3. **Theodolite**: Vernier and microscopic theodolite, construction, temporary and permanent adjustments, measurements of horizontal and vertical angles, methods of repetitions and reiteration, sources of errors, checks in traversing, omitted measurements.

4. **Plane table surveying:** Principles, merits and demerits, instruments and other accessories, methods used, radiation, traversing, resection, intersection and their uses, two and three point problem.

5. **Tacheometry:** General principles of stadia system, fixed and movable hair methods, inclined sights with staff vertical, inclined sight with staff normal to the line of sight, determination of tacheometric constants, analytic lens, field work and seconds, tangential system.

6. **Curves:** Types of curves, elements of curve, different methods of setting out-simple circular curves, compound curves, reverse curves, transition curves, types of transition curves, super-elevation, suitability of a circular curve, vertical curves.

7. **Introduction to Modern Survey Instruments.**

Books:

1. Surveying - I : K. R. Arora
2. Surveying Volume – I and II : B. C. Punmia
3. Advance Surveying : R. Agor

CE-244 **ENGINEERING GEOLOGY**

L	P	T
3	0	0

1. **General Geology**: Branches and scope of geology, Earth, its position in the solar systems, surface features and internal structure, work of natural agencies like lakes, oceans, atmosphere, wind, streams, sea, glacier, Earth movements. Types of weathering, mountains and mountain building.

2. **Mineralogy:** Definition of crystal and a mineral, the study of the physical properties and occurrence of quartz, Feldspar, Mica, kyanite, calcite, tale, corundum, gypsum, fluorite, biotite, mus, covite, graphite, realgar, magnetite, limonite, pyrite, galena, barite, dolomite, garnet, tourmaline, chal-copy-rite, opal, topaz, autite, hornblende, epidate, kaolinite, diamond.

3. **Petrology:** Formation and classification of rocks into three types, Igneous, sedimentary and metamorphic rocks, description of physical properties for constructional purposes of granite, pegmatite, dolerite, gabbzo, basalt, sandstone, conglomerate, breccia, limestone, shale, schist, marble, quartzite, khondalite, slate, gneiss, andesite, stratigraphy of India (a general idea), principles of correlation, fossils, their preservation and significance.

4. **Structural geology**: Strike and dip, out crops, volcanoes, overlaps, inliers and outliers, types classification of folds, faults, joints, unconformities.

5. **Engineering Geology**: Ground water, zones of ground water, water table and perched water table, water bearing properties of rocks, occurrence of ground water, springs, selection of a site for well sinking and ground water investigations.

6. **Earthquakes and landslides**: Classification, causes and effects of earthquakes and land slides, seismic curve, seismographs, seismograms, accelograms, seismic problems of India, seismic zones of India, remedial measures to prevent damage for engineering structures, case histories.

7. **Geological investigation:** Interpretation of geological maps, use of aerial maps in geological surveying, geophysical methods as applied to civil engineering for subsurface analysis (Electrical and Seismic methods).

8. **Geology of dams and reservoirs:** Types of dams, requirements of dam site, preliminary and detailed geological investigations for a dam site, important international and Indian examples of failures of dams and their causes, factors affecting the seepage and leakage of the reservoirs and the remedial measures, silting of reservoirs.

9. **Rock mechanics and tunneling:** Purposes of tunneling and geological problems connected with tunneling, geological considerations in road alignment, roads in complicated regions, problems after road construction, geology of bridge sites.

Books:

1. Engineering Geology : Parbin Singh
2. Engineering Geology : P.K. Mukherjee
3. Mineralogy : Dana
4. Structural Geology : H.P. Billings

CE-242(P) **SOIL MECHANICS LAB**

L	T	P
0	0	2

List of experiments:

1. Determination of water content by oven drying method
2. Determination of specific gravity by pycnometer
3. Determination of field density and dry unit weight by core cutter method
4. Determination of field density by sand replacement method
5. Determination of grain size distribution by sieve analysis
6. Determination of grain size distribution by hydrometer analysis
7. Determination of liquid limit of soil
8. Determination of plastic limit of soil
9. Determination of compaction properties of soil by standard proctor test
10. Determination of shear parameters of soil by direct shear method

CE-243(P) **SURVEYING LAB**

L	T	P
0	0	3

List of experiments:

1. Ranging and chaining of a line AB and taking offsets.
2. Traversing with compass and error adjustment to local attraction.
3. To determine the difference in elevation of two given points.
4. Profile levelling and cross sectioning of a given route.
5. To measure the horizontal angle by the method of reiteration and repetition.
6. Theodolite traversing.
7. To prepare the contour map of an area by the method of radial lines.
8. Plane tabling by the method of radiation and intersection.
9. To point problem in plane tabling.
10. Three point problem by mechanical method.
11. Setting out of simple circular curve by offsets from long chord
12. Setting out of simple circular curve by successive bisection.
13. Setting out of simple circular curve by radial and perpendicular offsets.
14. Setting out of simple circular curve by chord produced.
15. Setting out of simple circular curve by one theodolite method.
16. Setting out of simple circular curve by two theodolite method.
17. Setting out of compound curve.
18. Setting out of transition curve.
19. Techometric constant.
20. Use of total station.

5th Semester

Course No.	Subject	L	T	P/D	Hours	Credit
HU-354	Dynamics of Behavioral Science in Industries	3	0	0	3	3
OE-351	Open elective-I	3	0	0	3	3
CE-351	Concrete Structure Design	4	1	0	5	5
CE-352	Transportation Engg.-I	3	1	0	4	4
CE-353	Theory of Structure Lab	0	0	2	2	1
CE-356	Survey Camp*	0	0	0	0	3
CE-352 (P)	Transportation Engg. Lab	0	0	2	2	1
	Total				**19**	**20**

Survey camp of 3 to 4 weeks duration after 4th Semester

Open Elective

1. CE-1 Environmental Science and Engineering
2. CE-2 Transportation system Planning
3. CE-3 Earthquake Engg.
4. CSE-1 Image Processing
5. CSE-2 UNIX environment Programming
6. CSE-3 Information Security Systems
7. CSE-4 Computer Graphics
8. ME-1 Energy Conservation and Management
9. ME-2 Alternate Sources of Energy
10. ME-3 Computer Graphics and rapid photocopying
11. ME-4 Noise control
12. ME-5 Elements of Mechanical Engineering
13. ME-6 Product Design and Value Engineering
14. ME-7 Production Planning and Control
15. ME-8 Science and Technology
16. EE-1 Neural Networks and Fuzzy Logic
17. EE-2 Switched Mode Power Supplies
18. EE-3 Fundamental of Electrical Machines and Drives
19. EE-4 Image Processing
20. ECE-1 Advanced Telecommunication
21. ECE-2 Biomedical Electronic Instrumentation
22. ECE-3 Introduction to VLSI and HDL
23. ECE-4 Electronics Switching Circuits
24. BS-1 Physics of Semi Conductor Devices
25. BS-2 Material Characterization
26. BS-3 Bio-Polymer
27. BS-4 Aspects of Nano Technology
28. BS-5 Polymer Technology
29. BS-6 Operation Research
30. HU-1 Managing Interpersonal and Group Processes
31. HU-2 Human Resource Management
32. HU-3 Financial Management
33. HU-4 Marketing Management
34. HU-5 Managerial Communication

HU-354 DYNAMICS OF BEHAVIOURAL SCIENCE IN INDUSTRY

L	T	P
3	0	0

Objective: To impart knowledge to students about human behaviour, the managerial and Labour social system and work culture with special reference to Indian Scenario.

1. **Behavioural science:** An overview: definitions, Man-the critical factor, behavioural science and its historical development.

2. **Industrial sociology**: Concept and definitions; importance for engineers; growth; criticism of the Hawthorne studies; nature and scope of industrial sociology, industry and community, industry and tradition in India.

3. **Society and technical change**: Concept of social change, meaning and definitions of social change, nature of social change. Factors such as natural, cultural, economic, planning, technological, Indian information technology scenario, effect of technology on social institutions.

4. **Society and environment**: Meaning and definitions, characteristics, classification of environment, physical environment and its influence, social environment and its some basic elements, environment in industry, illumination, noise, atmospheric conditions, music and colour.

5. **Human relations:** Historical overview, definitions, early and later approaches to human relations, strategies for establishing healthy human relations.

6. **Groups**: Meaning and definitions, types of groups, characteristics, functions of formal and informal groups, merits and demerits of informal groups.

7. **Motivation**: Nature of drives, needs and motives, work motives, need-hierarchy theory and two factor theory of motivation, how to motivate the workers at work, factors effecting the morale of workers.

8. **Labour management relations**: Industrial relations; meaning, objectives and definitions, Dunlop's theory of industrial relations, Psychological and Gandhian approach to industrial relations, industrial relations in Japan and India, industrial relation in coming years, challenges of coming years, new dimensions of industrial relations, the ways of industrial peace. Trade unions; meaning and definitions, functions of Indian trade Unions, recent emerging trends in Indian trade unions.

Books:

1. Dynamics of Behavioural Science in Industry : P.C.Rihar
2. Fundamental of Industrial Sociology : P Gisbert
3. A Genesis of Behavioural Science : N Kumar
4. Industrial Relations : A. Monapa
5. Innovation and Change in Organization : N. Kind and Anderson
6. Human Relations and Organization Behaviour, A global perspective : R.S. Dwivedi

CE-1 **ENVIRONMENTAL SCIENCE AND ENGINEERING**

L	T	P
3	0	0

1. **Mass and energy transfer:** Material balance, steady-state conservative systems, steady-state systems with non conservative pollutants, energy fundamentals.

2. **Environmental chemistry**: Stoichiometry, chemical equilibria, solubility of gases in water, carbonate system, organic chemistry, nuclear chemistry, nuclear fission.

3. **Mathematics of growth:** Exponential growth, doubling time, half-life, exponential resource production rates, human population growth, age structure, population momentum.

4. **Hazardous substances and risk analysis:** Hazardous substance legislation, risk assessment, hazard deification, potential carcinogens, toxicity testing in animals, human exposure assessment.

5. **Treatment of water and wastes**: Water resources, characteristics of water, water pollutants, oxygen demanding wastes, surface water quality, groundwater quality, water treatment systems, wastewater treatment and reuse, solid and biomedical wastes treatment technologies and disposal options.

6. **Air pollution**: Air quality standards, emission standards, criteria pollutants, air pollution and meteorology, atmospheric dispersion, emission controls.

7. **Noise pollution**: Effect of noise on people, rating systems, community noise sources and criteria, traffic noise prediction, noise control.

Books:

1. Introduction to Environmental Engineering and Science : Gilbert M Masters
2. Environmental Science and Engineering : J. G. Henry and G. W Heinke
3. Introduction to Environmental Engineering : M.L. Davis and D.A. cornwell

CE-2 **TRANSPORTATION SYSTEM PLANNING**

L	T	P
3	0	0

1. **Transportation planning process:** Introduction, Elements of Transportation planning, Definition of goals and objectives, Identification of needs, Generation of alternatives. Evaluation of alternatives, Implementation of alternatives.

2. **Land use and transportation system:** Urban system components, Concept and definitions, criteria for measuring and comparing urban structure, land use and transportation.

3. **Transport demand analysis:** Nature and analysis of Transportation demand, Sequential demand analysis- Trip-generation models, Trip-distribution models, Model split analysis, Traffic assignment models.

4. **Public transportation:** Historical development of urban transportation, Mass Transit Definitions and classifications, Route development, stop location and stopping policy, Schedule development.

5. **Transportation economics:** Scope of transportation economics, Transportation demand, Demand, supply and equilibrium, Sensitivity of travel demand, Factors affecting elasticities, elements of engineering economics.

Books

1. Transportation Engineering : C.Jotin Khisty and B.Kent Lall,
2. Principles of Transportation Engineering : P.Chakraborty and A.Das.
3. Fundamentals of Transportation Engineering: C.S Papacostas
4. Traffic engineering and Transport planning : L.R.Kadyali, Khanna Publishers.

CE-3 **EARTHQUAKE ENGINEERING**

L	T	P
3	0	0

1. **Introduction**: Causes of Earthquakes, plate tectonics, Earthquake mechanism, seismic zoning map of India, Epicenter, focus, magnitude, intensity, characteristics of ground motion and attenuation, Earthquake recording instruments-seismograph, Accelerograph, Seismoscopy/multi SAR.

2. **Theory of vibration**: SDOF system, MDOF, Earthquake Excitation, forced vibration, continuous systems-uniform bending beam, uniform shear beams.

3. **Earthquake response spectra:** Strong motion earthquakes Elastic spectra, inelastic spectra-equivalent linear system.

4. **Site response to earthquakes:** Local geology and soil conditions, soil investigations and tests dynamic design criteria for a given site.

5. **A seismic design of structures:**
   i. Design data and philosophy, seismic coefficients, permissible stresses and load factors multi-storeyed buildings, base shear, fundamental period of building, distribution of forces along the height, dynamic analysis
   ii. Earthquake resistant instruction of building and ductility provisions in RCC as per IS-13920-1893, IS-1893-2002, IS-456-2000, IS-800-2000, IS-4326-2002
   iii. Elevated water tanks-behaviour, Design features and analysis.
   iv. Stack like structures-fundamental period, Dynamic bending moment and shear diagram.
   v. Bridges-Seismic force, live load, superstructure and substructure.
   vi. Dams-Hydrodynamic pressure, Zanger method, vertical component of reservoir load.

6. **Base isolation:** Isolation systems, base Isolation of single and multi-storey buildings, Application of base Isolation.

7. **Seismic strengthening, repair of restoration concepts:** Existing buildings, Aging, weathering, development of cracks, repair of masonry and concrete structure.

Books:

1. Dynamics of structures; : AK Chopra
2. Structural Dynamics : Mario Paz
3. Soil dynamics : Swami saran
4. Elements of Earthquake Engg. : Jai Krishna
5. Relevant IS Code. : AR Chander Sekoran

CSE-1 IMAGE PROCESSING

L	T	P
3	0	0

Introduction: Digital image representation, Fundamental steps in image processing, Elements of Digital Image processing systems, Elements of visual perception, Image model, Sampling and quantization, Relationship between pixels, Imaging geometry.

Image Enhancement: Enhancement by point processing, Sample intensity transformation, Histogram processing, Image subtraction, Image averaging, Spatial filtering, Smoothing filters, Sharpening filters, Frequency domain: Low-Pass, High-Pass, Homomorphic filtering.

Image Compression: Coding redundancy, Inter-pixel redundancy, fidelity criteria, Image compression models, Error-free compression, Variable length coding, Bit-plane coding, Loss-less predicative coding, Lossy compression, Image compression standards, Fractal Compression, Real-Time image transmission, JPEG and MPEG.

Image Segmentation: Detection of discontinuities, Edge linking and boundary detection, Thresholding, Region oriented segmentation, Use of motion in segmentation, spatial techniques, and Frequency domain techniques.

Spatial Operations and Transformations: Spatially dependent transform template and convolution, Window operations, 2-Dimensional geometric transformations.

Pattern Recognition: Classification and description, Structure of a pattern recognition system, feature extraction, Classifiers, Decision regions and boundaries, discriminent functions, Supervised and Unsupervised learning, PR-Approaches statistics, syntactic and neural.

Statistical Pattern Recognition: Statistical PR, Classifier Gaussian Model, Classifier performance, Risk and error, Maximum likelihood estimation, Bayessian parameter estimation approach, Clustering for unsupervised learning and classifiers.

Books

1. Digital Image Processing : R. Gonzalez and R. E. wood
2. Introductory Computer Vision and Image Procession : Andrian Low
3. Pattern Recognition-Statistical, Structural and neural approach : Robert Scholkoff
4. Digital Image Processing : W.K. pratt
1. Fundamentals of Image Processing : K. JAIN.

CSE-2 UNIX ENVIRONMENT PROGRAMMING

L	T	P
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1. **UNIX Standards:** Brief History of UNIX, AT&T and Berkeley UNIX Systems, POSIX, Library vs. System-Level Functions
2. **Files and Directories:** Basic File Types, File Descriptors, The open() and creat() Functions, Keeping Track of Open Files, File Table Entries, The v-node structure, The fcntl() function, File Attributes, The access() function, Link(), unlink(), remove(), and rename() functions, Functions to Manipulate Directories
3. **Shell Programming:** Bourne Shell, korn shell and C shell. Shell metacharacters, shell variable and scripts, facilities and command, environment, integer arithmetic and string manipulation, decision making, aliasing, arrays and job control.
4. **System I/O:** Standard I/O vs system I/O, System I/O Calls, File and Record Locking,
5. **Processes:** Process Creation and Termination, Process Memory Layout, Dynamic Memory Allocation, Accessing Environment Variables, Real and Effective User IDs
6. **Process Management:** Programs and Processes, The fork() System Function, Parent and Child, The Exec System Functions, Current Image and New Image, The wait() and waitpid() function, Interpreter files and exec
7. **Pipes - Basic IPC:** Interprocess Communication, Pipes, FIFOs
8. **Signals:** What is a Signal?, Types of Signals, Signal Actions, Blocking Signals from Delivery, The sigaction() function, Signal Sets and Operations, Sending a Signal to Another Process, Blocking Signals with sigprocmask (), Scheduling and Waiting for Signals, Restarting System Calls (SVR4) Signals and Reentrancy
9. **Introduction to Threads:** Processes and Threads, Creating Threads, Multitasking, Overview of Thread Architectures, Processes Versus Threads, The Threads API, Thread Termination, Joining and Detaching Threads, Passing Arguments to Threads
10. **Threads Synchronization:** The Sharing Problem, Mutexes, Creating and Initializing Mutexes, Using Mutexes, Additional Synchronization Requirement, Using Condition Variables
11. **Overview of Client/Server Programming:** Designing Distributed Application, Clients and Servers, Ports and Services, Connectionless vs. Connection-Oriented Servers, Stateless vs. Stateful Servers, Concurrency Issues
12. **The Berkeley Sockets API:** Berkeley Sockets, Data Structures of the Sockets API, Socket System Calls, Socket Utility Functions

Books

1. Advanced Programming in the UNIX Environment : W. Richard Stevens
2. The Art of UNIX Programming : Eric Steven Raymond
3. UNIX Network Programming : W. Richard Stevens

CSE-3 **INFORMATION SECURITY SYSTEMS**

L	T	P
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1. **Introduction:** Introduction to OSI Network Security Architectures, Services, Mechanisms and Attacks, Classical Encryption Techniques, Symmetric cipher model, Substitution techniques, Transposition techniques, Rotor Machines, Steganography.
2. **Introduction To Finite Fields:** Groups, Rings, and Fields, Modular Arithmetic, Euclid's Algorithm, Finite Fields of the Form *GF(p),* Polynomial Arithmetic, Finite Fields of the Form *GF(2n).*
3. **Cryptographic Techniques:** An overview of Cryptology, Primality test, *Perfect* security, Stream Cipher *Stream ciphers:* The one time pad. Pseudo-random key streams - properties and generation. Block Cipher -, Introduction to DES, differential and Linear Cryptanalysis, Block Cipher Cryptography, Triple DES Algorithm, International Data Encryption Algorithm (IDEA), Blowfish Algorithm, RC-x Algorithms, CAST-x Algorithms, Symmetric Block Cipher Schemes, Encryption Function Placement and Confidentiality problems. Cryptographic hash functions, Digital signatures,
4. **Public-Key Cryptography and Message Authentication:** The Key Distribution Problem, Random Number Generation, The Public-Key Cryptosystems, The RSA Algorithm, The Key Management riddle, The Diffie-Hellman Key Exchange, Elliptic Curve Cryptography. The Chinese Remainder Theorem, Discrete Logarithms., Introduction to Message Authentication, requirements and functions, Message Authentication Codes, Hash Functions, their Security and other considerations
5. **Authentication Applications**: The Message Digest (MD5) Algorithm, The Secure Hash Algorithm (SHA-1), RIPEMD-x and HMAC fundamentals, Digital Signature basics, Authentication Protocols, The Digital Signature Standard, Introduction to the Kerberos Authentication scheme, The X.319 Directory Authentication scheme.
6. **Systems and Applications Security -** Authentication, Access control policies, Mail security, PGP, Data (base) security, File system security, Program security, Memory security, Session security, SSH, Web security, Web applications security, Sandboxing, Linux security, Windows
7. **Security Protocols -** Security properties, attacks, Design of a security protocol, Examples of security protocols, Contract signing protocols, Formal models of protocols and detecting leaks, Electronic voting protocols, IPSec,, SSL, TLS worms and viruses, micro payments, smart card security, Security of wired / wireless networks
8. **Intrusion detection -** Key Management in Group Communication Systems, Router security, Denial of service and side-channel attacks, Intrusion Detection Systems, Intrusion detection techniques - centralized and distributed;

Books

1. Cryptography and Network Security: Principles and Practice : William Stallings
2. Cryptography: Theory and Practice : D Stinson
3. Network Security :C. Kaufman, R. Perlman and M. Spenser
4. Internet Security and Firewalls :S. Bellovin and W. Chesvick
5. Introduction to Cryptography with Coding Theory : Trappe & Washington
6. An Introduction to Cryptography : Richard A Mollin

CSE-4 **COMPUTER GRAPHICS**

L	T	P
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1. **Introduction To Computer Graphics:** Overview of Graphics Systems, Display Devices, Hard copy Devices. Interactive Input Devices, Display Processors, The Graphical Kernel System, Output Primitives, Line drawing algorithms, Circle Generation algorithms, Character Generation.

2. **Raster Scan Graphics:** Line Drawing Algorithms, Circle Generation, General Function Rasterization, Scan Conversion- Generation of the display, Image Compression, Polygon Filling, Fundamentals of Antialiasing

3. **Two-Dimensional Geometric Transformation & Viewing:** Basic Transformation, Translation, Rotation, Scaling, Other Transformation Reflection, Shear, Transformation functions, Window to viewport co-ordinate transformation, Clipping Operations, Point Clipping, Line Clipping, Polygon Clipping.

4. **Three- Dimensional Concepts & Object Representations:** Three Dimensional Display Methods, Parallel Projection, Perspective Projection, Translation, Rotation, Scaling, Composite Transformation, Three dimensional Transformation function, Polygon Surfaces, Curved Lines and surfaces, Bezier Curves and surfaces, B-Spline Curves and surfaces

5. **Graphics hardware**: Display technology, random scan, raster scan display processing, input devices for interaction.

6. **Visible Lines and Visible Surfaces**: Visual Realism, Hidden line and hidden surface removal: depth buffer algorithm, geometric computations, scan line coherence algorithms, area coherence algorithms, priority algorithm, shading and color models, Modeling methods.

7. **Rendering:** A simple illumination model, Transparency, Refraction effects in transparent materials, Simple Transparency Models, Z-Buffer Transparency, Shadows, Texture

Books

1. Procedural Elements for Computer Graphics : D.F. ROGERS,
2. Computer graphics : Hearn and Baker
3. Computer Graphics, A programming approach : S. Harrington
4. Mathematical Elements for Computer Graphics : D.F. Rogers

ME-1 ENERGY CONSERVATION AND MANAGEMENT

L	T	P
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1**. Energy management**: Concept of energy management, energy demand and supply, economic analysis; Duties and responsibility of energy managers.

2. **Energy conservation**: Basic concepts, Energy conservation in household, transportation, agricultural, service and industrial sectors, Lighting, HVAC systems.

3. **Energy audit**: Definition, need, and types of energy audit; Energy management (audit) approach: Understanding energy costs, bench marking, energy performance, matching energy use to requirement, maximizing system efficiencies, optimizing the input energy requirements; Fuel & energy substitution; Energy audit instruments; Energy Conservation Act; Duties and responsibilities of energy managers and auditors.

4. **Material and energy balance**: Facility as an energy system; Methods for preparing process flow; material and energy balance diagrams.

5. **Energy action planning**: Key elements; Force field analysis; Energy policy purpose, perspective, contents, formulation, ratification; Organizing the management: location of energy management, top management support, managerial function, roles and responsibilities of energy manager, accountability; Motivation of employees: Information system-designing barriers, strategies; Marketing and communicating: Training and planning.

6. **Energy conservation in plant service systems**: Centrifugal pumps: Energy consumption & saving potentials; Design consideration minimizing over design; Case studies Fans & Blowers: Specification, safety margin, choice of fans-controls, design considerations. Air compressor & compressed air systems: Selection of compressed air layout, Design consideration. Refrigeration & Air conditioning: Heat load estimation, methods of minimizing heat loads, optimum selections of equipments; Case studies, Energy conservation in cooling towers & spray ponds; Case studies.

7. **Thermal energy management**: Energy conservation in boilers, steam turbines and industrial heating systems; Application of FBC; Cogeneration and waste heat recovery; Thermal insulation; Heat exchangers and heat pumps; Building Energy Management.

Books

1. Energy Management Principles : C B Smith
2. Energy Auditing and Conservation; Methods, Measurements Management and Case Study : Hamies
3. Energy Management and Conservation : D. Patrick and S W Fardo
4. Heating and Cooling of Buildings: Design for Efficiency : J. Krieder and A. Rabi
5. Principles of Energy Conservation Archie : W. Culp
6. P. Energy Management : O Callaghan

ME-2 NON-CONVENTIONAL/ ALTERNATE SOURCES OF ENERGY

L	T	P
3	0	0

1. **Introduction**: Trends of energy consumption, sources of energy conventional and renewable, fossil fuel availability and limitations, need to develop new energy sources.

2. **Solar energy**: Solar radiation characteristics and estimation, Solar Collectors, Flat Plate and concentrating types. Their comparative study, design and material selection, efficiency, Selective paints and surfaces. Heating of air and water for building and other uses, Thermal storages, Solar Ponds, Solar pumps, solar Power, Solar Cookers etc. Direct Conversion of Solar energy to electricity and its various uses, materials, limitations and costs.

3. **Bio-conversion**: Generation of bio-gas, digesters and their design, selection of material, feed to digester, paralytic gasification, production of hydrogen, Algae production and their uses.

4. **Wind energy**: Types of rotors, horizontal axis and vertical axis systems, system design and site selection.

5. **Geo-thermal energy**: Sites, potentiality and limitation, study of different conversion systems.

6. **Tidal energy**: Sites, potentiality and possibility of harnessing from site, limitations.

7. **Ocean thermal energy**: Principle of utilization and its limitations, description of various systems.

8. **Other non-conventional energy sources**: Fluidized bed combustions, heat from waste and other sources.

Books

1. Solar Energy Utilization : G.D. Rai
2. Solar Heating and Cooling : Duffie and Beckman
3. Power Plant Technology : M.M. EL. Wakil
4. Power Plant Engineering : P.C. Sharma

ME-3 COMPUTER GRAPHICS AND RAPID PROTOTYPING

L	T	P
3	0	0

1. **Introduction and overview of graphics systems**: Computer-aided design, Presentation Graphics, Computer art, entertainment, education and training, visualization, image processing, graphical user interfaces, Video display devices, Raster scan systems, Random scan systems, Graphics monitors and workstation, Input devices, hard copy devices, graphics software.

2. **Output primitives**: Point, and lines, line drawing algorithms, loading the frame buffer, line function, circle generating algorithm, ellipse generating algorithms, other curves, pixel addressing, filled area primitives.

3. **Attributes of output primitives**: Line attributes, curve attributes, area fill attributes.

4. **Two-dimensional geometric transformations**: Two-dimensional translation, rotation, scaling, matrix representation and homogeneous co-ordinates, composite transformations, other transformations-reflection, shear transformation between co-ordinate systems.

5. **Two dimensional viewing**: The viewing pipeline, viewing co-ordinate reference frame, window to viewport coordinate transformations, clipping operations, point clipping, line clipping, polygon clipping.

6. **Three dimensional geometric and modeling transformation**: Translation, rotation, scaling, reflection, shear, composite transformations, three-dimensional modeling and co-ordinate transformations.

7. **Rapid prototyping**: Details/methods of Rapid prototyping, Basic principles of RP, Different RP Techniques, Advantages of RP, CAD modeling, CAE Analysis

B**ooks**

1. Computer graphics : Hearn and Baker
2. Geometric modeling : Vera B. Anand

ME-4 **NOISE CONTROL**

L	T	P
3	0	0

1. **Introduction**: Fundamentals of vibration, vibration of membranes and plates, Acoustic wave equation, acoustic energy and sound Intensity, Propagation of sound

2. **Acoustic waves**: Elastic behavior of fluids, Plane wave equation, Velocity of sound in fluids, Energy density of Plane waves, Acoustic density, Decibel scales, Transmission phenomenon, spherical acoustic wave.

3. **Resonators and filters**: Helmholtz Resonator, Acoustic impedance, Reflection of waves in pipe, Expansion chamber type of filters.

4. **Speech, hearing, and noise**: Mechanism of hearing, Thresholds of ear, Loudness.

5. **Architectural acoustics**: Sound intensity in a Live room, Decay of sound, Measurement of Reverberation time, Sound absorption coefficients, Sound absorbing materials for noise reduction.

6. **Noise engineering**: Machinery Noise, Reduction of Noise, Reduction of noise and its control, Design for less noise, Enclosures, Silencers, barriers etc. Noise control in industry, Addition of Sound levels, Calculation of SPL.

7. **Noise measurements**: The range of quantities encountered in Sound, Decibel scale. Frequency / octave bands, Microphones, Sounds Level Meter, Frequency analyzers, fault detection from noise analysis, Diagnostic Maintenance, Measurement environment, Anechoic chamber.

Books

1. Mechanical Vibrations : G. K. Grover
2. Vibration Theory & Applications : W. T. Thomson
3. Vibration & Noise for Engineers : K. K. Pujara and R S Pujara
4. Fundamentals of Acoustics : Kinsler and Frey
5. Acoustics of Ducts and Mufflers : Munjal
6. Noise and Vibration Control Engineering : Beranek
7. Noise Pollution and Control Strategy : Singal
8. Mechanical Vibrations and Noise Engineering : Ambekar

ME-5 ELEMENTS OF MECHANICAL TECHNOLOGY

L	T	P
3	0	0

1. **Introduction**: Plain motion, kinematic concepts of links; basic terminology and definitions; inversion of kinematic chain, Chebyshev spacing of precision points, Absolute and relative motion, instantaneous centers, velocity and acceleration polygons.

2. **POWER TRANSMISSION and FRICTION DEVICES**: Flat belts, V-belts, length of belts, transmission of power by belts, condition for maximum power transmissions, initial tension, Coulomb friction, pivots and collars, power screws.

3. **Governors**: Functions, Difference between Governor and Flywheel, Various Terms Used, Types of Governor- Watt, Porter, Proell & Hartnell; Inertia Governor, Sensitiveness and Stability of Governor; Isochronous Governor, Hunting, Effort and Power of a Porter Governor, Controlling Force Diagrams For Porter and Spring Controlled Governor, Coefficient of Insensitiveness.

4. **Simple stresses and strains**: Types of stresses and strains; Factor of safety; Thermal Stress and Strain, Stresses on oblique plane under biaxial loading, biaxial stresses combined with shear stresses, Principal stresses and planes, Determination of Principal stresses, Mohr's circle-biaxial state of stress accompanied with shear stress.
5. **Compressor**: Classifications, single and multistage reciprocating compressor, effect of inter cooling, volumetric efficiency.

6. **STEAM GENERATORS and TURBINE**: Classification and description of generators, Position of steam turbine in power industry; types and application. Impulse turbine; pressure and velocity compounding; velocity diagram; work output, losses and efficiency, Reaction turbines, velocity diagram, Degree of reaction, work output losses and efficiency, Governing of turbine.

7. **Hydraulic turbines**: Classification, Euler's equation for turbines, velocity triangle for single stage axial and radial machines, Impulse and reaction turbines, Pelton, Francis & Kaplan turbine. Power and efficiency calculations, draft tube, cavitation, water turbine governing.

Books

1. Machines and Mechanisms : David H. Myszka
2. Theory of Machines : Sarkar
3. Theory of Machines : S. S. Rattan
4. Theory of Machines : Abdulta Sharif
5. Turbo Machine : Shephard
6. Turbines, Compressors & Fans : Yahya
7. Hydraulic Machines : J. Lal
8. Strength of Material : Timoshenko
9. Strength of Material : Sadhu Singh

ME-6 PRODUCT DESIGN & VALUE ENGINEERING

L	T	P
3	0	0

1. **Introduction**: Introduction to Product Design, Design by Evolution and Innovation, Essential factors of product design, Production consumption cycle, Flow and value addition in Production consumption cycle.

2. **Functional & aesthetics consideration**: Basic design considerations, Role of Aesthetics in product design, Basic concept and elements of Visual design, Functional design practice.

3. **Manufacturing consideration**: Producibility Requirements in the design of machine components, Forging design, Pressed component design, Design for machining, Ease of location and Clamping, Some additional aspects of production design, Design of powder metallurgical parts, Redesigning on basis of production consideration.

4. **Value engineering**: Concept of value, cost and price, customer and value, philosophy and objectives of value analysis, types of value, areas of application of value engineering, limitations of value analysis, difference between value engineering and cost reduction techniques; Tool of technology in value analysis, method & engineering, cause and effect diagram, SWOT analysis, break even analysis, systems approach; Job plan for value analysis approach: Information phase, Function Phase, Creation Phase, Evaluation Phase, Recommendation Phase, Implementation Phase, Audit Phase; Value Engineering Cell, value manual, composition of cell, Cost cutting, various cost cutting techniques; Case studies in value engineering and analysis from manufacturing and service industries.

Books

1. Product Design and Development : Kail T. Ulrich and Steven D. Eppinger
2. Product Design and Engineering : A.K. Chitale and Gupta
3. Product Design and Process Engineering : Niebel & Draper
4. Design of Systems and Devices : Middendorf Marcel Dekker
5. Value Engineering SAVE : Mudge
6. Techniques of Value Analysis and Value Engineering: Miles Lawerence
7. Value Engineering in Manufacturing : ASME
8. Value Engg. Theory : D. E. Parker

ME-7 PRODUCTION PLANNING AND CONTROL

L	T	P
3	0	0

1. **Introduction:** Types and Characteristics of Production Systems – (i) Continuous or Process Production (ii) Mass Flow Line Production. PPC Phases – Planning Phase, Action Phase, Control Phase, Implications for Production planning & Inventory Control.

2. **Forecasting**: Definition and Concept, Purpose of Sales Forecasting, Basic elements of sales forecasting, Techniques of Forecasting – Time Series Analysis ; Delphi Method, Forecasting by moving average, Weighted Moving Average, Exponential Smoothening, Correlation Analysis and Linear Regression Analysis.

3. **Inventory control & management**: Inventory Control, Types Of Inventory, objectives of Inventory Control, Economic Order Quantity (EOQ) Inventory Models, ABC Analysis – Need and Procedural Steps: Material Requirement Planning (MRP) – Function – Inputs to MRP, Bill of Material (BOM).

4. **Process planning:** Introduction and Concept, Information Required to Process Planning, Process Planning Procedure, Make or Buy decisions, Process Analysis, Process chart – Outline and Symbols, Automated Process Planning – Computer Assisted Process Planning (CAPP), Group Technology (GT).

5. **Production scheduling**: The Production Environment, Controlling Continuous Production, Sequencing and Line Balancing Methodologies, Master Production Schedule (MPS) – Managing the Master Production Schedule, Maintenance of MPS - Scheduling in Manufacturing Systems - Conventional & Flexible Systems.

6. **Supporting ppc activities**: Enterprise Resource planning (ERP) - Objective and Advantages of ERP, Supply Chain Management (SCM) - Definitions, Need, SCM Models, Concept of Lean Manufacturing (LM) and Just in time (JIT) in Production Systems.

Books

1. Production Planning b& Inventory Control : L Seetharama L
2. Production & Operation Management : N. Gaither Dryden
3. Material Management System : R.J.Brown
4. Decision Support for Inventory Management & Production Planning: Peterson and Surer

EE-1 NEURAL NETWORKS AND FUZZY LOGIC SYSTEMS

L	T	P
3	0	0

1. **ANN Models & Architecture:** Biological foundations, ANN models, Types of activation function, introduction to network architecture, multilayer feed forward network (MLFFN), Kohonen self organizing map, radial basis function network (RBFN), recurring neural network.

2. **Learning Processes:** Supervised and unsupervised learning, error-correction learning, Hebbian learning, Boltzman learning, single layer and multilayer perception model, least mean square algorithm, back propagation algorithm, Application in forecasting and pattern recognition and other power engineering problems.

3. **Fuzzy Sets and Theory:** Fuzzy sets, fuzzy set operations, properties, membership functions, fuzzy to crisp conversion, measures of fuzziness, fuzzification and defuzzification methods, application in engineering problems.

4. **Fuzzy Control System:** Introduction, simple fuzzy logic controllers with examples, special forms of fuzzy logic models, classical fuzzy control problems.

Books:

1. Neural Network Design : M. T. Hagon, Howard B. Demuth and Mark Beale
2. Introduction to Artificial Neural Systems : Jacek M Zurada
3. Neural Computing: Theory and Practice : Wasserman
4. Neural Networks-Algorithms, application and programming techniques. J.A. Freeman
5., Essentials of Fuzzy Modeling and Control: Ronald R. Yager and Dimiyar P. Filev
6. Neural Networks, Fuzzy logic and genetic Algorithm: S. Rajasekran and G. A.V Pai

EE-2 SWITCHED MODE POWER SUPPLIES

L	T	P
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Linear power supplies and their limitations. Switched mode power supply. Analysis of various converter topologies – buck, boost and buck-boost. Calculation of inductor and capacitor size. Isolated converter topologies – fly back, forward, push pull, half bridge and full bridge. Comparison of these converters.

Design of inductor and transformer for dc- dc converters. Control of switched mode dc power supplies, transfer function and compensation. Current mode control, power supply protection and EMI considerations.

Book:

Power Electronics converters, applications and design : Ned Mohan, T.M. Undeland and W.P. Robbins

EE-3 FUNDAMENTALS ELECTRICAL MACHINES AND DRIVES

L	T	P
3	1	0

1. **Introduction to Transformer**: Working Principle, Construction and Operation and Equivalent circuit.

2. **Basic Concept of Rotating Machines**: Parts of rotating electrical machines, Torque production and Energy conversion.

3. **D. C. Motors**: EMF equation, Types of DC Motors, Torque speed characteristics, types of starters and speed control, losses and efficiency.

4. **Three-Phase Induction Motors**: Construction, Principle of working, Rotating magnetic field production, Slip, Equivalent circuit, Torque-slip characteristics, Speed control and method of starting.

5. **Special Motors**: Single phase motors, Stepper motor, Servomotors, Synchronous motor.

6. **Industrial Applications:** Case study of motor drive system for steel mills, paper mills and machine tool application.

Books:

1. Electric Machines : Ashfaq Hussain
2. Electrical Machinery : P. S. Bhimbra
3. Electrical Machinery : Chapman

EE-4 **IMAGE PROCESSING**

L	T	P
3	1	0

1. **Introduction:** Digital image representation, Fundamental steps in image processing, Elements of Digital Image processing systems, Elements of visual perception, Image model, Sampling and quantization, Relationship between pixels, imaging geometry.

2. **Image Enhancement:** Enhancement by point processing, Sample intensity transformation, Histogram processing, Image subtraction, Image averaging, Spatial filtering, Smoothing filters, Sharpening filters, Frequency domain: Low-Pass, High-Pass, Homomorphic filtering.

3. **Image Compression:** Coding redundancy, Inter-pixel redundancy, fidelity criteria, Image compression models, Error-free compression, Variable length coding, Bit-plane coding, Loss-less predicative coding, Lossy compression, Image compression standards, Fractal Compression, Real-Time image transmission, JPEG and MPEG.

4. **Image Segmentation:** Detection of discontinuities, Edge linking and boundary detection, Thresholding, Region oriented segmentation, Use of motion in segmentation, Spatial techniques, Frequency domain techniques.

5. **Spatial Operations and Transformations:** Spatially dependent transform template and convolution, Window operations, 2-Dimensional geometric transformations.

6. **Pattern Recognition:** Classification and description, Structure of a pattern recognition system, feature extraction, Classifiers, Decision regions and boundaries, discriminent functions, Supervised and Unsupervised learning, PR-Approaches statistics, syntactic and neural.

7. **Statistical Pattern Recognition:** Statistical PR, Classifier Gaussian Model, Classifier performance, Risk and error, Maximum likelihood estimation, Bayessian parameter estimation approach, Clustering for unsupervised learning and classifiers.

Books:

1. Digital Image Processing : R. Gonzalez and R. E. Wood
2. Introductory Computer Vision and Image Procession : Andrian Low
3. Pattern Recognition-Statistical Structural and neural approach : Robert Scholkoff
4. Digital Image Processing : W.K. Pratt
5. Fundamentals of Image Processing. : R. K. Jain

ECE- 1 ADVANCED TELECOMMUNICATIONS

L	T	P
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1. **Evolution of Tele-Communication:** Basic Switching System, Simple Tele-phone Communication, Telephone Transmitter, Telephone receiver, Telephone's bell & dialer pulsing mechanism, subscribers telephone sets, Dialing types, signaling tones, Brief Introduction to Electromagnetic Exchanges.
2. **Electronic Switching –** Space Division Switching Stored Programme Control – Centralized SPC, Distributed SPC, Software Architecture, Application Software – Enhanced Services, Multi Stage Switching Networks**.**
3. **Time Division Switching** - Time Division space switching, Time Division Time Switching, Time multiplexed space switching, Time multiplexed Time Switching, Combination Switching
4. **Traffic Engineering**, Grade of Service and Blocking Probability - Telephone Networks, Subscriber Loops, Switching Hierarchy and Routing, Signaling Techniques, In Channel, Common Channel. Transmission media.
5. **Fax system**: Basic facsimile system, facsimile applications working of FAX machines, recording media, FAX reproduction technique.
6. **Mobile radio communication**: Introduction, cellular structures & planning, Frequency allocation, propagation Problems, Base station antennas, Mobile unit antenna Type of mobile systems, Handoffs, Analog cellular Radio Digital Cellular radio, Digital Narrow band TDMA, CDMA technology.

Books

1. Digital Telemetry : John C Bellamy.
2. Telecommunication Switching System and Network : Tyagrajan
3. Telecommunication system Engg. : Roger L.Freeman.
4. Wireless Mobile Communication : Rappaport

ECE-2 BIOMEDICAL ELECTRONIC INSTRUMENTATION

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1. **Bioelectronics signal:** Origins of Bioelectric signals, Electrocardiogram (ECG), Electromyogram (EMG). Recording Electrodes: Silver-silver Electrodes, Electrodes for ECG, EEG and EMG. Physiological Transducers: Pressure Transducers, Temperature sensors, Pulse sensors.

2. **RECORDING AND MONITORING INSTRUMENTS**: Biomedical Recorders: Block diagrams of electrocardiogram phonocardiograph, Electroencephalograph, Electromyography. Monitoring system, block diagram of patient monitor, measurement of heart rate, blood pressure

measurement, and temperature measurement respiration rate. Basic Arrhythmia Monitoring system: Block diagram, Foetal Monitoring System: Methods of monitoring Foetal Heart Rate, Abdomen Foetal Electrocardiogram and Foetal Phonocardiogram. Biomedical Telemetry: Introduction, block diagram and description of single channel/multi channel telemetry systems.

3. **AUDIO METERS**: Mechanism of hearting, measurement of sound, basic audiometer, pure tone audiometer, sped audiometer.

4. **IMAGE SYSTEMS**: Introduction, Basic principle and block diagram of x-ray machine, x-ray computed topography (C.T. Scanner) and Nuclear Magnetic resonance (NMR) Topography, Ultrasonic Imaging System: Introduction, medical ultrasound, block diagram of pulse echo-system, A-Scan, M-mode, B-scanner and real time ultrasound imaging systems.

5. **THERAPEUTIC EQUIPMENTS**: Type of cardiac Pacemakers. Cardiac Defibrillator. Kidney Machine.

6. **PHYSIOTHERAPHY EQUIPMENTS**: Short-wave Diathermy, Microwave Diathermy, Ultrasound Therapy unit.

7. **PATIENT SAFETY**: Electric shock hazard, leakage currents, Test Instruments for checking safety parameters of Biomedical Equipments.

Books:

1. Handbook of Biomedical Instrumentation : R.S.Khandpur.
2. Biomedical Instruments: Theory and Design : Walter Welko- Witiz and Sid Doutsch

ECE-3 **INTRODUCTION TO VLSI AND HDL**

L	T	P
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Introduction, Trends & Projections in VLSI Circuits, Flow diagram of VLSI Circuit Design and VLSI Design issues.

MOSFET fundamentals, Enhancement Mode MOSFETs, Depletion Mode MOSFETs, Weak & strong Inversion Conditions, Threshold Voltage Concept in MOSFETs, IV Characteristics of a MOSFET, Limitations in IV Model and MOSFET Parasitic.

Basic VLSI Design Styles-NMOS, CMOS Process flow; Noise Margin; Inverter Threshold Voltage; NMOS Inverter design and characteristics; CMOS Inverter Design and Properties; Delay , Power Dissipation and scaling in CMOS circuits. Introduction to SPICE

Introduction to HDL: Design Flow, Design Methodologies, HDL History, Capabilities, Hardware Abstraction, Basic Terminology, Model Analysis, Comparison between VHDL and Verilog.

Basic VHDL Elements: Identifiers, Data Objects, Data Types, Operators.

Behavioral Modeling: Entity declaration, architecture body, Various Sequential Statements and Constructs, multiple processes, postponed processes.

Dataflow Modeling: Concurrent Signal Assignment Statements, delta delay model, multiple drivers, block statement, concurrent assertion statement.
Structural Modeling: Component Declaration, component Instantiation, resolving signal values.
Supporting Constructs: Generics and Configuration, Subprograms and Overloading, Operator overloading, Package declaration, package body, design Libraries, visibility.

Books

1. CMOS Digital Integrated Circuits-Analysis & Design : S.M. Kang and Y. Leblibici
2. Solid State Electronic Devices : B.G. Streetman & S. Banerjee
3. Introduction to VLSI : K. Eshraghian and Pucknell
4. VHDL primer : J. Bhasker
5. VHDL: Analysis and Modelling of Digital Systems : Z. Navabi; McGraw Hill Pub.

ECE-4 ***ELECTRONIC SWITCHING CIRCUITS***

L	T	P
3	0	0

1. **Introduction to sequential circuits**: Flip –Flops, flip-flop conversions, flip-flop excitation table. Classification of sequential circuits. Registers and A to D and D to A converter circuits.

2. **Design & analysis of synchronous sequential circuits**: - Sequential circuits introductory examples, Counters, Sequence Detector and Sequence Generator circuits Definite state model Basic definition, capabilities & Limitation of finite state machines, state equivalence & machine minimization, simplification of incompletely specified machines, Extraction of maximum compatibles, synthesis & analysis of synchronous sequential circuits.

3. **Design of asynchronous sequential circuits**: - Introduction to asynchronous circuits, timing diagram, state diagram & flow tables, fundamental mode circuits, synthesis, state assignment in asynchronous sequential circuits, pulse mode circuits.

4. **Hazards**: - Introduction, gate delays, generation of spikes, production of static hazards in combinational networks, elimination of static hazards, design of hazard free combinational networks, hazard free asynchronous circuit design, dynamic hazards, essential.

5. **Contact networks & symmetric networks**: - Relay contents, analysis & Synthesis of contact Networks, Properties of symmetric functions , Synthesis & identification of symmetric functions

Books:

1. Switching and finite automata theory : ZVI Kohavi
2. Logical design of switching circuits : Douglas Lewin.
3. Logic Design : N.N Biswas

CE-351 **CONCRETE STRUCTURE DESIGN**

L	T	P
4	1	0

1. **Introduction**: Properties of concrete and reinforcing steel, design philosophies, limit state, ultimate load method, working stress method.

2. **Limit state method**: Design of Beams: Singly reinforced, doubly reinforced, rectangular, T and L beams and lintels.
   Design of Slabs: One way, two way, baffle slabs.
   Design of Columns: Subjected to eccentric and axial loading, Using S.P. 16.
   Design of Stair Cases: Types terms used, design of stairs spanning, horizontally, doglegged stairs with quarter space landing, stairs with central stringer beam.

3. **Design of footings**: Individual and combined footing and raft foundation.

4. **Design of retaining walls**: Various types of retaining walls, design of cantilever and counterfort retaining walls.

5. **Design of water tanks**: Analysis of beams curved in plan, design of R.C.C. rectangular and curcular water tanks resting on ground, design of underground tanks, design of overhead water tanks.

Books

1. Reinforced Concrete Structures Vol-1 : B.C.Punmia
2. Reinforced Concrete (Limit state design) : A.K.Jain
3. R.C.C.Design : P.Dayaratnam
4. Reinforced Concrete : Ashok K.Jain
5. Design Codes and Design Aids

CE-352 **TRANSPORTATION ENGINEERING- I**

L	T	P
3	1	0

3. **Road development and planning**: Brief history of road development, road cross section, necessity of transportation planning, classification of roads, road patterns, planning surveys, saturation system, highway planning in India, road development plans

4. **Highway location and alignment**: Basic requirements of an ideal alignment and factors controlling, engineering survey for highway location, drawing and reports, highway projects.

5. **Highway geometric design**: Highway cross-section elements, sight distances, Design of horizontal alignment, Transition curves and vertical alignment.

6. **Traffic engineering**: Traffic characteristics, traffic studies and their uses, traffic flow characteristics, traffic control devices, intersections, traffic planning, Trip-generation models, trip-distribution models, modal split analysis.

7. **Pavements design:** Design factors, Design of flexible pavements, CBR, GI and Burmister methods, Design of rigid pavements.

8. **Pavement materials:** Soils, Aggregates and their characteristics, Bituminous materials and mixtures, portland cement concrete.

9. **Construction of roads:** Construction of water bound macadam roads, bituminous pavements, cement concrete pavements, design and construction of joints in cement concrete pavements.

10. **Hill roads:** General considerations, alignment, geometric design and construction, drainage and maintenance problems in hill roads

11. **Highway maintenance**:- Pavement failures, maintenance of highway pavement , evaluation and strengthening of existing pavements.

Books:

1. Highway Engineering : S.K. Khanna and C.E.G. Justo
2. Principles of Transportation Engineering : Patha Chakraborty and Animesh Das
3. Traffic Engineering and Transport Planning : L.R.Kadiyali
4. Highway Vol. IandII : C.A.O_Flaherty
5. Highway Engineering : S.K. Sharma

CE-353 **THEORY OF STRUCTURES LAB**

L	T	P
0	0	2

List of experiments:

1. To verify the Betti's law.
2. Study of a three hinged arch experimentally for a given set of loading and to compare the results with those obtained analytically.
3. To obtain experimentally the influence line diagram for horizontal thrust in a three hinged arch and to compare the same with the theoretical value.
4. To determine the flexural rigidity of a given beam.
5. To study the behavior of different type of struts.
6. To verify moment area theorem for slopes and deflection of a beams.
7. To find the deflection of a pin-connected truss and to verify the results by calculation and graphically.
8. To determine the carry over factors for beam with rigid connections.
9. To determine the rotational stiffness of a beam when far end is (a) fixed (b) pinned.
10. Determine experimentally the horizontal displacement of the roller end of a two hinged arch for a given set of a loading and to compare the results with those obtained analytically.
11. To obtain experimentally the influence line diagram for horizontal thrust in a two hinged arch and to compare the same with the theoretical value.

CE-352(P) **TRANSPORTATION ENGINEERING LAB**

L	T	P
0	0	2

List of experiments:

1. To determine the impact value of aggregates
2. To determine the crushing value of aggregates
3. To determine the flakiness and elongation index of aggregates.
4. To perform Los- angeles and test on aggregates.
5. To determine the c b r value of a given soil sample.
6. To determine the c b r value of given soil aggregates mix.
7. To conduct the grain size analysis of course aggregate & fine aggregates.
8. To perform penetration test on bitumen
9. To determine the softening point of bitumen material.
10. To determine the specific gravity and water absorption of aggregates.
11. To determine the ductility value of a bitumen Material.
12. To perform float test on bitumen.

6th Semester

Course No.	Subject	L	T	P/D	Hours	Credit
CE-361	Steel Structure Design	3	1	0	4	4
CE-362	Environment Engg.-I	3	1	0	4	4
CE-363	Transportation Engg. -II	3	1	0	4	4
CE-364	Irrigation Engg. and Hydrology	3	1	0	4	4
CE-365	Structural Drawing	0	0	3	3	2
CE-366	Minor Project	0	0	3	3	2
CE-362 (P)	Environment. Engg. Lab	0	0	2	2	1
	Total				**24**	**21**

** Industrial Training of 6 to 8 weeks duration after 6th Semester

CE-361 **STEEL STRUCTURE DESIGN**

L	T	P
3	1	0

1. **Design of connections in steel structures**: Riveted, and bolted and welded connections, assumptions, Different types of joints, design of various types of riveted and welded connections subjected to direct loads and moments.

2. **Design of tension members**: Selection of section, I.S. specifications, design of axially loaded tension members, design of members for axial tension and bending, end connections, design of lug angles and tension splices.

3. **Design of compression members**: Theory of buckling, design of column, cross section (single and built up sections), design of angle struts, eccentrically loaded columns, column splices, lacings and battens.

4. **Design of beams**: Laterally stability, design of single and built up beams, plated beams and curtailment of flange plates.

5. **Design of column bases and column footings:** Slab base, gusseted base, and column bases subjected to moment. Independent column footing, combined column Footing.

6. **Design of roof trusses**: Types of trusses, roofs and side coverage, types of loadings and load combinations, design of members and connections.

7. **Water tanks**: Design of rectangular pressed steel tanks, cylindrical tanks with hemispherical bottom, design of staging.

8. **Plastic design of steel structures**: Review of plastic analysis as covered in earlier courses, Effect of normal and shear forces on plastic moments, lateral buckling and local buckling of beam. Design of beams and frames, design of connections-straight corner, beam column and plate connections.

Books:

1. Design of Steel Structures : A.S.Arya and J.L. Ajmani
2. Design of Steel Structures : Ram Chandra
3. Design of Steel Structures : P. Dayaratnam

CE-362 WATER AND WASTE WATER ENGINEERING

L	T	P
3	1	0

1. **Water environment:** Environment, water resources of hydrosphere, different water pollutants and their impacts on human being, sources of supply, yield, design of intakes, estimation of demand, design period.

2. **Water and waste water characteristics**: Water quality criteria and standards for potable and industrial uses, control of water borne diseases, Physical, chemical and biological characteristics of domestic and industrial waste waters, significance of pollutant parameters and effluent discharge standards.

3. **Treatment objective and methods** Unit operations and processes and selection of treatment mode and sequence
   - *Primary treatment*: screening, neutralization, equalization, flocculation, sedimentation, floatation, stripping.
   - *Secondary treatment*: suspended and attached biological growth systems for aerobic, anaerobic, and anoxic processes, lagoons and stabilization ponds.
   - *Tertiary treatmen*t: Oxidation/reduction, precipitation, adsorption, ion exchange and membrane (R) O/UF) Processes, disinfection.

4. **Conveyance and distribution systems**:
   - *Conductors*: different pipe systems, design considerations, laying, testing and effects of pipe corrosion and its preventive measures.
   - *Sewers*: hydraulic design, construction and appurtenances, operation and maintenance.
   - *Pumps and pumping*: necessity, types of pumps, characteristics curves, selection criteria, economical diameter of pumping/transmission main, problems in sewage pumping.
   - *Distribution network*: methods, layout, storage, and distribution reservoir, analysis of distribution systems.

5. **Plumbing systems**: General principles, materials for service pipe, service connection, water meters, and valves, Principles of house drainage, pipes, traps, sanitary fittings, systems of plumbing, house drainage plans.

6. **Rural and semi urban sanitation**: Collection and disposal of dry refuse, sullage, excretal waste, night soil disposal without water carriage, latrines, chemical toilets, pre-cast units for low cost sanitation.

Books:

1. Theory and Practice of Water and Waste water treatment : Ronald L. Droste
2. Wastewater Engineering-Treatment and reuse : Metcalf and Eddy
3. Water and Waste water Technology : M.J Hammer
4. CPHEEO (Ministry of Urban Development, New Delhi). Manual on
   (i) Water Supply and Treatment.
   (ii) Sewerage and Sewage Treatment.

CE-363 **TRANSPORTATION ENGINEERING- II**

L	T	P
3	1	0

1. **Urban transportation planning:** Introduction, Transportation system management, Transportation plan, Travel forecasting, Trip generation models – Multiple linear regression analysis, Category analysis, Trip Distribution – Fratar method, Gravity model, Mode usage – Trip interchange mode choice models, Trip assignment- Minimum path techniques.

2. **Airports:** Introduction, ICAO, Aircraft characteristics, Airport Planning, Regional planning, development of new airports, airport site selection, Airport obstructions, Zoning, classification of obstructions, imaginary surfaces, approach zone and turning zones, Runway design, airport capacity, loading apron, service hanger, taxiway design, introduction to airport pavement design.

3. **Railways:** Component parts of railway track, gauges, resistances to traction and stresses in track, various resistances and their evaluation, hauling capacity and tractive effort, stresses in rail, sleepers, Coning of wheels, creep, wear, joints in rails, sleeper types, rail fittings and fixtures, ballast, Geometric Design, Track alignment, horizontal curves, super elevation, equilibrium cant and cant deficiency, transition curves, vertical curves-gradients and grade compensation, points and crossings, Design of simple turn out, various types of track junctions, Principles and classification of signals, functions and methods of interlocking.

Books:

1. Transportation Engineering : C.J. Khisty and B.K. Lall
2. Airport Planning and Design : Khanna, Arora and Jain
3. A Textbook of Railway Engineering : Saxena and Arora
4. Planning and Designing of Airport : Robers Horenjeff
5. Indian Railway Tracks : M. M. Agarwal
6. Fundamentals of Transportation Engineering : C.S Papacostas

CE-364 IRRIGATION ENGINEERING AND HYDROLOGY

L	T	P
3	1	0

1. **Hydrology**:
   Hydrological cycle
   Precipitation: Measurement, Computation of average rainfall over a basin
   Losses: Evaporation, transpiration, depression storage, infiltration, overland flow
   Runoff: Factors affecting computation, estimation of maximum rate of runoff
   Hydrograph Analysis: Unit and S-hydrograph, Unit Hydrograph from complex storms, rational method.

2. **Ground water flow:** Specific yield, storage coefficient, coefficient of permeability, confined and unconfined aquifers, aquitards, radial flow into a well under confined and unconfined condition, tube wells, pumping and recuperation tests, ground water potential.

3. **Irrigation engineering:**
   Water requirements of crops: Function of irrigation water, limiting soil water conditions, Depth and frequency of irrigation, duty and delta, irrigation efficiencies, principal crops, assessment of irrigation water.

   Irrigation methods and their efficiencies

   Canals: Canal classification, distribution system for canal irrigation, canal capacity, canal losses, alignment of canals, most efficient section, lined canals, their design, regime theory, Critical shear stress, bed load, local and suspended load transport, cost analysis of lined and unlined canals, drainage behind lining.
   Water logging: causes and control, drainage system design, salinity.

Books:

1. Design of Irrigation Structures : S.K.Sharma.
2. Irrigation and Water Power Engineering : B.C.Punmia, Pande and B.B.Lal
3. Irrigation Engineering and Hydraulic Structures : S.R.Sahasrabudhe
4. Irrigation Engineering Vol.I,II and III : K.R.Sharma
5. Irrigation Practice and Design Vol.1 to VII : K.B.Khushalni
6. The Fundamentals Principles of Irrigation and Water Power: B.B.Priyani
7. Fundamentals of Irrigation Engineering : Bharat singh
8. ISI Codes.

CE-365 **STRUCTURAL DRAWING**

L	T	P
0	0	3

1. Introduction: Building Byelaws, Orientation and Principles of planning, introduction of structural drawing.

2. Different types of bonds in walls and junctions in brick masonry, details of masonry columns, Drawings of partition walls, cavity walls.

3. Structural Drawing of RCC Structures, foundations, stair cases, retaining walls, water tanks.

4. Structural Drawing of steel structures, connections, beams, columns, trusses.

CE-362(P) ENVIRONMENTAL ENGINEERING LABORATORY

L	T	P
0	0	2

List of experiments:

1. To find the turbidity and colour of a given sample of water.
2. To determine the pH value of a given sample of water.
3. To determine the carbonate, bicarbonate, and hydroxide alkalinity of a sample.
4. To find out the concentration of chlorides in the given sample of water.
5. To estimate the hardness of the given sample of water by standard EDTA method.
6. To determine residual chlorine in a given sample of water.
7. To find out total dissolved solid, settleable solids and suspended solids of the given sample.
8. To find the quantity of dissolved oxygen (DO) present in the given sample.
9. To determine biochemical oxygen demand (BOD) exerted by the given waste water sample.
10. To find the optimum amount of coagulant required to treat the turbid water by Jar Test.
11. To find out total bacterial count present in a given sample (SPCT).
12. To determine MPN of coliforms of the given sample.

Books

1. Standard Methods for the Examination of Water and Wastewater: APHA, AWWA, WPCF
2. Chemistry for Environmental Engg and Science: C.N. Sawyer, P.L. McCarty & G.F. Parkin

7th Semester

Course No.	Subject	L	T	P/D	Hours	Credit
CE-471	Foundation Engineering	3	1	0	4	4
CE-472	Project Management and Quantity Surveying	3	1	0	4	4
CE-473	Solid Wastes and Environmental Pollution	3	1	0	4	4
CE-474	Departmental Elective-I	3	1	0	4	4
CE-476	Industrial training** Viva	0	0	0	0	2
CE-477	Major Project-1	0	0	6	6	3
CE-478	Seminar	0	0	3	3	2
	Total				**25**	**23**

LIST OF DEPARTMENTAL ELECTIVE (CE-474, CE-482, CE-483)

1. Advanced Structural Analysis.
2. Advanced Structural Design
3. Bridge Engineering
4. Traffic Engg.
5. Transportation Planning and Public Transport
6. Soil Dynamics
7. Ground Water Engg.
8. Water Power Engineering
9. Environmental Assessment and Modeling

(NB: Refer for CE-474 in the syllabus of 8th Semester)

CE-471 **FOUNDATION ENGINEERING**

L	T	P
3	1	0

1. **Stability of slopes**: Stability of finite and infinite slopes, types of failures, different factors of safety, determination of factor of safety by method of slices, swedish circle, friction circle, Bishop's method, Morgenstern-Price method, Taylor's stability number, location of critical circle, stability analysis of earth dam slopes for different conditions. Design of filters and rock toe
2. **Earth pressure**: Different types of earth pressures, states of plastic equilibrium Rankine's theory and Coulomb's theory, influence of water table, surcharge, wall friction and deformation on the earth pressure, application of Rankine's and Coulomb's theory to cohesionless and cohesive soils, Culmann's graphical method, stability considerations for retaining walls, effect or earthquakes. Design of retaining walls.
3. **Sheet plies**: Different types of sheet pile walls-free and fixed earth support, anchored bulk heads, design principles, arching in tunnels, open cut strutting and sheeting.
4. **Foundations**: Different types of loads on foundations, types of shallow and deep foundations, footing-rafts-piles-wells-selection of foundation type-dewatering of foundations-type of explorations, methods of boring, soil samples and samples.
5. **Shallow foundations**: Definition, bearing capacity, factors affecting bearing capacity, terzaghi's theory of bearing capacity, effect of foundation size and shape, Effect of ground water table, determination of bearing capacity from building codes, plate load test, penetration test, static and dynamic cone tests, Housel's approach, bearing capacity of sands and clays, settlements of foundation. Elastic settlements, consolidation settlements, differential settlements, permissible settlements, design principles of depth of foundation, spread footing, combined footing, raft foundations, principles of floating frats, foundations on non-uniform soils.
6. **Deep foundation**: Types of piles based on function, materials and methods of construction, friction and end bearing piles, static formulae-Engineering News and Hiley's formula, group action in piles, block failures, settlement of pile groups in sands and clays pile load test negative skin friction, under reamed piles.
7. **Well foundation**: Elements, forces acting on well, lateral stability analysis, problems in sinking of wells and remedial measures.
8. **Machine foundations**: model study, natural frequency of block foundation system, block foundation under vertical vibration.
9. **Reinforced earth**: Introduction, analysis and design of reinforced earth wall, reinforced earth base.

Books:

1. Analysis and Design of Foundation and Retaining Structures : S. Parkash and Gopal Ranjan
2. Soil Engineering Theory and Practice : Alam Singh
3. Soil Mechanics : B. M. Das
4. Design of Sub-structures : Swami Saran

CE-472 PROJECT MANAGEMENT AND QUANTITY SURVEYING

L	T	P
3	1	0

1. **Net work techniques and construction organisation:** An overview of planning process, planning through bar charts, mile stone charts, Definitions and difference between CPM and PERT, basic concept of network preparations, applications in construction planning scheduling and control, funds, material, layout and equipment planning using network techniques, Different types of organization, their structures, advantages and limitation.

2. **Construction plant and equipment:** Factors affecting selection of equipment, bulldozer, dumpers, trenchers, excavators, hoe , hoists, graders, piling hammers, pumps, compressors, bitumen mix plant, rollers, clam shell, aggregate production techniques, crushers, concrete production (only general features of equipments will be discussed).

3. **Estimating and analysis of rates:** Different types of estimates, deductions for openings, methods of taking out of quantities for building culverts, irrigation works, road works, canal works, sanitary and R.C.C. work, Scheduling of rates, analysis of rates, problem in analysis of rates for earth work, brick masonry, stone masonry, cement concrete, RCC work, iron work, plastering, flooring, white washing, painting, wood work.

4. **Specifications:** Object of specifications, general specifications, detailed specifications of the following: earth work in foundation, lean concrete in foundation, cement concrete, RCC, brick work, plastering, cement concrete floor, mosaic floor, white washing, distempering, painting, doors and windows, DPC, centering and shuttering, stone masonry, cement mortar, lime mortar.

5. **Accounts procedures and valuation:** Regular and work charged establishment, pay bill, ACR, classifications of works, contract, tender, tender notice, earnest money, security money, arranging contract, power of accepting tender, daily Labour, muster roll, classification of contracts, penalty, measurement book, account procedures of stores, issue rate, stock accounting, bill voucher, first and final bill, advance payment, hand receipt, refund of security money, cash book, imprest, deposit works, temporary advances, treasury challan, inventory, administrative approval, competent authority, Gross income, net income, outgoing, scrap value, salvage value, obsolescence, annuity, capitalized value, year's purchase, sinking fund, depreciation, valuation of building, determination of depreciation, method of valuation, fixation of rates, plinth area required for residential building.

Books:

1. Construction Planning equipments and methods : R.L.Peurity
2. PERT and CPM : L.S.Srinath
3. Quantity Surveying : B.N.Dutta.

CE-473 SOLID WASTES AND ENVIRONMENTAL POLLUTION

L	T	P
3	1	0

Solid waste management: Solid waste generation, onsite handling, storage and processing, collection, transfer and transport, processing techniques and equipments, recovery of resources, conversion products and energy, disposal.

Hazardous waste management: Exposure and risk assessment, environment legislation, characterization and site assessment, waste minimization, incineration, transportation, storage, landfill disposal, facility siting, site remediation.

Biomedical waste management and handling: Biomedical waste management issues, waste generation, current practices in health care facilities, environmental concerns, labeling and colour coding for waste storage, collection, transportation, treatment, common treatment facility, disposal.

Ecology and environment: Role of ecology in environmental issues, salient features of major eco-systems, energy transfer, local, regional and global impacts, ecological chain and balance, quantitative ecology in the context of environmental impact assessment of development projects.

Air pollution: Sources, emission of gases, suspended particulate mater, classification dynamics of pollutant dispersion and disposal, effects on environment including living and non-living matter, remedial measures and their effectiveness, environmental assessment, acts relating to air pollution, standards.

Noise pollution: Properties of sound waves, characterization of noise, kinetics of noise, rating systems, measurement and control standards.

Books:

1. Hazardous Waste management : M.D. LaGrega, P.L. Buckingham, J.C.Evans
2. Introduction to Environmental Engineering: M.L.Davis and D.A.Cornwell.
3. Integrated solid Waste Management, Principles and Management Issues : G. Tchobanoglous, H.Theisen, S.Vigil.
4. Manual on Municipal Solid Waste Management : CPHEEO (Ministry of Urban Development)

8th Semester

Course No.	Subject	L	T	P/D	Hours	Credit
CE-481	Design of Hydraulic Structure	3	1	0	4	4
CE-482	Departmental Elective-II	3	1	0	4	4
CE-483	Departmental Elective-III	3	1	0	4	4
CE-484	Departmental Elective-IV	3	0	0	3	3
CE-487	Major Project-II	0	0	6	6	3
	Total				**22**	**18**

Total Credit= 188

LIST OF DEPARTMENTAL ELECTIVE (CE-474, CE-482, CE-483)

1. Advanced Structural Analysis.
2. Advanced Structural Design
3. Bridge Engineering
4. Traffic Engg.
5. Transportation Planning and Public Transport
6. Soil Dynamics
7. Ground Water Engg.
8. Water Power Engineering
9. Environmental Assessment and Modeling

LIST OF DEPARTMENTAL ELECTIVE (CE-484)

1. Rock Mechanics.
2. Environmental Geotechnology.
3. Ground Improvement Techniques.
4. Advanced Surveying.
5. Remote Sensing and GIS

CE-481 DESIGN OF HYDRAULIC STRUCTURES

L	T	P
3	1	0

1. **Canal head works:** Introduction, layout, selection of site for diversion head work, various components and their functions, design of weirs and barrages on permeable foundation, Bligh's creep theory, Khosla's method of independent variables, use of Khowsla's charts, silt ejectors and their design principles.

2. **Canal falls:** Necessity and location of canal falls, types, design of Sarda and Glacis falls, energy dissipation devices and arrangement.

3. **Canal regulation works:** Canal head regulators and cross regulators, their functions and design concepts.

4. **Cross drainage works:** Introduction, types of cross drainage works and their selection, design aspects of aqueducts, siphon aqueducts, supper passages, canal siphon and level crossings.

5. **Storage works:** Investigation and planning for reservoirs, capacity and yield, storage works, types of dams and their choice, selection of suitable site.
   Gravity dams: Boreet in time, two dimensional design, stability criteria and foundation treatment.
   Earth dams: Design aspects of earth dams, simple design, seepage through earth dams, control seepage, design of filters.
   Arch dams: Constant angle and constant center arch dams (simple design and sketch), buttress and multiple arch dams (principle and sketch).

6. **Spillway and stilling basins:** Introduction, spillway capacity, different types, energy dissipation below spillways, stilling basins: type-I and II, gates and valves aerators.

Books:

1. Fundamentals of Irrigation : Bharat Singh
2. Irrigation Engineering and Hydraulics Structures : S.R.Sahasrabudhe
3. Theory and Design of Irrigation Structures Vol.I and II : R.S.Varshney

CE- **ADVANCED STRUCTURAL ANALYSIS**

L	T	P
3	1	0

1. **Introduction:** Stiffness, flexibility, flexibility and stiffness matrices.

2. **Matrix Methods in skeletal structural analysis:** force and displacement methods, analysis of beams, frames and trusses including analysis using substructures.

3. **Approximate Methods for Structural Analysis:** Cantilever and portal methods-two cycle moment distribution

4. **Theory of Plates and Shells:** Analysis of plates, folded plates and singly curved shells: conventional and approximate methods.

CE- **ADVANCED STRUCTURAL DESIGN**

L	T	P
3	1	0

1. **Wind, Snow, Pounding, Seismic, Bridge Loading**

2. **Light and Industrial Building Design**: Industrial Buildings with Cranes, Loading Conditions and Comb, general Building Systems, Roof Systems, Framing Systems, Bracing Systems.

3. **Plate Girder Design**: Introduction to Plate Girders, design of web plate, flanges, curtailment of flange plates, design of web stiffeners, web splices and flange splices, welded plate girder.

4. **Prestressed Concrete Design**: Basic Concepts of Prestressing, Calculation of Stresses in Prestressed Beams, Partial Loss of Prestress, Flexural Design of Prestressed Beams, Flexural Strength Design for Shear.

5. **Yield line theory**: Introduction to Yield line theory for reinforced concrete slabs, Yield line solutions based on work equations.

6. **Timber design**: Timber as a structural material, Material properties, Rigid-joined frames design under combined axial and flexural loads, General concept of glued laminated timber, General rules for designing of glued laminated structures, Design of bolted joints in timber structures.

Books :

1. Reinforced Concrete : E.G. Nawy
2. Steel Structures : V.N. Vazirani and M.M. Ratwani
3. Prestressed concrete : Krishna raju
4. Reinforced Concrete Design : R.N. Krishna and R.N. Pranesh

CE- **BRIDGE ENGINEERING**

L	T	P
3	1	0

1. **Introduction**: Definitions, components of a bridge, classification, importance and standard specifications.

2. **Investigation for bridge**: Site selection, data drawing, design discharge linear water way, economical span, location of piers and abutments, vertical clearance above HFL, scour depth. Traffic projection, investigation report choice of bridge type.

3. **Standard specification for Road Bridge**: IRC bridge code, determination of dead loads and live loads, wind loads, longitudinal forces, centrifugal forces, horizontal forces due to water current buoyancy effect, earth pressure, temperature effect, deformation stresses, Secondary stresses, erection stresses, seismic forces.

4. **Culverts**: Design of slab culvert and box culvert.

5. **Design of T-beam reinforced concrete bridges**.

6. **Design of pre-stressed concrete bridges**.

7. **Design of sub structure:** Design of piers and masonry abutments.

Books:

1. Essentials of bridge engineering : D.Jhonson Victor
2. Design of concrete bridge : Aswani, Vaziani, Ratwani
3. Concrete bridges : V.K.Raina
4. Bridge Engineering : Ponnuswamy

CE-- **TRAFFIC ENGINEERING**

L	T	P
3	1	0

1. **Properties of traffic engineering elements:** Introduction to Traffic Engineering, Vehicle Characteristics, Human factors and driver Characteristics, Road Characteristics.

2. **Traffic engineering studies and analysis:** Introduction to traffic studies, Traffic volume studies, speed studies, origin and destination studies. Travel time and delay studies, parking studies, accident studies.

3. **Traffic flow characteristics:** Nature of Traffic flow, Approaches to understand Traffic Flow, Parameters connected with Traffic flow, Categories of Traffic flow, Uninterrupted traffic flow model. Analysis of speed, flow and density relationship, Empirical studies of traffic stream Characteristics

4. **Fundamentals of interrupted traffic flow:** Shock waves, Traffic flow at signalized intersections, Traffic flow at unsignalized intersections.

5. **Intersection control and design:** Introduction, Types of intersections, Design considerations, Traffic control devices, Conflict areas at intersections, Types of Intersection controls, Traffic signals, warrants for interchanges, Design of interchanges.

6. **Highway capacity:** Introduction, Highway capacity, Level of service, basic freeway capacity studies, Multilane, Highway capacity, two lane Highway capacities.

Books:

1. Traffic Flow fundamentals: : Adolf D.May
2. Traffic Engineering : Mcshane and Roess
3. Traffic Engineering and Transport Planning : L.R. Kadyali
4. Principles of Transportation Engineering : Patha Chakraborty and Animesh Das

CE-- **TRANSPORTATION PLANNING AND PUBLIC TRANSPORT**

L	T	P
3	1	0

1. **Transportation planning process:** Introduction, Elements of Transportation Planning, Definition goals and objectives, Identification of needs, Generation of Alternatives, Evaluation of alternatives, Implementation of alternatives.

2. **Land use and transportation system:** Urban system components, Concept and definitions, criteria for measuring and comparing urban structure, land use and transportation.

3. **Transport demand analysis:** Nature and analysis of Transportation demand, Sequential demand analysis, Trip-generation models, Trip-distribution models, Models split analysis, Traffic assignment models.

4. **Public transportation:** Historical development of urban transportation, Mass Transit Definitions and classification, Route development, stop location and stopping policy, Schedule development.

5. **Transportation economics:** Scope of transportation economics, Transportation demand, demand, supply and equilibrium, Sensitivity of travel demand, Factors affecting elasticities, elements of engineering economics.

Books:

1. Transportation Engineering : C. Jotin Khisty and B. Kent Lall
2. Principles of Transportation Engineering : P. Chakraborty and A. Das
3. Fundamentals of Transportation Engineering: : C.S. Papacoastas
4. Traffic Engineering and Transport Planning: : L.R. Kadyali

CE- **SOIL DYNAMICS**

L	T	P
3	1	0

1. **Introduction and fundamentals of vibration**: Soil mechanics and soil dynamics, Nature of dynamic loads, Stress conditions on soil elements under earthquake loading, Problems of dynamic loading of soil and soil structures. Earthquakes causes, origin, classification and effects.

2. **Theory of vibrations**: Undamped and damped vibrations, Forced vibrations with harmonic excitation, System under transient vibrations, Rayleigh's method, Logarithmic decrement, Determination of viscous damping, Transmissibility, Principles of vibration measuring instruments, Systems with two degree of freedom (vibration absorber), Systems with multi degree of freedom, Spectral response.

3. **Wave propagation in an elastic medium**: Wave propagation in an elastic rod, Wave propagation in an elastic infinite medium, Wave propagation in a semi-infinite elastic half space, Waves generated by a surface footing.

4. **Stress-strain characteristics of soil under dynamic loads:** Introduction to dynamic tests, Pendulum loading apparatus, Behaviour of saturated sands under transit loading, Effects of static stress level and number of pulses on strength of cohesive solids, Oscillatory simple shear, Resonant column apparatus, Wave propagation methods, Block resonance test, Cyclic plate load test.

5. **Dynamic earth pressure:** Behaviour of retaining walls during earthquakes, Modification on Coulomb's theory Modified Culmann's construction, Analytical solution of c-Φ soils, displacement analysis, Indian standard code of practice.

6. **Dynamic bearing capacity:** Earthquake load on footing, Effect of horizontal load and moment, Provision of relevant standards, Dynamic analysis for vertical and horizontal loads.

7. **Liquefactions of soil:** Theory and criterion of liquefaction, Factors affecting liquefaction characteristics, Liquefaction studies in triaxial shear and oscillatory simple shear, Evaluation of liquefaction potential, Liquefaction analysis from standard penetration test data, Introduction to shake table and field test.

8. **Machine foundations**: Degrees of freedom of a machine foundation, Vertical sliding, Rocking, Yawing vibrations of a block, Simultaneous rocking sliding and vertical vibrations of a block, India standards for design of foundations for reciprocating machines and impact type of machines.

Books:

1. Soil Dynamics : Shamsher Parkash
2. Dynamics of bases and foundations : D.D.Barken
3. Soil Dynamics and Machine Foundations : Swami Saran.

CE- **GROUND WATER ENGINEERING**

L	T	P
3	1	0

1. **Ground water occurrence and quality**: introduction to ground water, water bearing formations, aquifers, aquicludes and aquitards, confined and unconfined and leaky aquifers, ground water origin, modes of occurrence, yield of water and water quality.

2. **Ground water movement**: Permeability, states of flow, Darcy's laboratory permeability tests, formation constants, flow through aquifers, storage equations and differential equations governing ground water flow.

3. **Ground water exploration**: Exploration by geologic and hydraulic methods, surface geophysical methods, map and tracer techniques.

4. **Well hydraulics**: Definition of terms, governing flow, equilibrium and non-equilibrium well equations, effect of hydro-geologic conditions on draw down, draw down from pumping tests, well interference and well efficiency, radius of influence, recharge and boundary conditions, effect of partial penetration, thesis equation.

5. **Well drilling**: Cable tool method, California stove-pipe method, direct rotary, drilling, drilling fluids, air and jet drilling, drilling with earth augers, grouting and sealing of well casing.

6. **Design of well**: Casing diameter, casing material, well depth, well screens length, slot opening and diameter, open area, entrance velocity, design of wells.

7. **Development of water wells**: Introduction, factors affecting development, method of development over pumping, back washing, mechanical surging, other method of well development.

Books :

1. Ground water and well : F.G. Driscoll
2. Ground water Engineering : K.R. Karanth
3. Ground water Hydrology : Todd
4. Manual of ground water and tube-wells technical report : H.D. Sharma and A.S. Chawla

CE- **WATER POWER ENGINEERING**

L	T	P
3	1	0

1. **Introduction**: Principal Components of hydro-electric scheme, water requirement, concept of firm power and secondary power, plant capacity.

2. **Types hydro electric plants**: Classification of hydro-power plants. Storage, Run off of the river and pumped storage plants, classification based on operating head, base load and peak load plants.

3. **Pondage and storage**: Need for pondage and storage, requirements of storage, economic analysis of storage capacity, aspects of cost allocation for different purposes, reservoir operation using flow duration and mass curves considerations for flood routing.

4. **Intake**: Types of intake, design of trench weir.

5. **Desilting**: Introduction, types of desilting basins, Principal of desilting, Design of Desilting basins.

6. **Water conductor system**: Intake structures, desilting tanks, conveyance channels and tunnels, surge tanks, surge shafts or fore bays, pressure shafts, penstocks, power house and tail race channels, different types of three structures and their brief design aspects.

7. **Hydraulics prime movers**: Conveyance channels and tunnels, surge tanks, surge shafts or fore bays, Pressure shafts, penstocks, designs of water conveyance systems and penstocks.

8. **Power house**: Types of power houses, various components and power planning.

9. **Economics of hydro power installation**: Engineering feasibility, political consideration, economic feasibility, analysis of cost, cost of power, operation of a power plant system, cost of hydro power.

10. **Project report**: General report, design report, cost and estimate report.

Books :

1. Hydro-electrical Engineering : Creager and Justin
2. Water Power Engineering : Barrows
3. Water Power Development (Vol.-I and II) : Mosony L. Emil

CE— **ENVIRONMENTAL ASSESSMENT AND MODELING**

L	T	P
3	1	0

1. **Environmental assessment:** Evolution of environmental impact assessment (EIA), EIA at project, regional and policy level; strategic EIA, EIA process, screening and scoping criteria, rapid and comprehensive EIA, specialized areas like environmental health impact assessment, environmental risk analysis, economic valuation methods, cost benefit analysis, expert system and GIS applications, uncertainties.

2. **Environmental policies and legislation:** Legislative and environmental clearance procedures in India and other countries, sitting criteria, public participation, resettlement and rehabilitation

3. **Methodologies:** Practical applications of EIA, EIA methodologies, baseline data collection, prediction and assessment of impacts on physical, biological and socio-economic environment, environmental management plan, post project monitoring, EIA report and EIS, review process.

4. **Environmental systems Modelling:** Principles of modelling, classification; introduction to air quality models, meteorology, atmospheric stability and turbulence, Gaussian plume model and modification, numerical models, Transport and fate of pollutant in aquatic system, introduction to river, estuarine and lake hydrodynamics, stratification and eutrophication of lakes, dissolved oxygen model for streams, temperature models.

Books:

1. Environmental Impact Assessment for Developing Countries: Asit K. Biswas
2. Environmental Impact Analysis Handbook : G.J. Rau and C.D. Wooten
3. Environmental Impact Assessment : L. Canter
4. Air Pollution : J.H. Seinfield
5. Principles of Surface Water Quality Modelling and Control : R.V. Thomann and J. A. Muller

CE- **ROCK MECHANICS**

L	T	P
3	0	0

1. **Introduction**: Rock Mechanics and its relationship with soil mechanics and engineering geology, application of rock mechanics to civil engineering problems.

2. **Classification of rocks**: Lithological classification, engineering classification of rocks, classification based on wave velocity ratio, R.Q.D. Classification of rock masses i.e. RMR and Q systems.

3. **Rock properties**: Laboratory test, compression, tensile, void index, permeability and shear, effects of size of specimen, rate of testing, confining pressure etc. Stress strain curves of typical rocks, strength of intact and fissured rocks, effects of anisotropy, saturation and temperature effects, shear strength of jointed rock mass.

4. **Field test**: Uniaxial tests in tunnels and open excavations, shear test, pressures tunnel tests etc.

5. **Stability of rock slopes**: Mode of failure of rock slopes, plane wedge analysis, 3D-wedge analysis circular mode of failure, back analysis of slopes, stability charts, types and design of rock bolts.

6. **Determination of in situ stresses**: Stresses in rock, methods of determining in situ stresses i.e hydraulic fracturing, flat jack test and over coring.

7. **Design of tunnels**: Rock pressure theories, ground reaction curve, rock support interaction analysis empirical and semi empirical methods of analysis, simple method of tunnel, design, types and design of tunnel lining.

8. **Foundation of rocks**: Stress distribution in foundation, methods of determination of bearing capacity of rocks, improvement of rock properties, pressure grouting for tunnels and dams, dental concreting, shear zone treatment.

Books:

1. Rock Mechanics in Engineering Practice : K.G. Stagg
2. Under ground excavation in rock : Hoek and Brown
3. Rock Mechanics in Engineering Practice : Cambridge University
4. Introduction to Rock Mechanics : R.E. Goodman

CE- **ENVIRONMENTAL GEOTECHNOLOGY**

L	T	P
3	0	0

1. **Introduction and waste characterisation:** Waste generation and disposal on land, sources of solid waste, waste quantities, characteristics of solid waste, management of solid waste, impact on environment. Liquid waste characterization, solid waster characterization, Geotechnical properties of solid waste, hazardous waste characterization.

2. **Ground water contamination processes beneath landfill**: Sources of ground water contamination, Transport Mechanisms, Flow through soil beneath landfills, Transport process in soil beneath landfills, Plume beneath Landfills.

3. **Land fill planning and design consideration:** Introduction, types of landfills, site selection for landfills, site characterization, landfill layout, landfill section, landfill capacity, planning of phased operation, leachate collection facility, gas collection facility, final cover, surface water drainage, stability aspects, environmental monitoring systems, construction schedule, material requirement, equipment requirement, environmental control during operation, landfill closure and post closure plan.

4. **Landfill liners compacted clays and amended soils:** Hydraulic conductivity of compacted soils, Factors affecting hydraulic conductivity, Compacted soil liners, liner material, hierarchy of options, compacted clay liners, amended soil liners, liner requirements and specifications, construction aspects of compacted clay liner and amended soil liner.

5. **Geosynthetics in environmental geotechnology:** Introduction, types of geosynthetics, functions of geosynthetics, physical properties and their determination, role of geosynthetics in environmental geotechnology, lining system, basal lining system, side lining system, drainage blanket, surface lining, use of geosynthetics in abandoned landfills. jute and coir production, status of jute and coir industry in India, physical and chemical characterization, jute and coir geotextiles, durability of jute and coir geotextiles, test procedures, role of vegetation, erosion control products and their classification, erosion process, surface erosion control techniques, installation guide lines for slopes.

6. **Mine tailings and ash pond:** Introduction, fly ash, chemical composition, need for disposing of fly ash, Geotechnical properties of Indian fly ashes, methods of disposal of fly ash, utilization of fly ash, management strategy, introduction to mine tailings impoundments and ash ponds.

Books:

1. Waste disposal in engineered landfills : Manoj Dutta
2. Geotextiles- Emerging Trends : G.Venkatappa Rao and K. Balan

CE- **GROUND IMPROVEMENT TECHNIQUES**

L	T	P
3	0	0

1. **Compaction**: Principles of compaction, Engineering behaviour of compacted clays, field compaction techniques static vibratory, impact, Earth moving machinery, Compaction control, application to granular soils, cohesive soils, depth of improvement, environmental considerations, induced settlements, compaction using vibratory probes, vibro techniques, vibro equipment, vibro compaction and replacement process, vibro systems and liquefaction, soil improvement by thermal treatment, preloading techniques, surface compaction, introduction to bio technical stabilization, dewatering systems.

2. **Grouting**: Chemical grouting, commonly used chemicals, grouting systems, grouting operations, applications, compaction grouting, application and limitations, plant for preparing grouting materials, jet grouting, jet grouting process, geometry and properties of treated soils and applications.

3. **Stabilization**: Introduction to soil improvement by adding materials, lime, flyash, cement and other chemicals and bitumen, sand column, stone column, sand drains, prefabricated drains, electro-osmosis, lime column, soil-lime column, stabilization of soft clay or silt with lime, bearing capacity of lime treated soils, settlement of lime treated soils, improvement in slope stability, control methods.

4. **Soil reinforcement**: Soil improvement using reinforcing elements, introduction to reinforced earth, load transfer mechanism and strength development, soil types and reinforced earth, anchored earth nailing, reticulated micro piles, soil dowels, soil anchors, reinforced earth retaining walls.

5. **Geosynthetics:** Polymer type geotextiles, woven geotextiles, non woven geotextiles, geo grids, physical and strength properties, behaviour of soils on reinforcing with geotextiles, effect on strength, bearing capacity, design aspects for slopes, clay embankments, retaining walls and pavements.

Books:

1. Text Book on Ground Improvement : Blackie Moseley
2. Text Book on Grouting in engineering Practice : R.Boweven
3. Text Book on Soil Reinforcement with Geotextiles, : R.A.Jewell
4. Text Bok on Soil Improvement Technique and their Evolution : W.E. Van Impe
5. Text Book on Bio Technical and Soil Engineering and Slope Stabilization : D. H. Gray & R. B. Sotir
6. Text Book on Engineering With Geosynthetics, : G.V. Rao and G.V.S.Rao
7. Construction and Geotechnical Methods in Foundation Korener

CE- **ADVANCED SURVEYING**

L	T	P
3	0	0

1. **Triangulation:** Classification of triangulation system, operation in triangulation survey, reconnaissance, selection of site for base line, its measurement and extension, correction to base line measurement, selection of stations, triangulation figures, scaffolds and signals, marking of stations, inter-visibility, strength of figures, reduction to centre, derivation of relations when observations are taken from the satellite station and towards the station.

2. **Trigonometric Levelling**: Introduction, determination of the level of the top of an object when its base is accessible and not accessible, determination of height of object when two instrument stations are not in the same vertical plane, indirect levelling on a rough terrain, indirect levelling on a slopes, effect of refraction and curvature, axis signal correction, signal correction, difference in elevation in single observation, difference in elevations by reciprocal observation.

3. **Theory of Errors**: Definitions, law of weight, probable errors, most probable value, normal equations, method of least square, triangle station adjustment, figure adjustment, quadrilateral and polygon adjustment of closed traverse and level nets.

4. **Photogrammetry**: Basic concepts, type of photographs, geometry of aerial photographs, measurement of parallax and height determination.

5. **Astronomy**: Solution of an astronomical triangle, co-ordinate systems time solar, sidereal and standard equation of time, conversion of time, sun dial, determination of time, azimuth, latitude and longitude, correction for astronomical observations.

6. **Introduction to Remote Sensing**

Books :

1. Surveying Volume-I : K.R. Arora
2. Surveying Volume I, II and III : B.C. Punmia
3. Advance Surveying : R. Agor

CE-- REMOTE SENSING AND GEOGRAPHICAL INFORMATION SYSTEM

L	T	P
3	0	0

1. **Introduction:** Introduction to Remote Sensing, data acquisition and processing, sensor systems, applications, Electromagnetic Radiation (EMR) and its characteristics, Radiation principles, Planck"s Law, Stefan's Law, Wein's Displacement law, Kirchoff's Law, prosperities of solar radiant energy, atmospheric windows.

2. **Physical basis of remote sensing**: Interaction in the atmosphere, nature of atmospheric interaction, atmospheric effects of visible, near infra-red thermal and microwave wavelengths, interaction at ground surface, interaction with soils and rocks, effects of soil moisture, organic matter, particles, size and texture, interaction with vegetation, spectral characteristics of individual leaf, vegetation canopies, effect of leaf pigments, cell structure, radiation geometry.

3. **Platform and sensors:** Multi concept in remote sensing, general requirements of a platform, balloon aircraft, satellite platforms sun-synchronous orbits, sensors for visible and near infra-red wavelengths, profilers, images, scanners, radiometers, optical mechanical and push button scanners, spectral, spatial, radiometric and temporal resolution, IFOV, FOV, geometric characteristics of scanners, V/H ratio, comparison of some satellite/ aerial platforms and sensors and remote sensing data products, land sat MSS and TM, SPOT, IRS, ERS etc.

4. **Geographical Concepts and Terminology:** Difference between image processing system and geographical system (GIS), utility of GIS, various GIS packages and their salient features, essential components of a GIS, scanners and digitisers, raster and vector data, data storage, hierarchical data, network systems, relational database, data management, conventional database management systems, spatial database management, data manipulation and analysis, reclassification and aggregation, geometric and spatial operation on data management and statistical modeling, applications of GIS in various natural resources and engineering applications.

Books:

1. Remote Sensing and Image Interpretation : T.M. Lillensand and R.W. Keifer
2. Principles of Remote Sensing : P.J. Curren
3. Principles of Geographical Information systems for land Resources Assessment : P.A. Baurrough
4. Manual of Remote Sensing, Vol.2 : American Society of Photogrammetry and Remote Sensing
5. Geographical Information systems- A Management Perspective : Stan Aromoff