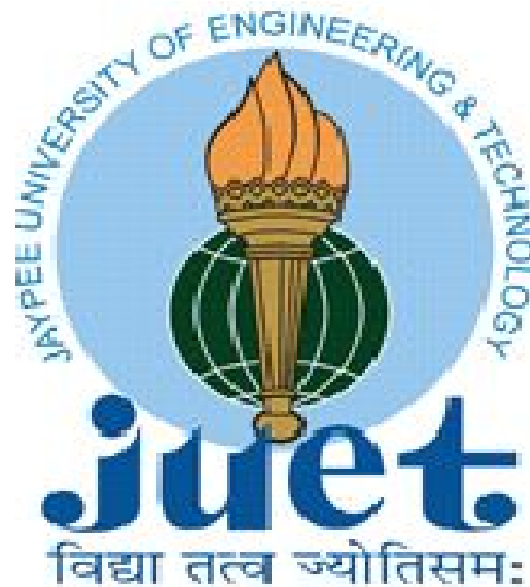


SYLLABI

B.Tech

IN

CIVIL ENGINEERING



2016

Department of Civil Engineering
JAYPEE UNIVERSITY OF ENGINEERING & TECHNOLOGY
A-B ROAD, RAGHOGARH, DT. GUNA-473226 MP, INDIA

TEACHING SCHEME
Bachelor of Technology (B.Tech.)
Branch – CE

Year/Sem: Ist Year/IstSem

SN	Subject Code	Subject	Core/ Elective	L	T	P	Credits
1	14B11HS111	Presentation and Communication Skills	Core	3	0	0	3
2	14B19HS199	English - Audit Course	Core	-	-	-	0
3	14B11MA111	Mathematics-I	Core	3	1	0	4
4	14B11PH111	Physics-I	Core	3	1	0	4
5	14B11EC111	Electrical Circuit Analysis	Core	3	1	0	4
6	14B11CI 111	Introduction to Computers and Programming	Core	3	1	0	4
7	14B17PH171	Physics Lab-I	Core	0	0	2	1
8	14B17EC171	Electrical Circuits Lab	Core	0	0	2	1
9	14B17CI171	Computer Programming Lab	Core	0	0	4	2
Total			Sub Total				23

Year/Sem: Ist Year/IIIndSem

SN	Subject Code	Subject	Core/ Elective	L	T	P	Credits
1	14B11HS211	Group and Cooperative Processes	Core	3	0	0	3
2	14B11MA211	Mathematics - II	Core	3	1	0	4
3	14B11CL212	Chemistry	Core	3	1	0	4
4	14B11CE211	Building Materials & Construction	Core	3	0	0	3
5	14B11CE212	Engineering Mechanics	Core	3	1	0	4
6	14B11CE314	Engineering Geology	Core	3	0	0	3
7	14B17CE271	Workshop Practices (Lab)	Core	0	0	2	1
8	16B17CE272	Engineering Mechanics Lab	Core	0	0	2	1
9	14B17CL272	Chemistry Lab	Core	0	0	2	1
Total			Sub Total				24

Year/Sem: IIInd Year/IIIrdSem

SN	Subject Code	Subject	Core/ Elective	L	T	P	Credits
1	14B11HS311	Managerial Economics	Core	3	0	0	3
2	14B11CE311	Mechanics of Solids	Core	3	1	0	4
3	14B11MA312	Numerical Methods	Core	3	1	0	4
4	14B11CE312	Fluid Mechanics	Core	3	1	0	4
5	14B11CE313	Concrete Technology	Core	3	0	0	3

6	14B11GE211	Environmental Studies	Core	3	0	0	3
7	14B17CE371	Engineering Graphics & CAD Lab	Core	0	0	4	2
8	14B17CE372	Fluid Mechanics Lab	Core	0	0	2	1
9	14B17CE373	Concrete Technology Lab	Core	0	0	2	1
10	16B17CE374	Strength of Material Lab	Core	0	0	2	1
		Total	Sub Total				26

Year/Sem: IInd Year/IVthSem

SN	Subject Code	Subject	Core/ Elective	L	T	P	Credits
1	14B11HS411	Financial Management	Core	3	0	0	3
2	14B11CE411	Water Supply Engineering	Core	3	1	0	4
3	14B11CE412	Surveying	Core	3	1	0	4
4	14B11CE413	Geotechnical Engineering	Core	3	1	0	4
5	14B11CE414	Water Resource Engineering	Core	3	1	0	4
6	14B11CE415	Structural Analysis	Core	3	1	0	4
7	16B17CE471	Environmental Engineering Lab	Core	0	0	2	1
8	14B17CE472	Surveying Lab	Core	0	0	4	2
9	14B17CE473	Geotechnical Engineering Lab	Core	0	0	2	1
		Total	Sub Total				27

Year/Sem: IIIrd Year/VthSem

SN	Subject Code	Subject	Core/ Elective	L	T	P	Credits
1		HSS Elective	Elective	3	0	0	3
	14B14HS541	Social & Legal Issues					
	14B14HS542	Human Psychology					
	14B14HS543	Professional Ethics					
	14B14HS544	Macro Economics					
2	14B11CE511	Sewage Treatment & Disposal	Core	3	1	0	4
3	14B11CE512	Highway Engineering	Core	3	1	0	4
4	14B11CE513	Design of Concrete Structures	Core	3	1	0	4
5	14B11CE514	Advanced Structural Analysis	Core	3	1	0	4
6	14B17CE572	Highway Engineering Lab	Core	0	0	2	1
7	14B17CE573	Building Drawing Lab	Core	0	0	2	1
8	14B19CE591	Seminar	Core	0	0	2	1
9		Department Elective - 1	Elective	3	0	0	3
		Total	Sub Total				25

List of Electives for DE-1			Core/ Elective	L	T	P	Credits
	14B14CE541	Open Channel Hydraulics	Elective	3	0	0	3
	14B14CE542	Advanced Construction Materials	Elective	3	0	0	3
	14B14CE543	Advanced Surveying	Elective	3	0	0	3
	14B14CE544	Geosynthetic And Reinforced Soil	Elective	3	0	0	3

Year/Sem: IIIrd Year/VIthSem

SN	Subject Code	Subject	Core/ Elective	L	T	P	Credits
1		HSS Elective	Elective	3	0	0	3
	14B14HS641	Project Management					
	14B14HS642	Business Environment					
	14B14HS643	Fundamentals of Financial Market					
	14B14HS644	Marketing Management					
2	14B11CE611	Foundation Engineering	Core	3	1	0	4
3	14B11CE612	Design of Steel Structure	Core	3	1	0	4
4	14B11CE613	Transportation Engineering	Core	3	1	0	4
5	14B11CE614	Estimation and Costing	Core	3	1	0	4
6	14B17CE671	Foundation Engineering Lab	Core	0	0	2	1
7	14B17CE672	Civil Engineering Software Lab	Core	0	0	2	1
8		Department Elective - 2	Elective	3	0	0	3
		Total		Sub Total			24

After completion of 6th Semester, Industrial Training of Six Weeks is Compulsory for All Students.

List of Electives for DE-2			Core/ Elective	L	T	P	Credits
1	14B14CE641	Environmental Legislation & Auditing	Elective	3	0	0	3
2	14B14CE642	Disaster Management And Mitigation	Elective	3	0	0	3
3	14B14CE643	Selected Concrete Structures	Elective	3	0	0	3
4	14B14CE644	Traffic Engineering	Elective	3	0	0	3

Year/Sem: IVth Year/VIIthSem

SN	Subject Code	Subject	Core/ Elective	L	T	P	Credits
1		HSS Elective	Elective	3	0	0	3
	14B14HS743	Entrepreneurship and Small Business					
	14B14HS744	Marketing Management					
	14B14HS745	Human Resource Management					

	14B14HS746	Total Quality Management					
2		Department Elective – 3	Elective	3	0	0	3
3		Department Elective – 4	Elective	3	0	0	3
4		Outside Department Elective – 5	Elective	3	0	0	3
5		Construction Technology & Management	Core	3	1	0	4
6		Project Part-I	Core	0	0	14	7
		Total	Sub Total				23

List of Electives for DE-3			Core/ Elective	L	T	P	Credits
1	14B14CE741	Ground Improvement Technique	Elective	3	0	0	3
2	14B14CE742	Risk And Reliability In Geotechnical Engineering	Elective	3	0	0	3
3	14B14CE743	Soil Dynamics And Machine Foundations	Elective	3	0	0	3
4	14B14CE744	Rock Mechanics	Elective	3	0	0	3
5	14B14CE745	Underground Technology	Elective	3	0	0	3
6	14B14CE746	Advanced Foundation Engineering	Elective	3	0	0	3

List of Electives for DE-4			Core/ Elective	L	T	P	Credits
1	14B14CE747	Metal Structures	Elective	3	0	0	3
2	14B14CE748	Pre-Stressed Concrete Structures	Elective	3	0	0	3
3	14B14CE749	Earthquake Engineering	Elective	3	0	0	3
4	14B14CE750	Bridge Engineering	Elective	3	0	0	3
5	14B14CE751	Fem And Its Applications To Civil Engineering	Elective	3	0	0	3
6	14B14CE752	Advanced Concrete Technology	Elective	3	0	0	3

List of outside department Electives for DE-5			Core/ Elective	L	T	P	Credits
1	14B14PH731	Nanotechnology And its Application (Physics)	Elective	3	0	0	3
2	14B14MA733	Optimization Techniques(Mathematics)	Elective	3	0	0	3
3	14B14CL844	Introduction To Computational Fluid Dynamics(CHE)	Elective	3	0	0	3
4	14B14CI853	Artificial Neural Network(CSE)					
5	14B14WE753	Wind Resistant Design of Structures (WEAC)	Elective	3	0	0	3

Year/Sem: IVth Year/VIIIthSem

SN	Subject Code	Subject	Core/ Elective	L	T	P	Credits	
1		HSS Elective	Elective	3	0	0	3	
	14B14HS841	Knowledge Management						
	14B14HS842	Industrial Psychology						
	14B14HS843	Supply Chain Management						
	14B14HS844	Management of Technology						
	14B14HS845	Strategic Management						
2		Department Elective – 6	Elective	3	0	0	3	
3		Department Elective – 7	Elective	3	0	0	3	
4		Department Elective – 8	Elective	3	0	0	3	
5		Department Elective – 9	Elective	3	0	0	3	
6		Project Part-II	Core	0	0	16	8	
			Sub Total					23
			TOTAL					195

List of Electives for DE-6			Core/ Elective	L	T	P	Credits
1	14B14CE841	Hydro-Power Engineering	Elective	3	0	0	3
2	14B14CE842	Dams And Reservoir Design	Elective	3	0	0	3
3	14B14CE843	River Engineering	Elective	3	0	0	3
4	14B14CE844	Design Of Hydraulic Structures	Elective	3	0	0	3

List of Electives for DE-7			Core/ Elective	L	T	P	Credits
1	14B14CE845	Advanced Pavement Design	Elective	3	0	0	3
2	14B14CE846	Airport Engineering	Elective	3	0	0	3
3	14B14CE847	Urban Transportation, Planning & Design	Elective	3	0	0	3
4	14B14CE848	Highway Construction, Maintenance & Management	Elective	3	0	0	3
5	14B14CE849	Docks And Harbor Engineering	Elective	3	0	0	3

List of Electives for DE-8			Core/ Elective	L	T	P	Credits
1	14B14CE850	Environmental Management & Impact Assessment	Elective	3	0	0	3
2	14B14CE851	Geoenvironmental Engineering	Elective	3	0	0	3

3	14B14CE852	Energy Resources & Conservation	Elective	3	0	0	3
4	14B14CE853	Industrial Waste Treatment	Elective	3	0	0	3
5	14B14CE854	Design Of Water And Wastewater Treatment Plants	Elective	3	0	0	3

List of Electives for DE-9			Core/ Elective	L	T	P	Credits
1	14B14CE855	Remote Sensing & Gis Applications	Elective	3	0	0	3
2	14B14CE856	Sustainable Design & Construction	Elective	3	0	0	3
3	14B14CE857	Repair, Retrofitting & Rehabilitation Of Structures	Elective	3	0	0	3
4	14B14CE858	Forensic Geotechnical Engineering	Elective	3	0	0	3

SYLLABI
Bachelor of Technology (B.Tech.)
Branch - CE

Year/Sem: Ist Year/I Sem

14B11HSS111 Presentation and Communications Skills

Introduction to Communication, Oral Communication skills: Stress, Rhythm, Intonation, Coherence, Phonetics etc., Listening Skills, Reading Skills: Intensive and Extensive Reading, SQ3R, Vocabulary and morphology, Writing Skills: Letter Writing, Circulars, Notices, Agenda, Minutes, Report Writing, Power point presentation.

14B19HS199 English-audit course

Conversational Skills, Vocabulary and comprehension, Functional English Grammar: Noun, Pronoun, Verb, Tenses, Narration, Active and Passive voices, Clause etc., Compositions and Translations.

14B11MA111 Mathematics-I

Partial differentiation, Taylor's series, Maxima and Minima, Jacobians, Double integrals Equations to a line, plane, curve and surfaces, Line and surface integrals, Gradient, divergence and curl, Normal and tangent to a surface, Gauss and Stokes theorems, Differential Equations with constants coefficients, Laplace transforms, Algebra of matrices, Determinants, Gauss elimination method, Rank, Eigen values and vectors, Quadratic forms.

14B11PH111 Physics-I

Physical Optics: Analytical treatment of interference, Intensity distribution of fringe system, Fresnel's biprism, Newton's rings, Diffraction (limited to Fraunhofer class) from Single slit, double slit and Diffraction grating, Polarization, Phenomenological understanding of Birefringence, Principles of use of uniaxial crystals in practical polarizers, compensators and wave plates, Production and analysis of completely polarized light. Optical activity. Relativity: Michelson-Morley experiment, Lorentz transformations, Addition of velocities, Mass variation with velocity, Mass-energy relation.

Radiation: Black body radiation, Wein's law, Rayleigh Jean's law, Planck's law of radiation, Compton scattering.

Atomic Structure: Origin of spectral lines, spin and orbital angular momentum, Quantum numbers, Atoms in magnetic field, Zeeman Effect. Statistical Distributions: Maxwell-Boltzmann, Bose-Einstein and Fermi-Dirac distributions and their applications. Lasers: Principle and working of laser, Different types of lasers (He-Ne Laser, Ruby Laser, Semiconductor Laser), Holography.

14B11EC111 Electrical Circuit Analysis

Introduction to circuit elements R, L, C and their characteristics, Different types of sources (like AC and DC, current and voltage, dependent and independent), KCL and KVL, Node and Loop analysis, Star and Delta conversion, Thevenin's and Norton's theorem, Superposition, Reciprocity, Maximum Power Transfer, Graph Theory, Tree and links, planar networks, Ideal opamp as a circuit element, AC waveform analysis frequency, phase, amplitude, peak, RMS and average value of ac waveform. Single phase ac circuit analysis containing R, L and C, and their combinations, Concepts of impedance, power, active, reactive and apparent power and power factor, Series and parallel resonance, bandwidth and quality factor, Concept of 3-phase ac circuits, star and delta connections, Frequency domain analysis – Laplace transform solution of Integral differential equations, Forced and natural responses, Transient analysis, Concept of two-port Network, Z, Y, transmission (ABCD) and Hybrid parameter, Introduction to electrical filters and transmission line.

14B11CI111 Introduction to Computer and Programming

Introduction to Programs, Processing programs, Types of Programming Languages, Programming Design tools (Pseudo code and Flowcharts), Program Design, Structured Programming, Problem solving and programming, Quality aspects of structured programs, Testing and Debugging Techniques, Self Learning of Pascal.

14B17PH171 Physics Lab-I

Experiments List

1. To study the variation of magnetic field along the axis of Helmholtz Galvanometer and to determine its reduction factor. [set-up no. 1 & 11]
2. To determine the specific rotation of cane sugar solution using Biquartz polarimeter. [set-up no. 2 & 12]
3. To observe Newton's rings and to determine the wavelength of sodium light [Set-up no. 3 & 13]
4. To determine the wavelengths of spectral lines Red, Green and Violet of mercury using plane transmission grating. [set-up no. 4 & 14]
5. To study the presence of energy levels in an atom by Franck-Hertz Experiment. [set-up no. 5 & 15]

6. To determine the resistance per unit length of a Carey Foster's bridge and to obtain the specific resistance of a given wire. [set-up no. 6 & 16]
7. To determine the Planck's constant using solar cell. [set-up no. 7 & 17]
8. To determine the wavelength of sodium light with the help of Fresnel's biprism. [set-up no. 8 & 18]
9. To draw hysteresis loop of a ferromagnetic material & calculate its retentivity and coercivity. [set-up no. 9 & 19]
10. To study ultrasonic waves in aluminium and to obtain Young's modulus for it. [set-up no. 10 & 20]

14B17EC171 Electrical Circuit Lab

List of Experiments

Experiment No. 1: To familiarization with the Digital multimeter (DMM) and measurement of various signals and circuit elements.

Experiment No. 2: To familiarization with the CRO, Function generator and power supply.

Experiment No. 3: (a) To study & draw the volt-ampere characteristics of the resistor.

(b) To study the loading effect of a voltmeter.

Experiment No. 4: To verify Thevenin's Theorem.

Experiment No. 5: To verify Tellegen's Theorem.

Experiment No. 6: To verify Superposition Theorem.

Experiment No. 7: To verify Reciprocity Theorem.

Experiment No. 8: To verify Maximum Power Transfer Theorem.

Experiment No. 9: To determine the Z parameters of the given two port network.

Experiment No. 10: To determine the Y parameters of the given two port network.

Experiment No. 11: To sketch the transient response of RC Low pass filter.

Experiment No. 12: To sketch the transient response of RC High pass filter.

14B17CI171 Computer Programming Lab

Initial exercises on MS office, Familiarity with Microsoft word, Familiarity with Microsoft power point, Familiarity with Microsoft excels, Pattern generating problems, Loop Control and Case Control Structures, Arrays and Strings, Functions and Pointers, Structures and Union, Recursion, Dynamic Memory Allocation, linked-lists, File I/O, C Library.

Year/Sem: Ist Year/II Sem

14B11HSS211 Group and Cooperative Process

Group-Behavior, Development, Structure and Process, Team- Types and Contemporary issues, Individual-- Personality, Learning, Perception, Values, Attitudes and Job satisfaction, Assertiveness- Communication Styles, self expression, Social Boldness, Emotional intelligence, Transactional Analysis- Ego states, Life position, Transaction, Stroking, Motivation, Leadership, Conflict and Negotiation.

14B11MA211 Mathematics-II

Second order linear differential equations, Convergence of series, convergence tests, solution in series, Bessel's and Legendre functions, Chebyshev polynomials and orthogonality, Second order partial differential equations and classification, one dimensional, Wave and diffusion equations with their applications, Functions of complex variable, analytical functions and Cauchy-Riemann, Equations. Conformal mapping, Poles and singularities, complex integration, Taylor's and Laurent's series, Cauchy residue theorem, contour integration and their application.

14B11CL212 Chemistry

Chemical Bonding & Characteristics of solids: Introduction to various kinds of bonding including hydrogen bonding, Physical chemistry: Structure of water and anomalous behavior, conductivity of Electrolytes: specific conductivity, measurement of conductance, conductivity water, acid- base equilibria, pH, buffer solution; electrochemistry, Applied chemistry: Corrosion and its control; types of corrosion; galvanic series; factors influencing corrosion and protection against corrosion; protective coatings; metallic coatings; electroplating; paints, formulation of paints; failure of paint film; varnishes enamels, emulsion paints, lacquers; metals and alloys; Chemistry of materials: Polymers; introduction, specific uses of important polymers; ceramics, refractories; glasses, types of glasses, zeolites, clay minerals, Chemistry in the environment: Atmospheric pollution; composition of the atmosphere, Reactions, speciation and toxicity.

14B11CE211 Building Materials & Construction

Building Materials: Classification, Properties and selection criteria of Bricks Burning of Bricks, tests for bricks, stone Classification, characteristics of good building stone, common building stones in India, lime, timber, Characteristics of good timber, defects in timber, seasoning of timber, tests on timber, plywood, cement, concrete, steel, glass, plastics, P.V.C., paint,

Varnish, Adhesive material, Bitumen, Composite Material, Ceramics, Material from industrial wastes. Building Construction: Classification of buildings, Brick masonry, stone masonry, Types of walls, partition and cavity walls Pre-fabricated construction. Plastering and pointing. Types of roofs and roof covering, treatment for water proofing, Types of floors, foundations. Damp proofing materials and techniques, Anti-termite treatment, Doors and windows: sizes and locations, proportions, Stair and staircases, Lifts and escalators, White washing, colour washing, painting, distemping, Shuttering, scaffolding and centering. Expansion and construction joints, Sound and fire proof construction, Recommendation of NBC and Building by laws.

14B11CE212 Engineering Mechanics

Introduction and application of Equivalent force system and equations of equilibrium. Basic concept of force - couple system, planar force system, parallel force system, general force system Analysis of pin jointed frames. Friction and its application. Kinematics of particle and rigid body, Dynamics of particle and rigid body, Virtual work, Impulse and Momentum, Centroid & center of gravity, Moment of inertia Mechanical Vibrations: Introduction, Equations of motion for single degree of freedom system, free and forced vibrations and damped vibrations. Compound springs with linear motion.

14B11EC314 Engineering Geology

General Geology: Branches and scope of geology, Earth- 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. Mineralogy: Definition of crystal and a mineral, the study of the physical properties and occurrence of quartz, Feldspar, Mica, kyanite, calcite, talc, corundum, gypsum, fluorite, biotite, muscovite, graphite, realgar, magnetite, limonite, pyrite, galena, barite, dolomite, garnet, tourmaline, chalcopyrite, opal, topaz, autite, hornblende, epidate, kaolinite, diamond. 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, gabbro, basalt, sandstone, conglomerate, breccia, limestone, shale, schist, marble, quartzite, khondalite, slate, gneiss, and schist, stratigraphy of India (a general idea), principles of correlation, fossils, their preservation and significance. Structural geology: Strike and dip, out crops, volcanoes, overlaps, inliers and outliers, types classification of folds, faults, joints, unconformities. Engineering Geology: Ground water, zones of ground water, water table and perched water table, water bearing properties of rocks, occurrence of ground water, springs, well sinking and ground water investigations. 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). Earthquakes and landslides: Classification, causes and effects of earthquakes and landslides, seismic problems of India, seismic zones of India, remedial measures to prevent damage for engineering structures, case histories. Geology of dams and reservoirs: 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. Geological studies in tunneling and bridges: Purposes of tunneling and geological problems connected with tunneling, geological considerations in road alignment, roads in complicated regions, geology of bridge sites.

14B17CE271 Workshop Practice (Lab)

Carpentry Shop: Timber: Type, Qualities of timber disease, Timber seasoning, Timber preservation. Wood Working tools: Wood working machinery, joints & joinery. Two jobs to cover above topic such as: Name Plate. Carpentry joints such as cross halving joint mortise and tenon joint, Dovetail joint etc. Fitting Shop: Metal bench work Measuring instruments; Engineer steel rule, Surface gauges calliper, feeler gauges, Try square and micrometer. Use, Care and maintenance of hand tools such as hammer, Cold chisel of different type, Center punch. Hack-saw, Dot punch, Different types of files, Use of surface plate, Surface gauges, type of drills. Taps and dies for drilling tapping and screw threads. Fitting operations: Chipping, filling, Drilling and tapping. Two jobs to cover above course such as: Preparation of job piece by making use of filling, sawing and chipping operation. Job having combined practice for drilling and tapping, Job having combined practice for drilling and reaming. Welding: Students are required to make three jobs related to Brazing, Soldering and welding and to know about: Equipment used for Brazing, Soldering and gas, Arc welding. Selection of material and flux used in brazing and soldering Selection of welding rods, flux and pipe for gas welding, Selection of welding machine, Electrodes and current for Arc welding, Use of tools and the equipments, Safety precautions. Black Smithy Shop: Ferrous and Non-ferrous materials, Fe-C diagram, Smithy forges, maintenance and control of fire and fuel used in smithy shop. Use of various smithy tools such as swage block, Anvil, different types of Hammers, Tongs, Flatters, Cold set, Hot set, set hammers punches, Callipers (outside and inside). Introduction to forging and forging methods heating metals for forging. Forging operations: Upsetting, Punching and drafting, Forging of chisel, Forging of C-Ring, Forging of Pan Hook (S-shaped), Forging of screw driver, forging of hexagonal nut etc. Foundry: Pattern Making: Students are required to prepare four jobs related to pattern making and molding and know about: Pattern materials, pattern allowances and types of patterns. Core box and core print, Use and care of tools used for making wooden patterns. Moulding: Properties of good molding and core sand, Composition of green sand, Dry sand and loam sand. Care and use of molding tools, Attempt should be made to expose students to as many workshop practices as feasible.

16B17CE272 Engineering Mechanics (Lab)

List of Experiments:

Experiment No.1: To find the Law of triangular of forces by gravensand's Apparatus.

Experiment No.2: To find the law of parallelogram of forces by gravensand's Apparatus

Experiment No.3: To verify the law of polygon of forces by gravensand's Apparatus

Experiment No.4: To verify Lami's theorem by Jib crane apparatus.

Experiment No.5: To find the forces in Jib crane apparatus.

Experiment No.6: To find coefficient of friction between two surfaces on a horizontal surface.

Experiment No.7: To find coefficient of friction between two surfaces on a inclined plane.

Experiment No.8: To verify support reaction by parallelogram force apparatus.

Experiment No.9: To find the forces in a member of a triangular truss.

Experiment No.10: To find the resultant of forces graphically.

14B17CL272 Chemistry (Lab)

List of Experiments:

Experiment No.1: Preparation of standard solution: NaOH

Experiment No.2: Preparation of standard solution: HCl,

Experiment No.3: pH metric titration of: Strong acid (HCl) against Strong base (NaOH),

Experiment No.4: pH metric titration of: Weak acid (Oxalic acid) against Strong base (NaOH),

Experiment No.5: Column chromatography,

Experiment No.6: Determination the order of saponification of ethyl acetate with NaOH,

Experiment No.7: Thin layer chromatography,

Experiment No.8: Double titration,

Experiment No.9: Oxidation and Reduction titration,

Experiment No.10: Hardness of water by complexometric titration.

Year/Sem: IInd Year/III Sem

14B11HS311 Managerial Economics

Introduction to Managerial Economics & Macro-economic Concepts: Definition of Economics, Meaning & Scope of Managerial Economics, Micro & Macro Economics, Concept of economic profit, (Opportunity Cost), Concept of Presentvalue. Demand Analysis: Law of demand, Individual & market demand, Determinants of market demand, Marginal Utility theory, Elasticity of demand– Price, Income, Cross, Advertising Theory of Consumer choice using Indifference Curve analysis, Demand forecasting techniques, Delphi, Survey, Time series analysis. Production Theory and Analysis: Production with one variable, optimal employment of a factor of production, Cobb Douglas production function, Production with two variable inputs, Production Isoquants, Production Isocosts, Optimal employment of two inputs, the expansion path, Basics of Supply, Market Equilibrium. Cost Theory and Analysis: Cost concepts – Opportunity, Explicit, Marginal, Incremental and Sunk, Relation between Production & Cost, Short run cost function, Long run cost function, Special topics -Profit contribution analysis, - Break Even analysis, Operating Leverage. Pricing under Different Market Structures: Perfect Competition - Determination of Price output relationship in short run, long run, Monopoly Determination of Price output relationship in short run & long run, Price discrimination, Monopolistic Competition-Determination of Price output relationship in short run & long run, Product Differentiation, Oligopoly-Types, Determination of Price output relationship, Kinky demand curve {Stickiness of Price}, Price leadership model.

14B11CE311 Mechanics of Solids

Simple stresses and strains: Stress-strain relationships, elastic constants and their relationships, temperature stresses. Analysis of axially loaded members: Bars of uniform, varying and tapering cross sections, composite bars. Complex Stresses: Stresses on inclined planes, principal stresses and strains, Mohr's circle of stresses, theories of elastic failure. Simple theory of bending, bending and shear stress distributions in beams Bending moment and shear force diagrams, relationships between loads, shear force and bending moment. Slope and deflection of beams: Differential equation of the deflection curve, double integration method, Macaulay's method, moment area method and conjugate beam method.

14B11MA312 Numerical Methods

Solution of linear system of equations- Direct and iterative methods. Eigen values and Eigen vectors, Jacobi and Householder methods. Interpolation. Approximation. Numerical differentiation, Numerical Integration, Gauss quadrature, Solution of a system of non-linear equations; Initial and boundary value problems in ODE Numerical solution of PDE by finite difference method. Method of weighted residuals (MWR).

14B11CE312 Fluid Mechanics

Introduction; Definition, Types of fluid, Properties of fluid, Fluid pressure on curved & plane surfaces, Pressure measurement, Stability of floating bodies. Kinematics of fluid flow; steady & unsteady, uniform & non-uniform, rotational & irrotational, Laminar & turbulent flow, Continuity equations for 1-D & 2-D flows, Flow-nets. Dynamics of fluid flow; Euler's equation, Bernoulli's equation; Venturi-meter, Pitot-tube, Orifice-meter, Notches & Weirs, Mouthpieces, Impulse-momentum equation, Dimensional analysis & modeling criteria. Boundary Layer Theory; Elements of boundary layer theory, Drag & lift Airfoil theory. Analysis of pipe flow; Laminar & Turbulent flow through pipes & velocity distribution, Darcy Weisbach's equation, Losses in pipe sections, branching of pipes

14B11CE313 Concrete Technology

Cements: Portland cement - chemical composition - Hydration, Setting of cement - Structure of hydrate cement - Test on physical properties - Different grades of cement - IS code Provisions, ADMIXTURES - Mineral and chemical admixtures. Aggregates: Classification of aggregate - Particle shape & texture, strength & other mechanical properties, Specific gravity, Bulk density, porosity, adsorption & moisture content, Deleterious substance in aggregate, Soundness of aggregate, Alkali aggregate reaction, Thermal properties, Sieve analysis, Fineness modulus, Grading curves, Gap graded aggregate, Maximum aggregate size, IS code Provisions. Fresh concrete: Workability - Factors affecting workability - Measurement of workability by different tests - Setting times of concrete - Effect of time and temperature on workability - Segregation & bleeding - Mixing and vibration of concrete - Steps in manufacture of concrete - Quality of mixing water. Hardened concrete: Nature of strength of concrete, water cement ratio, Strength & durability, Strength in tension & compression, Factors affecting strength, Relation between compression & tensile strength, Maturity concept, deleterious reactions- Mechanism of attack, choice and type of cement, role of quality in construction. Testing of hardened concrete: Compression tests - Tension tests - Flexure tests. Splitting tests - Nondestructive testing methods - codal provisions. Elasticity, creep & shrinkage: Modulus of elasticity - Dynamic modulus of elasticity - Poisson's ratio - Creep of concrete - Factors influencing creep - Shrinkage - types of shrinkage-factor influencing shrinkage. Concrete mix design: Factors in the choice of mix proportions - WORKMANSHIP: Batching, Mixing, Placing, Compacting, Curing, Extreme Weather concreting, Proportioning of concrete mixes by various methods - BIS method of mix design

14B11GE211 Environmental Studies

The Multidisciplinary nature of environmental studies: Definition, scope and importance, Need for public awareness, Types of Ecosystems, World Biomes, Ecosystem functioning, biogeochemical cycles. Natural resources, their consumption & Protection: Water, Land Energy (Renewable, non-renewable, wind, solar, hydro, Biomass), Mineral, Forest, & Food resources, Role of an individual in conservation of natural resources, Equitable use of resources. Pollution- a threat to environment: Air, Water & Land pollution, sources & causes, Space pollution, causes & effects, toxicity limits of pollutants. Critical issues concerning global Environment (Urbanization, population growth, global warming, climate change, acid rain, ozone depletion etc.) and the Roots in: Cultural, Social, Political, Commercial, industrial, territorial domains. Biodiversity loss: Diversity of flora and fauna, species and wild life diversity, Biodiversity hotspots, threats to biodiversity. Environmental Impact assessment: Objectives of impact assessment, Study of impact parameters, Methods for impact identification, Economics. Environmental standards & Quality: Air, Water & Soil Quality, Pollutant sampling, pollution control systems, Sustainable building, Urban planning, Disaster Management and Contingency Planning, Modern safety systems. Sustainability & Planned reversal of human destruction to environment: redevelopment of brown fields, energy plantations, social forestry, engineering aspects of Re-use & Recycling, biogas for marginal income groups, organic farming, eco-consumerism, dematerialization, green technologies, eco-tourism. Regulation of technology and innovation, Policy and law: Environmental Laws & Regulations (Different Acts - Environmental Protection Act, Air and Water Acts, Wildlife and Forest Acts), US-EPA, National Environmental Policy. Function of pollution control boards (SPCB and CPCB), their roles and responsibilities, Eco-mark Scheme, Laws relating to Urbana and Rural land use, Ethics. Case studies: Industry-Environment interface, Field Work: Explore the surrounding flora & fauna (Study of common plants, insects, birds document environmental assets), documentation of industries in local region and their possible effects, measure of water, air and land quality, Visit to a local polluted site-Urban/Rural /Industrial / Agricultural, Study of simple ecosystems-pond, river, hill slopes etc.

14B11CE371 Engineering Graphics and CAD Lab

Introduction: Drawing Instruments and use, Letter writing, Geometrical configurations, Scales Conic Sections. Orthographic Projections: Points, straight lines, planes, simple solids. Isometric Projections: Simple solids like cube, cylinder, prism, cone. Orthographic projections of simple machine elements like machine clamp, dovetail brackets and bearing block. Development of

Surfaces. Applications of AutoCAD Software: Basic terminology, Drawing commands and skills, Project Planning, 3-Dimensional drawing, Advance Tools: Template files, object snap in AutoCAD, line types, file formats, editing and modifying, Inquiry tools, X-Rays in CAD, System variables.

14B11CE372 Fluid Mechanics Lab

List of Experiments

- Experiment No.1:** Determination of meta-centric height
- Experiment No.2:** Calibration of a Venturi-meter
- Experiment No.3:** Determination of frictional losses in pipes of different diameters.
- Experiment No.4:** Determination of minor losses in pipes
- Experiment No.5:** Calibration of Pitot tube
- Experiment No.6:** Calibration of a, V - notch and rectangular notch
- Experiment No.7:** Reynolds dye experiment for flow characterization
- Experiment No.8:** Determination of C_c , C_v and C_d of an orifice
- Experiment No.9:** Verification of Bernoulli's theorem
- Experiment No.10:** Calibration of orifice meter
- Experiment No.11:** Verify the impulse moment equation (impact of jet)
- Experiment No.12:** Performance characteristics of a centrifugal pump
- Experiment No.13:** Valve characteristic

14B17CE373 Concrete Technology Lab

List of Experiments

- Experiment No.1:** To determine the quantity of water for cement paste for normal consistency
- Experiment No.2:** To determine initial and final setting time of cement
- Experiment No.3:** To determine the fineness, specific gravity and unit weight of cement
- Experiment No.4:** Determination of tensile and compressive strength of cement
- Experiment No.5:** To determine fineness modulus of fine and coarse aggregate
- Experiment No.6:** To determine compressive strength of nominal mix concrete of a given grade
- Experiment No.7:** To determine the modulus of rupture of concrete
- Experiment No.8:** To determine the workability of concrete by various methods
- Experiment No.9:** To determine the split tensile strength of concrete of given mix proportions
- Experiment No.10:** To determine the percentage bulking of fine aggregate
- Experiment No.11:** To determine soundness of given cement by Le-Chatelier method
- Experiment No.12:** Effect of water cement ratio on strength of concrete
- Experiment No.13:** Concrete mix design

16B17CE374 Strength of Materials Lab

List of Experiments

- Experiment No.1:** To determine of yield stress, ultimate stress, percentage elongation and plot the stress strain diagram and compute the value of Young's modulus on mild steel.
- Experiment No.2:** To determine the compressive strength of given specimen using UTM.
- Experiment No.3:** To determine the flexural strength of given specimen using UTM.

Experiment No.4: To determine the hardness of given sample by Brinell hardness testing machine.

Experiment No.5: To perform Izod Impact test on the given specimen.

Experiment No.6: To study the Impact testing machine and perform the Charpy test.

Experiment No.7: To draw shear Force, Bending Moment Diagrams for a simply Supported Beam under Point and Distributed Loads.

Experiment No.8: Fatigue test on fatigue testing machine.

Experiment No.9: Determination of torsional strength through torsion testing machine.

Experiment No.10: Experiment on buckling of columns.

Experiment No.11: To determine deflection in simply supported and cantilever beams.

Experiment No.12: To draw the shear and bending moment diagrams of a simply supported beam using graphical method.

Year/Semester: 2nd Year/IV Semester

14B11HS411 Financial Management

Introduction, Scope and Objectives, Basic Financial Concept, Time value of money, Capital budgeting techniques, Cash flows, Long term sources of finances. Concept and measurement of cost of capital, Leverages, EBIT-EPS analysis, Working capital management- Inventory Management, Financial Statement analysis.

14B11CE411 Water Supply Engineering

Introduction: Importance of planned water supplies; financing, planning and execution of modern water supply schemes. Water demands: Various types of demands; the per capita demand: variations in demand; design periods; population forecasting by various methods. Sources of water: Kinds of water sources and their characteristics; factors governing the selection of a source of water supply; storage capacity of impounded reservoir. Collection and Distribution of water: Intakes and their design for lakes, streams and rivers; methods of distribution; concept of service and balancing reservoirs; capacity of distribution reservoirs; Design of water distribution systems; analysis of pipe networks by Hardy Cross method, equivalent pipe method, method of sections and Newton-Raphson method; Layout of distribution system; the house water connection; construction and maintenance of distribution systems. Pipes-Joints-Fittings: various types of conduits; testing and inspection; joints in pipes; valves in pipe line. Pumps and pumping stations: Types of pumps and their choice; pumping stations; economical diameter of rising main; hand pumps; pump testing; Water hammer and its control measures. Planning and preparing water supply projects. Quality of water: physical, chemical and biological characteristics of water, common water born diseases, standards of portable water for various purposes. Treatment of water: screening and types; aeration units; sedimentation; sedimentation tanks and their types; sedimentation aided with coagulation; classifications of filters and their constructional and operational details. Disinfection: Methods of disinfection; chlorination and its types. Water softening: Importance of water softening; lime- soda process; zeolite process. Miscellaneous treatment methods: Removal of colour, odour and taste, iron and manganese; fluoridation and de-fluoridation.

14B11CE412 Surveying

Introduction: Classification of surveying, Principle of surveying. Error due to use of wrong scale. Chain Surveying: Instruments for chaining, Errors due to incorrect chain, Chaining on sloping ground, Errors in chaining, Tape corrections, Chain triangulation, setting out right angles, Basic problems in chaining, Conventional symbols used in chaining. Compass Surveying: Instruments (Prismatic & Surveyor compass), Bearing and angles, Magnetic declination, Local attractions, errors in compass survey. Leveling: Instruments, Optical defects in lenses. Temporary adjustment of a level, Direct leveling. Differential leveling, Reciprocal leveling, Curvature & Refraction corrections, Leveling problems, Errors in leveling, the level tube, trigonometric leveling. Contouring: Contours, Contour interval, Contour gradient, Characteristics of contours, Methods of locating contours & their interpretation, Uses of contour maps, Calculation of areas & volumes, Planimeter, minor instruments. Theodolite: Transit & Non-transit, Definition & terms, Measurement of horizontal & vertical angles, Fundamental lines of the theodolite and desired relationships, Sources of error. Traverse Surveying: Methods of traversing, Traverse computations, closing errors, Balancing the traverse, Omitted measurements. Plane Table Surveying: Instruments, Principle & methods of plane tabling, Three-point problem, two point problem, Errors in plane tabling, Advantages & disadvantages. Tachometric Surveying: Instruments and Tachometric methods. Curves: Simple circular, Compound, Reverse & Transition curves, setting out of the curves. Photographic Surveying: Principles, Advantages of Aerial photography. Setting Out Works: Buildings, Culverts, Bridges, Tunnels, Transferring levels underground. Introduction to Remote Sensing, GPS, GIS and Map study

14B11CE413 Geotechnical Engineering

Introduction to Geo-technical problems in Civil Engineering, complexity of soil nature, Soil types and formation, regional soil deposit of India; Solids-water-air relationships and index properties of soils, Soil identification and B.I.S. classification; Flow

through soils, permeability, capillarity, design of protective filters, and principle of effective stresses; Soil compaction and field control, Stress distribution in soil due to applied surface loads; Compressibility and one dimensional consolidation characteristics of soils; Shear strength of soil; Earth pressure theories for retaining walls, Stability of Slopes.

14B11CE414 Water Resource engineering

Hydrology; Hydrological cycle, precipitation, snowfall and snowmelt, evaporation, transpiration, depression storage, infiltration, overland flow, stream flow measurements, hydrograph. Ground water flow; Specific yield, storage coefficient, coefficient of permeability, confined and unconfined aquifers, aquitards, radial flow into a well under confined and unconfined conditions, tube wells, pumping and recuperation tests, ground water potential. Water Resources; Ground and surface water resource, single and multipurpose projects, storage capacity of reservoirs, reservoir losses, and reservoir sedimentation. Irrigation Engineering; Water requirements of crops, Moisture-crop relationship, Irrigation requirements, duty and delta, Irrigation efficiencies, Design of conventional and modern methods of irrigation, Irrigation of arid lands, Salinity of soil, Salinity control, Quality of irrigation water, Contaminants and their effects on various crop types, Rain water management, conjunctive use of water, Water logging causes and control, drainage system design. Canals; Distribution systems for canal irrigation, canal capacity, canal losses, alignment of main and distributary canals, most efficient section, lined canals, their design, regime theory: Lacey's theory and Kennedy's theory, critical shear stress, bed load, local and suspended load transport, cost analysis of lined and unlined canals. River training; Objectives of river training, methods of river training, river training structures

14B11CE415 Structural Analysis

Introduction: Statically determinate & indeterminate structures. Analysis of statically determinate structures: trusses, frames, and three hinged arches Strain energy due to axial, bending, shear and torsion loads, Castigliano's theorem, Maxwell-Betti's theorem, Principal of virtual work, reciprocal theorem, and principal of superposition. Analysis of plane redundant frames up to two degree of redundancy by energy method, slope deflection method and moment distribution method Analysis of propped cantilever, fixed beam, continuous beam, and Clapeyron's three-moment theorem two hinge and fixed arches Buckling of columns, critical loads, axially and eccentrically loaded columns

16B17CE471 Environmental Engineering Lab

LIST OF EXPERIMENTS

Experiment No.1: To determine the pH, conductivity and turbidity of given sample.

Experiment No.2: To estimate the total solids, suspended solids (settleable and non settleable) and dissolved solids of the given sample.

Experiment No.3: To estimate the optimum dosage of coagulant using jar test apparatus.

Experiment No.4: To determine the residual chlorine content in the given water sample.

Experiment No.5: To estimate the chlorides content in the given sample.

Experiment No.6: To estimate the dissolved oxygen content in the given wastewater sample.

Experiment No.7: To estimate the biochemical oxygen demand (BOD) of the given wastewater sample.

Experiment No.8: To estimate the chemical oxygen demand (COD) of given wastewater sample.

Experiment No.9: To estimate the most probable number (MPN) of coliforms in the given water sample.

Experiment No.10: To determine the suspended particulate matter (SPM) content and respirable particulate matter (RPM) in the ambient air.

Experiment No.11: To estimate the noise level at various places in the campus

14B17CE472 Surveying Lab

LIST OF EXPERIMENTS:

Experiment No.1: Chain survey

Experiment No.2: Compass survey

Experiment No.3: Plane table survey

Experiment No.4: Simple leveling

Experiment No.5: Profile leveling

Experiment No.6: Longitudinal & Cross section

Experiment No.7: Contouring

Experiment No.8: Theodolite

Experiment No.9: Tachometry

Experiment No.10: Areas & Volumes

Experiment No.11: Traversing

Experiment No.12: Trigonometric leveling.

Experiment No.13: Total station

14B17CE473 Geotechnical Engineering Lab

LIST OF EXPERIMENTS:

Experiment No.1: Soil Identification Test

Experiment No.2: Moisture content determination by oven drying method, pycnometer method, and rapid moisture meter

Experiment No.3: Specific Gravity of soil particles by Pycnometer method and Density Bottle method

Experiment No.4: Particle size distribution of soils (Grain size analysis) by Sieve analysis and Hydrometer analysis.

Experiment No.5: Atterberg's limits tests

Experiment No.6: Field density tests of soils by Core cutter method and sand replacement method

Experiment No.7: Permeability tests of soils by Variable head method and Constant head method

Experiment No.8: Soil compaction test (Density moisture relations)

Experiment No.9: Moisture Content variation with drying duration

Year/Sem: IIIrd Year/V Sem

14B11HS541 Social & Legal Issues

Contract Act, Consumer Laws, Laws of Patent, Company Act, Business ethics and values, Codes of Ethics & Professional Conduct, The place of code of ethics for an Engineer, Ethics in Bio-Tech, Environmental Ethics, Role of Board of Directors, The role of Top Management, Executive Compensation, Legal provisions and SEBI code, Governance mechanism and ethical behaviour, Corporate governance in India, Impact of internet on corporate governance. Intellectual Property Issues (What is Intellectual Property, Copyright law, Software Copyright), Copyright in Cyberspace, Offensive Speech in Cyberspace, pornography, censorship, Bomb-making Information Harassing Speech Online), Liability of service providers. Computer Crimes (Fraud and Embezzlement, Sabotage & Information theft, Intruders, Hacking & Cracking), Computer Crime Laws, Digital Forgery, Cyber Terrorism, Wiretapping, IT Act 2000, ICE Bill.

14B14HS542 Human Psychology

Understanding human experience and behavior: Definition, schools, methods, branches and application of psychology for engineers. Measuring human abilities: Intelligence, Personnel testing; the individual working life. Personality - definition, approaches and theories, Psychological problems of everyday life. Stress and coping; Psychological disorders, human error & Reliability, Work and mental health. Human learning Theories, conflict resolutions, Leadership and management.

14B14HS543 Professional Ethics

Introduction, The nature and characteristics of professions, Obligations and professional services, Obligation to clients, professions and third parties. The foundations and norms of professional ethics. The need for separate code of conduct for professionals. The relation between professional and general ethics. Moral conflict and the issue of autonomy of professional ethics. Certain specific issues pertaining to medical ethics, legal ethics, computer ethics and business ethics. Teaching from scriptures and tradition (Geeta, Ramayana, Mahabharata, Upanishads, Vedas, Bible and Quran). Ethical Issues in Capitalism and market systems, Ethics and social responsibility, Ethics and marketing, Ethics in finance, Ethics and human resource, Ethics and Information Technology, Intellectual property rights like designs, patents, trade marks, copy rights,

14B14HS544 Macro Economics

Meaning and Importance of Macro Economics. Concepts of Income, Output and employment – Gross Domestic Product (GDP), GNP, GNI and NNP – methods of measurement of GDP and limitations; monetary policy a fiscal policy, Balance of Payments: Current and Capital Accounts. Disequilibrium in balance of payments and its consequences. Balance of payments, adjustment policies in fixed and flexible exchange rate. Theories of Consumption spending: Absolute, Relative, Permanent Income and Lifecycle hypotheses. Consumption under uncertainty, Price Level at the macro level – WPI and CPI. Theories of Investment

spending: Keynesian, Accelerator and Neo-classical, Determination of Money Supply: Functions and Post-war controversy on definition of Money. Theories of Demand for Money: Quantity Theory and Keynes approach. Baumol and Tobin Contributions and Friedman's restatement of quantity theory. IS and LM curves: Derivation, their shifts and rotations. Simultaneous equilibrium of product market and money market.

14B11CE511 Sewage Treatment & Disposal

Introduction: sewage, sewerage, sullage, systems of sanitation, sewerage systems, estimation of quantity of sewage and patterns of collection systems. Sewers: types, shapes, materials, design, laying and testing of sewers. Quality and characteristics of sewage: Decomposition of Sewage (N,C & S cycles), physical, chemical & biological characteristics of sewage. Treatment of sewage: Basics of primary, secondary and tertiary treatment, screening, grit chamber, comminuting, trickling filters, activated sludge process, rotating biological contactors, ponds and lagoons, septic tank, imhoff tank, advanced waste water treatment: nutrient removal and solids removal. Sludge: Thickening, digestion, dewatering and disposal of sludge, anaerobic digester. Wastewater Disposal and Reuse: Disposal of sewage, reduction of BOD, land disposal, discharge in to rivers. Lakes and ocean, self purification of streams and Zones of pollution, oxygen sag curve, recycle and reuse of waste effluents. Plumbing systems: systems of plumbing, pipes, traps and sanitary fittings.

]14B11CE512 Highway Engineering

Importance of transportation, different modes, characteristics & Scope of highway engg in India, Highway development in India, classification of roads, planning surveys, highway planning in India Highway alignment, engineering surveys, drawings and report, realignment. Geometric design: Introduction cross section elements, sight distance, design of horizontal and vertical alignment of highways. Traffic Engineering: Introduction, characteristics, traffic operation. , design of intersections, parking facilities, and lighting, traffic planning. Highway materials: sub grade soil classification, evolution of soil strength, modulus of sub grade reaction, C.B.R test, tests for road aggregate, types of bituminous materials, tests on bitumen. Bituminous paving mixes, marshal method of mix design, Pavement Design: types of pavements, design factors, design of flexible pavements by G.I method, C.B.R. method, Burmister's method, design of rigid pavements by using I.R.C.Recommendations. Highway construction: construction of earth roads, gravel roads, W.B.M. roads, bituminous roads, and Cement concrete pavement, joints in concrete pavement. Highway maintenance: Flexible & Rigid Pavement failures, maintenance of bituminous surfaces,& cement concrete pavements, strengthening of existing pavements, overlay design by Benkelman beam deflection studies. Surface &sub surface Drainage of pavements.

14B11CE513 Design of Concrete Structures

Introduction to the design of Concrete structures; Working & Limit state concepts. Limit state Design of beams for flexure, bond, shear and torsion (singly & doubly reinforced, T-beams & L-beams); axially and eccentrically loaded Columns; One and two-way Slabs, Stair cases; Footings, isolated and combined; Retaining wall.

14B11CE514 Advanced Structural Analysis

Kani's method to analyze simple portal frames, Column Analogy, Basic Principles of matrix method Flexibility and Stiffness matrices and their generation, Analysis of Fixed arches, Rolling loads and Influence lines for beams and arches, Plastic Analysis of beams and frames, Approximate Methods to analyze Portal frames: Portal method, cantilever method

14B17CE572 Highway Engineering Lab

LIST OF EXPERIMENTS:

Experiment No.1: Aggregate crushing strength test.

Experiment No.2: Los Angeles abrasion test.

Experiment No.3: Aggregate impact test.

Experiment No.4: Flakiness index & elongation index test.

Experiment No.5: Penetration test.

Experiment No.6: Ductility test.

Experiment No.7: Viscosity test.

Experiment No.8: Softening point test.

Experiment No.9: Flash & fire point test.

Experiment No.10: Determination of bitumen content by centrifuge extractor.

Experiment No.11: Determination of marshal stability value.

Experiment No.12: Determination of rebound deflection of pavement by Benkelman beam

16B17CE573 Building Drawing Lab

LIST OF DRAWING:

Plan, elevation and section of:

Drawing No.1: Single storied residential building

a) Load Bearing Structure b) Framed Structure

Drawing No.2: Double Storied residential building

3. Drawing No.3: Single storied educational building

4. Drawing No.4: Single storied hospital building

5. Drawing No.5: Staircases

6. Drawing No.6: Doors and windows

14B19CE591 Seminar

Seminar is a course requirement wherein under the guidance of a faculty member a student is expected to do in depth study in a specialized area by doing literature survey, understanding different aspects of the problem and arriving at a status report in that area. While undergoing a seminar course, the student is expected to learn investigation methodologies, study relevant research papers, correlate work of various authors/researchers critically, study concept, techniques, prevailing results etc, analyze it and present a seminar report.

Departmental Elective-1

14B14CE541 Open Channel Hydraulics

Introduction to free surface flows, Comparison between pipe and channel flows, Basic equations governing channel flows. Uniform Flow: Flow resistance in channel flows, Resistance relationships, Normal depth, Section factor for uniform flow computation, Design of Channels: Most efficient cross-section in rigid boundary channels, Incipient motion condition, Regimes of flow and Resistance to flow in mobile bed channels, Non- scouring erodible boundary channel design, Alluvial channel design, uniform flow in mobile bed channels. Concepts of specific energy and specific force, section factor for critical flow computation, Critical depth computations, Control sections, Applications of specific energy and critical depth. Gradually Varied Flow: Governing equations, Characteristics and classification of water surface profiles, Computation of GVF profiles in prismatic and non-prismatic channels. Hydraulic Jump: Types of jump, Hydraulic jump in horizontal rectangular channels, Forced Jump, Hydraulic Jump in non-rectangular and sloping channels, stilling basins. Flow measurement in open channels: Broad and sharp-crested weirs, Free overall, Flow over spillways, Side weirs, Sluice gates.

14B14CE542 Advanced Construction Materials

Plastics: brief history, composition, polymerization, classification of plastics, resins, moulding compounds, fabrication, properties of plastics, uses of plastics, PVCpipes in building. Glass: General, Properties, types and uses, special varieties of glass. Timber: characteristics, identification and uses of common Indian timber - teak, deodar, Shisham, chil, sal, veneers, plywood, laminated boards- their uses and properties, uses and strength of bamboo, preservation of timber against fire and weather etc. Miscellaneous Materials: Fly ash, rubber-types, uses and properties, heat insulating materials, Sound absorbent materials. Steel: market forms, properties of mild steel and hard steel, preventive measure for corrosion. Composite Materials: definition, classification-particulate composites, fibrous composites, properties of fibers and conventional materials. Unidirectional Composites: Introduction, volume fractions, weight fractions longitudinal strength and stiffness, factors influencing longitudinal strength and stiffness, transverse strength and stiffness. Short fiber composites: Introduction, modulus and strength of short fiber composites. Rubber reinforced composites. Laminated composites- and its applications. Fiber reinforced plastics (FRP) and its applications. Mortars: Properties and uses of cement, lime and surkhi mortars, proportions, mixing, uses. Steel Fibrous Concrete: Introduction, types of fibers, properties of steel fibrous concrete.

14B14CE543 Advanced Surveying

Triangulation and trilateration, network, strength of figures, selection of stations, inter visibility, satellite stations,

measurements and computations, trigonometric Leveling. Geodesy Earth, spherical trigonometry, convergence of meridians, latitude computation, determination of bearing and distance, map projection. Photogrammetry: Principle and types of aerial photographs, stereoscopy. Map vs Mosaic, Ground control, Parallax measurements for height determinations. Hydrographic survey: Shoreline and river survey, soundings methods, equipment and ranges locating sounding. Global Positioning System (GPS): GPS principles, Satellite navigation System, GPS Space segment, Control segment, User segment, GPS satellite signal Receivers, Static, Kinematic and Differential GPS. Modern surveying electronic equipments: Principles, working and applications of digital levels, digital theodolites, EDMs, Total stations, lasers in surveying.

14B14CE544 Geosynthetics and Reinforced Soil

Introduction: Historical background of reinforced soil, Principles of reinforced soil through Mohr circle analysis. Different types of geosynthetics: Types of geosynthetics like geotextiles, geogrids, geonets, geocells, geo-composites, their manufacturing methods. Testing methods for geosynthetics: Techniques for testing of different index properties, strength properties, Apparent Opening Size, In-plane and cross-plane permeability tests. Reinforced Soil retaining walls: Different types of walls like wrap-around walls, full-height panel walls, and discrete-facing panel walls, modular block walls Design methods as per BS-8006 and FHWA methods Construction methods for reinforced soil retaining walls. Reinforced soil slopes: Different slope stability analysis methods like planar wedge method, bi-linear wedge method, circular slip methods, Erosion control on slopes using geosynthetics. Applications in foundations: Binquet and Lee's approach for analysis of foundations with reinforcement layers. Drainage and filtration applications of geosynthetics: Different filtration requirements, filtration in different types of soils and criteria for selection of geotextiles. Pavement application: Geosynthetics for separation and reinforcement in flexible pavements, design by Giroud-Noiray approach, reflection cracking and control using geosynthetics. Construction of landfills using geosynthetics: Different components of modern landfills, collection techniques for leachate, application of different geosynthetics like geonets, geotextiles for drainage in landfills, use of geomembranes and Geosynthetic Clay Liner (GCL) as barriers.

Year/Semester: 3rd Year/VI Semester

14B14HS641 Project Management

Project Management Basics, Role, attitude and skills of Project manager, Project Lifecycle, Project Environment, 7'S of Project Management., Project Model. Basics of Project Selection, Risk Management. Key Structure of Project Organization, Project Planning, Project Budgeting and cost estimation. Project Scheduling (Importance, PERT/CPM, AOA and AON charts, Probability analysis). Project Control, Project Termination.

14B14HS642 Business Environment

Introduction to Business ,Meaning of Business Environment : Economic and non economic factors influencing Business, Environmental Scanning ,Process of environmental scanning ,Economic systems: basic philosophies of Capitalism and Socialism with their variants, Concepts of Mixed Economy, Constitutional Framework of state control of Business : The relationship between Business and Government in India, Definition of Security, Securities Exchange Board of India-Composition Stock Exchange-BSE-NSE, Securities Exchange Board of India-Powers and Functions, Competition Act 2002: Objective, Anti Competitive Agreements : Competition Commission of India –Composition, Powers and Functions, MRTP Act : Abuse of Dominant, Position, Regulation, The Foreign Exchange Management Act, 1999- Objective and Applicability of the Act FEMA Vs FERA, Fiscal Policy Instruments – taxation, Monetary Policy: Types of Monetary Policy Instruments ,Philosophy and strategy of planning in India ,Industrial Policy in recent years, Indian Financial System Financial Sector reforms – 1, Indian Financial System Financial Sector reforms – 2, Policy with regard to small scale industries -1, Policy with regard to small scale industries -2, e-business - objectives, trends and practical uses ,Corporate Social responsibility ,FDI Policy ,EXIM Policy, New Economic policy ,(LPG), WTO & GATT, Make in India , Digital India campaigns

14B1HS643 Fundamentals of Financial Market

Financial institutions as firms & intermediaries, Financial markets, Lenders and borrowers, The financial system and the real economy, Deposit-taking institutions, Non-deposit-taking institutions, Interest rates. Money market purpose and structure, Money market segments, Money market participants, Money market instruments - Treasury bills and other government securities, Commercial papers, Certificates of deposit, Repurchase agreements, Money market interest rates and yields. Debt market instrument characteristics, Bond market: characteristics & yields, Bond valuation - Discounted models, Bond duration and risk, Bond analysis. Equity instruments - Common shares, Preferred shares, Private equity, Primary equity market, Secondary equity market structure, Equity market transactions, Equity market characteristics, Stock valuation, Processes of consolidation of stock exchanges. Hedging against risk, Description of derivatives markets, forward and futures contracts: Principles, valuation, uses, Swaps, Options: definition, components, determinants, Option pricing models.

14B14HS644 Marketing Management

Defining Marketing for the 21st Century, Developing Marketing Strategies and Plans. Gathering Information and Scanning the Environment, Conducting Marketing Research and Forecasting Demand. Creating Customer Value, Satisfaction, and Loyalty, Analyzing Consumer Markets, Analyzing Business Markets, Identifying Market Segments and Targets. Dealing with Competition, Creating Brand Equity, Crafting the Brand Positioning. Setting Product Strategy, Designing and Managing Services, Developing Pricing Strategies and Programs.

14B11CE611 Foundation Engineering

Foundation requirement, types and selection, terminology; Soil exploration techniques (SPT, CPT, pressure-meter tests etc.) and site investigation report; Methods of determination of bearing capacity of shallow foundations, safety factors in foundation design, eccentrically loaded footings, Settlement considerations. Raft foundation- bearing capacity and design principle, settlements; Pile foundation-types and uses, cast in situ pile construction, pile load capacity-static and dynamic formulae, pile load test, correlation with penetration test data, group action of piles, negative skin friction, settlement computations. Well and Cassion foundation, construction and sinking of a well; Sheet Pile Walls & Bulk Heads. Arching in soils and braced cuts; Ground improvement techniques, deep compaction, soil reinforcement.

14B11CE612 Design of Steel Structures

Structural steel and their properties, rolled steel sections. Permissible stresses, working stresses, factor of safety, design loads Simple connections: Riveted, bolted and welded. Design of tension members. Design of axially loaded compression members and built-up columns Design of beams, plate girders. Estimation of Wind & Earthquake forces for towers

14B11CE612 Transportation Engineering

Railways: History of railways in India and Role of Indian Railways in National Development, Engineering. Surveys for Track Alignment - Obligatory points - Conventional and Modern methods (Remote Sensing, GIS & GPS, EDM and other equipments). Permanent Way, its Components and Functions of each Component, Rails - Types of Rails, Rail Fastenings, Concept of Gauges, Coning of Wheels, Creeps and kinks, Sleepers - Functions, Materials, Density, Ballasts - Functions, Materials, Ballastless Tracks. Geometric Design of Railway Tracks - Gradients and Grade Compensation, Super-Elevation, Widening of Gauges in Curves, Transition Curves, Horizontal and Vertical Curves (Derivations of Formulae and Problems), Points and Crossings - Design of Turnouts, Working Principle Signaling, Interlocking and Track Circuiting Construction & Maintenance - Conventional, Modern methods and Materials, Track Drainage Track Modernization- Automated maintenance and upgrading, Technologies, Re-laying of Track, Lay outs of Railway Stations and Yards, Rolling Stock, Tractive Power, Track Resistance, Level Crossings, maintenance of track. Air ports: Development of air transport in India, airport planning, air port design standards, terminal lay out & classification, drainage, marking & lighting, heliports, air traffic control, air cargo, accidents in the air, maintenance of air ports. Docks, harbours & inland water ways: Historical development in India, tides, winds & waves, docks, harbours, break waters, jetties, landing stages & wharves, dry docks, transit sheds, cargo handling, inland water transport, maintenance. Minor modes of transportation: Pipelines, elevators, belt conveyors, aerial rope ways, & under sea transportation.

14B11CE614 Estimation and Costing

Planning of Residential, Commercial, Educational and Hospital buildings by considering different aspects like. Site, climatic, utility, Vastu & architectural, financial etc, municipal town planning rules & regulations. The Units of measurements and payments for various items of works and materials Methods of estimating, estimating steps, estimating of buildings, different types of roofs, sanitary and water supply works, road works, culverts, bridges, wells, and irrigation works. Types of estimates: preliminary and detailed estimates, contingies, administrative approval, Analysis of rates; factors affecting the rate analysis, material and labour requirements for different types of work, rates of materials & labour. Estimate the unit rate for different items. Estimating of quantities of materials and transport. Specifications, rules and methods of measurement. Autocad/3D home: Draw the plan, elevation, section and views of different civil engineering structures by using 3D home/AutoCAD software and check the estimation done manually by using MS-Excel. Drawing work: Plan, elevation, section and views of residential buildings, different types of roofs, sanitary and water supply works, road works, culverts, bridges, wells, and irrigation works, etc.

14B11CE671 Foundation Engineering Lab

LIST OF EXPERIMENTS:

Experiment No.1:Consolidation test

Experiment No.2:Triaxial compression test

Experiment No.3:Unconfined compression test

Experiment No.4:Direct shear test

Experiment No.5:Vane shear test

Experiment No.6: Swelling pressure test by swelling pressure apparatus and consolidometer

Experiment No.7:CBR test (Soaked and Unsoaked)

Experiment No.8:SPT test (Demonstration)

Experiment No.9:Plate load test (model)

14B11CE672 Civil Engineering Software Lab

1. Spreadsheet for calculating and drawing shear force and bending moment diagrams of determinate beams.
2. Spreadsheet for designing a singly reinforced beam.
3. Spreadsheet for designing a doubly reinforced beam.
4. Primavera – Creating and analyzing a project – Project 1 part 1
5. Primavera – Creating and analyzing a project – Project 1 part 2
6. Primavera – Creating and analyzing a project – Project 2 part 1
7. Primavera – Creating and analyzing a project – Project 2 part 2
8. STAAD.Pro – Analysis of beams and plane frames
9. STAAD.Pro – Analysis of Trusses
10. STAAD.Pro – Analysis of a building for Gravity loads
11. STAAD.Pro – Analysis of a building for Wind loads
12. STAAD.Pro – Analysis of building for Earthquake load

Departmental Elective-2

14B14CE641 Environmental Legislation and Auditing

Environmental pollution, Introduction: water pollution, Air pollution, soil pollution, Sources, Causes and affects, Indian Constitution and Environmental Protection: National Environmental policies, precautionary principle and polluter pays, introduction to environmental legislation in India, institutional framework (SPCB/CPCB/MoEF). Environmental agreements and Protocols: Montreal protocol, Kyoto agreement, Rio declaration. Water (Prevention &Control of Pollution) Act, 1974: Power & functions of regulatory agencies, responsibilities of occupier provision relating to prevention and control scheme of Consent to establish, consent to operate, conditions of the consents, outlet, legal sampling procedures, state water laboratory, appellate Authority, penalties for violation of consent conditions etc. Provisions for closure/directions in apprehended pollution situation.. Air (Prevention &Control of Pollution) Act, 1981: Power & functions of regulatory agencies, responsibilities of occupier provision relating to prevention and control, scheme of consent to establish, consent to operate, conditions of the consents, outlet, legal sampling procedures, state air laboratory, appellate authority, penalties for violation of consent conditions etc. Provisions for closure/directions in apprehended pollution situation. Environment (Protection) Act, 1986: Genesis of the Act, delegation of powers, role of central government, EIA Notification, Industries, coastal zone regulation, responsibilities of local bodies mitigation scheme etc., for municipal solid waste management, responsibilities of pollution control boards under hazardous waste rules and that of occupier, authorization, biomedical waste rules, responsibilities of generators and role of pollution control boards. Environmental Audit: Introduction, types of audits, features of effective auditing, programme Planning, definition, organization of auditing programme, pre visit data collection audit protocol, onsite audit, data sampling, inspections, evaluation of audit report.

14B14CE642 Disaster Management & Mitigation

Overview of Disaster Management: Introduction, Disaster Management Cycle, Education and Public Awareness, The Role of Media in Disaster Management, Disaster Associated Health Issues Physical and Socio-economic Impacts of Disasters, Vulnerable Groups

in Disasters. The Role of Technology in Disaster Management, Geographic Information Systems (GIS) and Global Positioning System (GPS) in Disaster Management , Remote Sensing and Disaster Management , Early warning systems. Natural Hazards: causes, distribution pattern, consequences and mitigation measures for : Earthquake, Tsunami , Cyclone, Flood, Drought, Landslide.

14B14CE643 Selected Concrete Structures

Introduction: Review of Limit State Design of Beams, Slabs & Columns according to IS 456-2000. Calculation of Deflection & Crack Width according to IS 456-2000. Design of special rc elements: Design of Slender Columns, Grid Floors, Curved Beams, Deep Beams, Plain & Reinforced Concrete Walls, Corbels & Edge (Spandrel) Beams. Slabs: Design of Circular & Flat Slabs. Yield Line Analysis of Slabs. Bunker and silos, water tanks: Rectangular Water Tanks, Circular Water Tanks, Overhead and Underground Water Tanks.

14B14CE644 Traffic Engineering

Administration and functions , road user and vehicle characteristics, Speed, journey time and delay surveys, vehicle volume counts, classification and occupancy, O&D surveys, parking surveys, photographic techniques in traffic survey, statistical methods for traffic engineering, speed studies, traffic forecasting ,geometric design ,traffic signs ,road markings, traffic signals, street furniture, regulation of traffic, road accidents ,street lighting ,traffic management , highway capacity, basic diagram of traffic flow,

Year/SemIVth Year/VII Sem

14B14HS743 Entrepreneurship and Small Business

Entrepreneurship-Enterprise:Conceptual issues, Entrepreneurship vs. Management, Roles and functions of entrepreneur in relation to the enterprise and in relation to the economy. Entrepreneurship is an interactive process between the individual and the environment. The process of setting up a small business: Preliminary screening and aspects of the detailed study of the feasibility of the business idea and financing/non-financing support agencies to familiarize themselves with the policies/programs and procedures and the available schemes. Management roles and functions in a small business. Designing and re-designing business process, location, layout, operations planning and control.. The pros and cons of alternative growth options: internal expansion, acquisitions and mergers, integration and diversification, Crisis in business growth. Brief introduction to Single-Entry system of record keeping.Sources of risk/venture capital, fixed capital, working capital and a basic awareness of financial services such as leasing and factoring. The contemporary perspectives on Infrastructure Development, Product and Procurement Reservation, Marketing Assistance, Subsidies and other Fiscal and Monetary Incentives. National state level and grass-root level financial and non-financial institutions in support of small business development.

14B14HS744 Marketing Management

Understanding Marketing Management, Defining Marketing for the 21st Century, Developing Marketing Strategies and Plans Capturing Marketing Insights, Gathering Information and Scanning the Environment, Conducting Marketing Research and Forecasting Demand. Connecting with Customers, Creating Customer Value, Satisfaction, and Loyalty, Analyzing Consumer, Markets, Analyzing Business Markets, Identifying Market Segments and Targets. Building Strong Brands, Dealing with Competition, Creating Brand Equity, Crafting the Brand Positioning Shaping the Market Offerings, Setting Product Strategy, Designing and Managing Services, Developing Pricing Strategies and Programs.

14B14HS745 Human Resource Management

Human Resource Management: Meaning, Nature and Scope, HRM functions and objectives, evolution of HRM environment. Human resource development in India: evolution and principles of HRD Vs personnel functions, Role of HR managers. Strategic Human Resource Management: Nature of strategies and strategic management, strategic management process.Environment scanning, strategy formulation, implementation and evaluation. Human Resource Planning: Definition, purposes, processes and limiting factors. Human resources information system (HRIS): HR Accounting and audit, Job analysis- job description, job specification. Training and Development: purpose, methods and issues of training and management development programmes. Performance Appraisal: definition, purpose of appraisal, procedures and techniques including 360 degree performance appraisal. Job evaluation and Compensation administration: nature and objectives of compensation, components of pay structure in India,Wage policy in India. Discipline and Grievance Procedures: definition, disciplinary procedure, grievance handling procedures.Industrial relations: nature, importance and approaches to industrial relations.

14B14HS746 Total Quality Management

Basics of Total Quality, Total Quality Management, TQM -Thinkers and Thoughts, Quality Awards. Cost of Quality, Team work for Quality, Total Employee Involvement Customer Satisfaction. Quality Circles, Kaizen, Six Sigma, People CMM, Benchmarking. Control of Accuracy and Precision, Process Capability, Statistical Process Control, Quality Function Deployment, Quality Management Systems, Design of Experiments (Taguchi Technique), FMEA, Total Productivity Maintenance. ISO: 9000 series, ISO: 14000 series.

Departmental Elective-3

14B14CE741 Ground Improvement Technique

Introduction: Need for Ground Improvement, Different types of problematic soils, Emerging trends in ground Improvement. Mechanical stabilization: Shallow and deep compaction requirements, Principles and methods of soil compaction, Shallow compaction and methods. Properties of compacted soil and compaction control, Deep compaction and Vibratory methods Dynamic compaction. Hydraulic modification: Ground Improvement by drainage, dewatering methods. Design of dewatering systems, Preloading, Vertical drains, vacuum consolidation, Electro-kinetic dewatering, design and construction methods Modification by admixtures: Cement stabilization and cement columns, Lime stabilization and lime columns. Stabilization using bitumen and emulsions, Stabilization using industrial wastes Construction techniques and applications Grouting: Permeation grouting, compaction grouting, jet grouting, different varieties of grout materials, grouting under difficult conditions. In situ soil treatment methods: Soil nailing, rock anchoring, micro-piles, design methods, construction techniques.

14B14CE742 Risk and Reliability in Geotechnical Engineering

Reliability based Methods in Civil Engineering: Risk, terminology, randomness, uncertainty, modeling uncertainty, Engineering judgment, introduction to probability, and examples. Statistics and Probability: Histogram and frequency diagram, measures of variability, probability theory, Conditional probability, random variables, probability mass and density functions, Moments of distribution, Bayes theorem, examples Random Field Theory: Stationery process, autocovariance functions, functions of random fields. Sampling: Sampling techniques, concepts of sampling, sampling plans, decisions based on Samplings. Reliability Analysis: Levels of reliability, loads and resistances, reliability methods, first order second moment, (FOSM) method, Hasofer-Lind approach, comparative discussion. Simulation Methods: Basis of simulations methods, random number generation Fault Tree Analysis: Decision making, branching, use of fault tree and event tree analysis. System reliability: System analysis, theoretical models, use of event tree and fault tree analyses and examples.

14B14CE743 Soil Dynamics and Machine Foundations

Foundation vibration-Theories of elastic of elastic half space, Analysis of foundation vibration, Dynamic bearing capacity of shallow foundation, Earthquake and ground vibration, Lateral earth pressure on retaining walls, Compressibility of soil under dynamic loads, Pile foundations-effect of vibrations on piles, dynamic analysis, codal provisions; Machine foundations- criteria for satisfactory machine foundation, method of analysis, degrees of freedom of a block foundation, vertical, sliding, rocking and yawing vibrations of a block, Indian standards for design and construction of foundations for reciprocating machines, design procedure for block foundation, foundations for impact machines, Indian standards for design and construction of foundations for impact machines, design procedure for impact machines, vibration screening - active and passive isolation (use of open trenches and piles).

14B14CE744 Rock Mechanics

Historical development of rock mechanics, Basic equations from solid mechanics, distribution of rocks on Indian mainland, stereographic presentation of geological data, laboratory testing of rocks, strength, modulus and stress-strain responses of rocks, engineering classification of rock and rock masses, In situ geophysical methods, electrical resistivity methods for ground characterization, deformability tests in rock mass, field shear test & permeability tests, estimation of stresses in rock mass, stability of rock slopes, rock foundations, methods to improve rock mass responses.

14B14CE745 Underground Technology

Introduction to various underground structures, Underground construction methodology & equipments, Excavations, soil support methods, diaphragm walls, Management of groundwater, dewatering methods, Cofferdams, Caisson & wells, Methods of Basement construction, Grouting, In- situ Densification: Preloading, Compaction Grouting, Dynamic Compaction, Blast densification, Vibro-Compaction and Vibro-Replacement, Compaction piles, Reinforcement of embankments and foundations, Tunnels: Introduction, Tunnel stabilization and lining, Cut and Cover Tunnels, Bored Tunnels, Immersed Tube Tunnels, Water Conveyance Tunnels, Micro-tunnels; Underground Conduits: Ditch Conduits, Positive Projecting Conduits, Negative Projecting Conduits, Imperfect Ditch Conduits, Tunneled Conduits

14B14CE746 Advanced Foundation Engineering

Bearing capacity from field tests data, bearing capacity for footings on layered soils, on slopes; bearing capacity of foundations with uplift or tension force; proportioning of footings; Stresses and displacements in layered and anisotropic soils; Foundations on difficult soils - residuals soils, sanitary landfills and geoenvironmental considerations; Special footings and beams on elastic

foundation, Design of raft foundation by flexible methods; Design of Piles for resisting uplifts, and laterally loaded piles; Settlement of pile groups; Design of foundations for vibration control, analysis and design of machine foundations; Computational methods in Geomechanics, Introduction to forensic geotechnical engineering

Departmental Elective-4

14B14CE747 Metal Structures

Moment connections: Simple, Semi-rigid and Rigid Connections; Connection Configurations; Angle. Cleat Connections; End-plate Connections; Semi-rigid Connections; Moment-rotation Characteristics. Industrial buildings: Structural Configurations; Functional and Serviceability Requirements; Industrial Floors; Roof Systems; Plastic Analysis and Design of Portal Frames; Crane Gantry Girders; Design for Wind Actions; Design for Earthquake Actions. Multi-storied buildings: Structural Configurations; Steel-Concrete Composite Floor Systems; Loading; Analysis for Gravity Loads; Lateral Load Resisting Systems; Analysis for Lateral Loads; Dual Systems; Advanced Structural Forms, Towers & tanks.

14B14CE748 Pre-Stressed Concrete Structures

Introduction to basic concept of pre-stressing, System of pre-stressing, Loss of pre-stress, Analysis for flexure, Design for flexure shear and torsion, Deflection and cracking consideration, Transmission of pre-stress, Precast elements: poles, railway sleepers, beams, slab, use of relevant codes of practice.

14B14CE749 Earthquake Engineering

Nature of Earthquakes: Plate Tectonics Theory, Faults and fault movements, Magnitude of earthquakes, Intensity scaling of earthquakes: subjective intensity and instrumental intensity, Characteristics of earthquake ground motions. Response Of Simple Structures To Earthquake Ground Motions: Seismic response of linear elastic single degree of freedom (SDOF) systems, Seismic response of inelastic SDOF systems Response spectra. Response of Multi Degree Of Freedom Systems (MDOF) To Earthquake Ground Motions: Free vibration analysis, Equivalent Lateral Load Procedure, Mode Superposition Procedure. Seismic Design Principles: Earthquake design philosophy, Design spectrum, Earthquake resistance of building systems, Response modification factors. Seismic Code Procedures: Classification of building systems, Selection of analysis procedure, Capacity design principles for reinforced concrete buildings, Case study: analysis and design of a multistory R/C frame.

14B14CE750 Bridge Engineering

Planning of bridges: Investigation for bridges- need for investigation- selection of site- economical span- subsoil exploration- investigation report- importance for proper investigation-Design of RCC bridges- IRC loading- types of bridges- components of bridges- analysis and design of slab bridges and box culvert. Design of girder bridges: T-beam bridges- Analysis and design of deck slab, longitudinal girders and cross girders Pigeaud's method- Courbon's method- Morice and Little method- Hendry-Jaegar method- prestressed concrete bridges (simply supported case only). Bearings: Importance of bearings- bearings for slab bridges- bearings for girder bridges-Design of elastomeric bearings -Joints -Appurtenances. Substructure- different types- materials for piers and abutments- substructure design- piers and abutments - shallow footings - well foundation. Construction methods: Inspection and maintenance and construction of bridges-case studies of recently constructed major bridges-critical studies of failure of major bridges. Features of suspension bridges and cable stay bridges.

14B14CE751 FEM and Its Applications To Civil Engineering

Introduction, Matrix-Displacement Formulation, Element Shapes, Nodes, Nodal Unknowns and Coordinate Systems, Shape Functions, Strain-Displacement Matrix, Assembly Stiffness Equation - Direct Approach, Galerkin's Method, Virtual Work Method, Variational Method, Applications of FEM in Civil Engineering 1-D Static Problems: Rod, String, Beam, Shaft One-dimensional Formulations; Boundary Conditions; Solution Algorithms; Descretization; Stress Deformation Analysis 2-D Static Problems: Plane Stress, Plane Strain, Axisymmetric Problems, Stability of Columns and Thin Plates Two-dimensional Formulations; Boundary Conditions; Solution Algorithms; Descretization.

14B14CE752 Advanced Concrete Technology

Basic concrete Technology: Ingredients of concrete; cement, aggregate, mineral and chemical admixture, water, properties of concrete, workability, strength, durability, essentials of concrete mix design, codal requirement. Approach to design for durability: Deleterious agencies, mechanism of attack, transport phenomena, ingress of liquids and gases in concrete, suction, permeability and diffusion, chloride diffusion coefficient, role of cover and mix proportion, latest provisions in modern code of practice. High Performance concrete: Definition, logical development, self compacting concrete, mix design, field practices, sustainable construction, role of mineral and chemical admixtures, examples as application in India.

Special Concrete: Light weight concrete, heavy weight concrete, Fiber Reinforced Concrete, Ferrocement, vacuum treated concrete, controlled permeability formwork. Quality control: Role of workmanship, batching, mixing, transportation, placing, compaction, curing, extreme weather concreting, role of RMC, statistical concept and acceptable criteria. Assessment of concrete and structures: Testing of concrete, accelerated strength test, core testing, nondestructive testing, load test on structures, distress investigations. Repair Techniques: Approach; planning for repair, material and procedure.

From outside Departmental Elective-5

14B14PH731 Nanotechnology & its Application

Introduction and Classification of nano-structured materials: Nanoscience and Nanotechnology, Brief History and future scope, Gleiter's classification of nano-structured materials, Classification of nanostructures by dimensionality. Fullerene, Nanotubes, Graphene. Conceptual background : Concept of matter waves, Schrodinger wave equation, confinement, particle in a potential box, barrier penetration and tunneling effects, concept of density of states. Size effects and properties of nano-structured materials. Concept of characteristic time and length scales of physical phenomena, Definition and types of size effects, extended internal surface, increasing surface energy and tension, Grain boundaries, classical and quantum size effects, size dependent thermal, mechanical, electrical, magnetic and optical properties of nano-structured materials e.g. Reduction of lattice parameter, decrease in melting point, decreasing thermal conductivity, diffusion enhancement, increasing plastic yield strength and hardness, blue shift, broadening of energy bands, phase transitions in ferromagnetic and ferroelectric materials, Techniques for synthesis of Nanostructures, Top-down and Bottom approaches, Vapor – phase synthesis, Liquid phase synthesis, Sol-gel technique, Solid – state phase synthesis, consolidation of nano-powders. Basic characterization and microscopy of Nanostructure materials: X-ray diffraction (XRD), UV- visible, FTIR, TGA, Scanning Electron microscopy (SEM), Transmission electron Microscopy (TEM), Scanning probe microscopy, Scanning tunneling Microscopy (STM) and Atomic Force microscopy (AFM). Nanotechnology Applications: Applications of Nanostructures for diversified fields of Engineering.

14B14MA733 Optimization Techniques

Formulation of Linear Programming (LP) and Non- Linear Programming Problems (NLPP) and their Graphical Solutions, Simplex Method, Sensitivity Analysis, Duality, Dual Simplex Method, Integer Linear Programming Problems, Transportation Problems, Assignment Problems, Introduction to NLPs, Kuhn- Tucker Conditions, Quadratic Programming Problems and their solutions.

14B14CL844 Introduction to Computational Fluid Dynamics

Introduction: History, Comparison of the three basic approaches for engineering problems in solving by analytical, experimental and computational methods, Beam advance in computational techniques, Softwares available for CFD. Problem Formulation: Formulation of problem, Physical and mathematical classification of problems, Types of governing differential equations. Methods Of Discretisation: Basic of finite difference method, Finite element method, Finite volume method and Spectral method, Treatment of boundary conditions. Numerical Solution Of Heat Conduction Problems: Steady-state problems, One dimensional heat conduction transfer through a pin-fin, Two dimensional conduction through a plate unsteady state problem, One dimensional transient heat conduction, Explicit and implicit methods, Assessing accuracy and stability of numerical methods. Numerical Solution Of Fluid Flow Problems: Types of fluid flow and their governing equation, Viscous incompressible flows calculation of flow field using the stream function-vorticity method, Calculation of boundary layer over a flat plate, Numerical algorithm for solving complete Navier-Stokes equation-MAC method SIMPLE algorithm, Introduction to standard model for turbulent incompressible flow, Project problem.

14B14CI853 Artificial Neural Network

Introduction to AI: Definitions, Goals of AI, AI Approaches, AI Techniques, Branches of AI, Applications of AI. Introduction of Intelligent Systems, Agents and Environments, Good Behaviour: the concept of Rationality, The Nature of Environments, The structure of Agents, How the components of agent programs work. Problems Solving, Search and Control Strategies: Solving Problems by Searching, Study and analysis of various searching algorithms. Implementation of Depth-first search, Problem-Solving Agents, Searching for Solutions, Uninformed Search Strategies: Breadth-first search, Uniform-cost search, Depth-first search, Depth-limited search, Iterative deepening depth-first search, Bi-directional search Informed (Heuristic) Search Strategies: Greedy best-first search A* search: Minimizing the total estimated solution cost, Conditions for optimality: Admissibility and consistency, Optimality of A*, Memory-bounded heuristic search, Heuristic Functions, Generating admissible heuristics from sub problems: Pattern databases, Learning heuristics from experience. Beyond Classical Search, Local Search Algorithms and Optimization Problems: Hill-climbing search Simulated annealing, Local beam search, Genetic algorithms, Local Search in Continuous Spaces, Searching with Non-deterministic, Actions: AND-OR search trees, Searching with Partial

Observations. Adversarial Search and Constraint Satisfaction Problems, Study of min-max algorithm: Adversarial Search: Games, Optimal Decisions in Games, The mini-max algorithm, Optimal decisions in multiplayer games, Alpha--Beta Pruning, Move ordering , Imperfect Real-Time Decisions, Evaluation functions, Cutting off search, Forward pruning, Search versus lookup, Stochastic Games, Evaluation functions for games of chance, Partially Observable Games. Constraint Satisfaction Problems: Defining Constraint Satisfaction Problems, Variations on the CSP formalism, Constraint Propagation: Inference in CSPs, Backtracking Search for CSPs, Local Search for CSPs, Alpha-beta pruning and CSP, Implementation aspects of mini-max algorithm and CSP. Knowledge Representations Issues, Predicate Logic, Rules: Knowledge representation, KR using predicate logic, KR using rules. Reasoning System - Symbolic, Statistical: Reasoning, Symbolic reasoning, Statistical reasoning. Fundamentals of Neural Networks: Introduction and research history, Model of artificial neuron, Characteristics of neural networks, learning methods in neural networks, Single-layer neural network system, Applications of neural networks.

14B14WE753 Wind Resistant Design of Structures

Basic wind characteristics: Atmospheric boundary layer- nature of wind- normal and extreme wind-deterministic and probabilistic description- mean return period-mean velocity profile-power law and logarithmic law—average time-turbulence-terrain types-correlation –spectrum of wind-topography. Basic bluff body aerodynamics: Flow around bluff bodies-Governing equations-Important aerodynamic parameters-pressure and force coefficients-mean and fluctuating pressures- -drag and lift- flow over prisms and circular cylinders- role of Reynolds number and turbulence intensity-effects of aspect ratio. IS code on wind loads: Basic wind speed-Modification factors-k1, k2, k3 and k4-design wind speed-design wind pressures- external and internal pressures-pressure coefficients-Force coefficients-static and dynamic wind loads and effects. Introduction to boundary layer wind tunnel testing: Types of wind tunnels- principle of wind tunnel testing-similarity laws-simulation techniques - important flow and response parameters-case studies. Structural dynamics as applied to wind engineering: Static and dynamic loads- wind sensitive structures-single degree and multiple degrees of freedom Dynamic properties of a structure-Mechanical admittance function- Response of structures to dynamic wind loading. Wind resistant design of structures: Structural design philosophy- various loads-gravity and lateral loads-Design considerations-low-rise and high-rise buildings –Wind-sensitive structures - Case studies.

14B11CE711 Construction Technology and Management

Introduction to various operations in construction, execution and management Types of contract, contract documents, arbitration and settlement of disputes, contract laws and handling of contracts Introduction to network based project management techniques: Defining activities and their interdependence, drawing of network, time and resource estimations, and use of network as scheduling techniques, use of network as control technique. Selection of construction equipment, cost of owning and operating, capacity and utilization, breakdown analysis, economic life, replacement of equipment and sinking fund . Standard and special construction equipments, heavy earthmoving equipments, shovels and cranes, crushing plant, batching plant, bitumen plant. Techniques and equipments for concreting, tunneling, road pavement, dewatering, drilling, blasting and grouting Form works, their design, fabrication and uses. Use of information technology in construction industries Uses and design of scaffoldings .Steel constructions; fabrication and erection techniques.

14B19CE791 Project Part-I

Project is a course requirement wherein under the guidance of a faculty member, a final year student is required to do an innovative work with application of knowledge earned while undergoing various courses and laboratories in the course of study. The student is expected to do literature survey and carry out development and/or experimentation. Through project work the student has to exhibit both analytical and practical skills. The project is done in two semesters, i.e. 7th and 8th , on a continuous problem.

Year/Sem: IVth Year/VIII Sem

14B14HS841 Knowledge Management

Introduction, Types of Knowledge, Knowledge workers, Valuing knowledge, Communities of Practice, Content management, Creativity and Innovation, Knowledge management strategies, Business process and the process-oriented organization, Information and communication technologies (ICT), Management of intellectual capital, Different level of Knowledge management, Organizational culture, Developing human capital, Building and managing the knowledge repository.

14B14HS842 Industrial Psychology

Definitions & Scope of Industrial Psychology, Major influences on industrial Psychology- Scientific management and human relations schools Hawthorne Experiments. Motivation : Theories of Motivation: Early and Contemporary views, Three level Work Motivation Model, Motivating a Diverse Workforce, Stress management: Understanding Stress and Its Consequences, Causes of Stress, Managing Stress, Leadership: Style and Theories of Leadership-Trait, Behavioural and Situational Theories. Fatigue, Boredom, Accidents and safety, Job Analysis, Job Satisfaction, Recruitment and Selection – Different types of recruitment and selection tests, Reliability & Validity of recruitment tests. Group Dynamics: Definition, Stages of Group

Development, Group Cohesiveness, Formal and Informal Groups, Group Processes and Decision Making, Dysfunctional Groups, Organizational culture : Organisational Culture: Concept, Characteristics, Elements of Culture, Implications of Organisation culture, Process of Organisational Culture.

14B14HS843 Business Environment

Introduction to Business, Meaning of Business Environment: Economic and non economic factors influencing Business, Environmental Scanning, Process of environmental scanning, Economic systems: basic philosophies of Capitalism and Socialism with their variants. Concepts of Mixed Economy. Constitutional Framework of state control of Business: The relationship between Business and Government in India. Definition of Security, Securities Exchange Board of India- Composition Stock Exchange-BSE-NSE. Securities Exchange Board of India-Powers and Functions. Competition Act 2002: Objective, Anti Competitive Agreements : Competition Commission of India –Composition, Powers and Functions. MRTP Act : Abuse of Dominant, Position, Regulation, The Foreign Exchange Management Act, 1999- Objective and Applicability of the Act FEMA Vs FERA, Fiscal Policy Instruments – taxation, Monetary Policy: Types of Monetary Policy Instruments , Philosophy and strategy of planning in India, Industrial Policy in recent years, Indian Financial System Financial Sector reforms – 1, Indian Financial System Financial Sector reforms – 2, Policy with regard to small scale industries -1, Policy with regard to small scale industries -2 , e-business - objectives, trends and practical uses, Corporate Social responsibility , FDI Policy, EXIM Policy, New Economic policy (LPG), WTO & GATT, Make in India , Digital India campaigns.

14B14HS844 Management of Technology

Introduction to Technology Management: Definition, Concept of creativity, Components, Features, Classification of Technology, Concept and Nature of Technology Management, Drivers of MOT, Significance and Scope of MOT, Role of Chief Technology Officer, Responding to Technology challenges. The Role of Technology in the Creation of Wealth: The creation of wealth, Long-wave cycle, Evolution of production technology, Critical Factors in Managing Technology: The creativity factor, Types of innovation, Technology, price relationship, Managing change. Management of Technology: The New Paradigms Essential issues in technology management, Project planning and management, Management paradigm and the technology factor. Technology Life Cycles: S-curve of technological progress, Multiple generation technologies ,Diffusion of technology. The Process of Technological Innovation: Innovation and creative transformation in the knowledge age: critical trajectories, Case-Xerox, A model for technological innovation in biomedical devices. Strategic planning: Competitiveness, Business Strategy and Technology Strategy, Technology Planning. The Acquisition and Exploitation of Technology: Acquisition of technology. Exploitation of technology, Stages of technology development, Technology Transfer. Technology Diffusion: Concept of Diffusion, Integrated Diffusion Strategy, Influencing factors, Innovation adoption, Diffusion strategies, Community effects and network externalities, Distribution of Adopters, Crossing the Chasm, Market dynamics. Technology Absorption and Deployment, Technology Absorption, Influencing factors, Deployment strategies, Corporate Venturing, Benefits and Drawbacks of Corporate Venturing, Spin-off Companies.

14B14HS845 Strategic Management

Introduction, Strategic Management, Business Policy, Corporate Strategy, Basic Concept of Strategic Management, Mission, Vision, Objectives, Impact of globalization, Basic Model of Strategic Management, Strategic Decision Making, Impact of Internet and E-Commerce, Role of Strategic Management in Marketing, Finance, HR and Global Competitiveness. Environmental Scanning, Industry Analysis, Competitive Intelligence ETOP Study, OCP, SAP Scanning, Corporate Analysis, Resource based approach, Value-Chain Approach, Scanning Functional Resources, Strategic Budget and Audit. SWOT Analysis, TOWS Matrix, Various Corporate Strategies: Growth/Expansion, Diversification, Stability, Retrenchment & Combination Strategy. Process of Strategic Planning, Stages of corporate development, Corporate Restructuring, Mergers & Acquisitions, Strategic Alliances, Portfolio Analysis, Corporate Parenting, Functional Strategy, BCG Model, GE 9 Cell, Porters Model: 5 Force and Porters Diamond Model, Strategic Choice. Strategy Implementation through structure, through Human Resource Management: through values and ethics. Mc Kinsey's 7S Model, Organization Life Cycle, Management and Control, Activity based Costing, Strategic Information System.

Departmental Elective-6

14B14CE841 Hydro-Power Engineering

Introduction: Sources and forms of energy, types of power plants, historical perspective of hydropower development, hydropower development in India and world, hydropower potential, constraints in hydro power development, general arrangement of a hydroelectric project. Hydropower plants classification: Surface and underground power stations, low, medium and high head plants, layout and components, storage plants, diversion or run-of -river system, pumped storage plants, tidal power plants, micro tydal units, scale of hydro power projects, underground development. Load and power studies: Nature of power demand or load, load curve, load factor, capacity factor, utilization factor, load duration curve, firm power and secondary power, reservoir capacity. Intake structures: Components of intake, factor affecting the layout function and types of intakes,

energy losses at intake, trash rock, spacing of bars, air entrainment at intakes, inlet aeration. Penstocks and power canals: Classification of penstocks, design of penstocks, economic diameter, bends, anchor blocks, surges in canals, design criteria of power canals. Surge tanks: functions, location & arrangement of surge tank, types of surge tanks, hydraulic design, design of simple surge tank-stability. Hydraulic turbines: Types and classification, main components of turbines, efficiency of a turbine, constructional features, selection criteria, characteristic curves, governing of turbines specific speed, drafts tubes-types, draft tube theory, cavitation in turbines, unit quantities. Small hydropower development: Benefits and potential of small hydropower plants, components of small hydropower plants, trench weir, desilting tank

14B14CE842 Dams and Reservoir Design

Planning of project, Purpose of development, Project study, Ecological and environmental considerations, Flood studies, Economic considerations. Selection of type of dam, Classification of types, Physical factor governing selection of type, legal, economic, aesthetic considerations. Foundation and construction materials: Investigation, Source of information, Surface exploration, sampling, Field and laboratory tests. Earth fill dam: Origin, Selection of type, Design principles, Foundation design, Embankments, Embankment details. Rock fill dam: Origin and usage, Definition and types, Foundation design, Embankment design, Membrane design. Concrete gravity dam: Introduction, Origin and development, Forces acting on dam, Requirements for stability, Dams on pervious foundations

14B14CE843 River Engineering

Elements of river geomorphology: Origin and properties of sediment, river problems control of vegetation an river morphology. Soil Erosion and Sediment Yield: Types of erosion, Mechanism of soil erosion, Sediment delivery ratio, Process based modeling of soil erosion. Hydraulics of Alluvial Streams: Incipient motion, Modes of Sediment transport, Bed-forms, Resistance to flow in alluvial rivers, Bed load transport, Suspended load transport River Geometry and Plan Forms: Stable channels and their geometry, Flow around river bends, Braided river, Meandering River. Gravel Bed Rivers: Hydraulic geometry of gravel Bed Rivers, Armouring, Bed forms and resistance to flow in gravel bed rivers. Bed Level Variations in Streams: Degradation, Local scour, Aggradation, Reservoir sedimentation, Mathematical modeling for river bed variations. Rivers and Environment: Environmental effects of hydraulic structures, River pollution, River action plans, Stream restoration.

14B14CE844 Design of Hydraulic Structures

Diversion Head Works; Weirs and Barrages - Layout of a diversion Head work and its components. Failures of hydraulic structures founded on pervious foundations - creep theory for seepage flow - (Bligh's Lacey's and Khosla's). Storage works; Design of gravity dams : modes of failure and criteria for structural stability of gravity dams - Diversion problems in dam - construction of Galleries - joints - foundation treatment - Types of earthen dams - methods of construction - Causes of failure of earthen dams , Seepage Analysis - seepage control in Earthen dams. Spillways; Spillway types, control concepts, overflow, side channels, shaft and siphon spillways, chutes, cavitations, aeration Maintenance of Hydraulic structures; Types, procedure, charts, Annual maintenance.

Departmental Elective-7

14B14CE845 Advanced Pavement Design

Advanced highway materials; Sub grade soils , special problems in soil stabilization works, stone aggregates, Bituminous materials, Bituminous paving Mixes, Modified binders, Cement concrete Mixes, Design of bituminous mixes by marshal method, modified Hubbard -field method, Hveem method etc Flexible pavements: Layered system concept, California Resistance value or stabilometer method triaxial test method, McLeod method, Burmister method, IRC: 37 method. Rigid pavements: design parameters, modulus of sub grade reaction, stresses calculation, design of slab, spacing of joints, dowel bars, tie bars, reinforcement, IRC:58 method. Overlays: Pavement strengthening problems, types of overlays, advantages of Cement concrete overlays over bituminous overlays, white topping, overlay design, IRC:81 method. Joint filling & sealing, pre stressed concrete pavements, Influence charts,

14B14CE846 Airport Engineering

The Nature of Civil Aviation and Airports, Air Traffic Management, Development of air transport in India, Airport Planning - Air traffic potential, Site Selection, Cost Estimates, Evaluation and Institutional arrangements, Forecasting for Airport Planning, Advantages and Limitations of Air Transport, Aircraft Characteristics Related to Airport Design, Airport design standards. Components of Airports Runway Design- Orientation, Cross wind Component, Wind rose Diagram, Geometric Design and Corrections for Gradients, Drainage. Taxiway Design - Geometric Design Elements, Minimum Separation Distances, Design Speed, Design of Airport pavements. Airport Zoning - Clear Zone, Approach Zone, Buffer Zone, Turning Zone, Clearance over Highways and Railways Airport Layouts - Apron, Terminal Building, Hangars, Motor Vehicle Parking Area and Circulation Pattern, Case studies of Airport Layouts. Airport Buildings - Primary functions, Planning Concept, Principles of

Passenger Flow, Passenger Facilities Visual Aids - Runway and Taxiway Markings, Wind Direction Indicators, Runway and Taxiway Lightings Air Traffic Control - Basic Actions, Air Traffic Control Network, Helipads, Hangars, Service Equipment, heliports, air traffic control, air cargo, accidents in the air, maintenance of air ports.

14B14CE847 Urban Transportation, Planning & Design

Introduction: Transport and Socioeconomic Activities, Historical Development of Transport, Transportation in the Cities, Freight Transportation, Future Developments. Urban Transportation System Planning - Conceptual Aspects: Transport Planning Process, Problem Definition, Solution Generation, Solution Analysis, Evaluation and Choice, Implementation, Sequence of Activities Involved in Transport analysis. Trip Generation Analysis: Trip Production Analysis, Category Analysis, Trip Attraction Modelling. Mode Choice Modelling: Influencing Factors, Earlier Modal Split Models, Trip-End Type Modal Split Model, Trip-Interchange Modal Split Model, Disaggregate Mode-Choice Model, Logit Model of Mode Choice, Binary Choice Situations, Multinomial Logit Model, Model calibration, Case studies. Trip Distribution Analysis: Presentation of Trip-Distribution Data, PA Matrix to OD Matrix, Basis of Trip Distribution, Gravity Model of Trip Distribution, Calibration of Gravity Model, Singly and Doubly Constrained Gravity Models, A case Studies, Growth Factor Methods of Trip Distribution, Uniform. Factor Method, Average Factor Method, Fratar Growth-Factor Method, Disadvantage of Growth Factor Method. Route Assignment: Description of transport network, Route Choice Behaviour, The Minimum Path, Minimum Path Algorithm, Route Assignment Techniques, All-or-Nothing Assignment, Multipath Traffic Assignment, Capacity-Restrained Traffic Assignment Transportation Surveys: Definition of Study Area, Zoning, Types of Movements, Types of Surveys, Home-Interview Survey, Commercial Vehicle Survey, Intermediate Public Transport Survey, Public Transport Survey, Roadside-Interview Survey, Cordon-Line Survey, Post-Card Questionnaire Survey, Registration-Number Survey, Tag-on-Vehicle Survey. Transport Related Land-Use Models: Development of Land-Use models, The Lowry Model, Application of Lowry Model.

14B14CE848 Highway Construction, Maintenance & Management

Highway construction: History of road construction, equipments for the road construction, stages of construction, limitations in pavement construction due to weather. Earthwork: Clearing and grubbing, excavation, embankment construction, replacement of soils, soil stabilization. Non bituminous pavement constructions: granular sub base, water bound macadam, Bituminous pavement construction: Sub grade, granular sub base, base course, binder course, wearing coat, interlayer coats. Cement concrete pavement: Dry lean concrete, laying of concrete pavement, concrete surfacing, joints for cement concrete pavement, Highway maintenance: General, distress in pavements, cracking, patching, rutting, pot holes, stripping and swelling, evaluation of pavement, structural evaluation, pavement maintenance. Introduction to transport economics: Recycling of pavements: Introduction, selection of road for recycling, methods and equipments for recycling. Hill Roads: Alignment, geometrics, design and construction for hill roads, drainage design, maintenance. Quality control of road works: control of alignment, quality control tests during construction.

14B14CE849 Docks and Harbor Engineering

General: Historical development of water transportation in India, elements of water transportation, river and ocean transportation Natural phenomena: Tides, wind, water waves, wind rose diagram, currents, beach protection, littoral drift, design wave height, tide, storm surge and Tsunami. Docks and harbours: Requirements of port & harbour, site investigations, ship characteristics, Types of harbours,harboursize,harbour depth, turning basin,harbour entrance, , Naval hydrographic chart, Harbour works: Types of breakwater, design of breakwater, jetty, fenders, piers, warves, dolphins, trestle, moles, mooring accessories, off-shore moorings, types of dry docks and design, Navigational Aids: Types of navigational aids, requirements of signals, light- house, becon lights, floating navigational aids, light ships, buoys. Docks and repair facilities: Harbour docks, wet docks, dry docks, repair docks, marine railways, lift docks, keeland bilge blocking, timber gravity docks, construction of docks, lock gates, pumping plant and slipways. Port facilities: Port development, layout of ports, port planning, port building facilities, transit sheds, warehouses, cargo handling facilities, container handling terminal facilities, cargo carriers, marinas, ship terminals, inland port facilities .Mechanical handling systems, Dredging: Classification, types of dredgers, selection of dredger, uses of dredged materials, execution of dredging, Costal protection: Coastal erosion and accretion, design of sea wall, revetment, bulkhead, cathodic protection. Case studies: Effect of earth quake and Tsunami, integrity monitoring, Retrofitting and rehabilitation, Maintenance and modernization of existing ports: UPV, Half-cell potential, low strain and high strain integrity tests, rapid and comprehensive EIA, PPR on green field ports, DPR on green field ports.

Departmental Elective-8

14B14CE850 Environmental Management & Impact Assessment

Introduction, definitions and concepts, rationale and historical development of EIA, EIA for civil engineers. Components of EIA: Initial environmental examination, environmental impact statement, environmental appraisal, environmental

impact factors and areas of consideration. Pertinent institutional information, unique pollution problems, existing visual quality, public participation techniques. Composite consideration, potential cultural resources, potential visual impacts, geographical study area. Methodologies: Measurement of environmental impact, organization, scope and methodologies of EIA pertinent environmental factors. Six generic steps, descriptive checklists, simple interaction matrix, stepped matrix, uniqueness ratio, habitat evaluation system, public involvement techniques, comprehensive environmental impact study. Status of EIA in India: EIA Regulations in India, case studies from hydropower projects, highway and cement manufacture. Environmental management: Principles, problems and strategies; Review of political, ecological and remedial actions. Future strategies; multidisciplinary environmental strategies, the human, planning, decision-making and management dimensions EMS and Standardization: Introduction to ISO and ISO 14000. EMAS regulations, wider application of system based approach. Introduction to life cycle assessment. Carbon trading: GHG emissions, global warming, climate change and Carbon credits, CDM, Initiatives in India; Sustainable development; Future scenarios.

14B14CE851 Geoenvironmental Engineering

Soil- Pollutant Interaction: Introduction to geo environmental engineering, environmental cycle, sources, production and classification of waste, causes of soil pollution, factors governing soil-pollutant interaction, physicochemical behavior, failures of foundations due to pollutants. Characterization, Stabilization and Disposal: Safe disposal of waste, site selection for landfills, characterization of land fill sites, waste characterization stability of landfills, current practice of waste disposal, passive contaminant system, hazardous waste control and storage system, mechanism of stabilization, solidification of wastes, micro and macro encapsulation, absorption, adsorption, precipitation, detoxification, organic and inorganic stabilization. Transport of Contaminants: Contaminant transport in sub surface, advection, diffusion, dispersion, governing equations contaminant transformation, sorption, biodegradation, ion exchange, precipitation, hydrological consideration in land fill design, ground water pollution, bearing capacity of compacted fills, pollution of aquifers by mixing of liquid waste, protecting aquifers. Detection and Testing Methods: Methodology, review of current soil testing concepts, proposed approach for characterization and identification of contaminated ground soil for engineering purposes. Remediation of Contaminated Soils: Rational approach to evaluate and remediate contaminated sites, monitored natural attenuation, exsitu and insitu remediation, solidification, bioremediation, incineration, soil washing, electro kinetics, soil heating, verification, bio venting, ground water remediation, pump and treat, air sparging, reactive well application of geo synthetics in solid waste management - rigid or flexible liners.

14B14CE852 Energy Resources & Conservation

Introduction: Trends of energy consumption, sources of energy, conventional and renewable, fossil fuel availability and limitations, need to develop new energy sources. Energy Conservation Act, duties and responsibilities of energy managers and auditors Role of BEE, central & state governments. Energy audit: Definition need and types of energy audit. Conventional energy sources: Hydropower: Classification of hydro electric schemes, principal components of hydro electric scheme & their importance, assessment of water power potential. Thermal power: Principle of thermal power generation, raw material extraction & processing, layout of thermal power plant, gas power plants, braytons cycle, working, diesel power plant, environmental impacts of coal based thermal power plants, consideration in construction of nuclear power plant, Cooling Towers: principle, component parts, types an necessity. Nuclear power: Introduction, nuclear fission, raw material extraction & processing, layout of nuclear power plant, types of nuclear reactors and their application, safety measures in nuclear power plant, consideration in construction of nuclear power plant. Non-Conventional energy sources: Solar energy: Solar radiation characteristics and estimation, Solar Collectors, Flat Plate and concentrating types. Their comparative study, design and material selection, efficiency, solar photo voltaic systems, applications of solar collectors, cooking, heating, desalination, power plants and their considerations.. Biomass energy: Introduction, classification of biomass, types of conversion, direct combustion, thermo chemical conversion, biochemical conversion, biogas plant and its design, biofuel extraction and their applications. Wind energy: Introduction, wind turbine and its components, classification of wind turbines, horizontal axis, vertical axis, efficiency of wind power, Estimation of power rating of wind turbine. Geo-thermal energy: Sites, potentiality and limitation, study of different conversion systems. Tidal energy: Sites, potentiality and possibility of harnessing from site, limitations. Ocean thermal energy: Principle of utilization and its limitations, description of various systems. Energy conservation-principles, technologies, waste heat utilization, heat regenerators, energy storage, devices, instruction and control

14B14CE853 Industrial Waste Treatment

Introduction: Industrial scenario in India, industrial activity and environment, uses of water by industry, sources and classification of pollutants, industrial pollutants and environmental impacts, air pollution, water pollution, radioactive pollution, soil pollution, characteristics of waste water, disposal of wastes and considerations, methods for analysis. Treatment: Introduction to treatment of industrial waste water, reactors used for the treatment, equalization neutralization, proportioning, oil separation, flotation, chemical precipitation, air stripping, heavy metal removal, aerobic and anaerobic biological treatment, chemical oxidation, adsorption, photocatalysis, ion Exchange, membrane technologies, miscellaneous pollutants removal: chromium, mercury, ammonia, nutrient, phenolic effluents, organic vapour, low cost treatment systems and their design.

Management: Recent trends in industrial waste management, cradle to grave concept, life cycle analysis, clean technologies, common effluent treatment plant, case studies of various industries, e.g., dairy, fertilizer, tannery, distillery, sugar, pulp and paper, steel, cement, textile industries.

14B14CE854 Design of Water and Wastewater Treatment Plants

Water treatment: Unit operations and processes. Sedimentation: Design of primary and secondary sedimentation tank, Settling and removal efficiency for discrete and flocculent settling. Coagulation: coagulants and their reactions, determination of optimum doses of coagulant, design of rapid mix chamber. Flocculation, hydraulic and mechanical flocculators and their design, criteria for good flocculation. Filtration: Design of slow sand and rapid sand introduction to dual media filters and mixed media filters. Disinfection: disinfectants, chlorination and practices of chlorination. Water softening by lime soda process and ion exchange; calculation of dosage of chemicals. Design of water treatment plant. Wastewater Treatment: Unit operations and processes. Preliminary and Primary treatment: screens, grit chamber and their design, sedimentation and chemical precipitation. Secondary Treatment: Activated Sludge Process, aeration tanks, design of activated sludge units & modifications, trickling filters, theory and design using NRC equation. Anaerobic digestion of sludge, design of anaerobic digesters. Tertiary Treatment: Introduction to microstraining, adsorption on activated carbon, solvent extraction, ion exchange, reverse osmosis, electro dialysis, ammonia stripping, nitrification and denitrification, biological phosphorus removal, advanced biological systems, chemical oxidation, design of low cost waste water treatment systems. Design of complete wastewater treatment plant

Departmental Elective-9

14B14CE855 Remote Sensing & Gis Applications

Remote Sensing: System, data acquisition and processing; Applications; Multi concept in remote sensing. Physical basis of remote sensing - Electro-magnetic radiation (EMR) - nature, nomenclature and radiation laws; Interaction in atmosphere - nature, its effects in various wavelength regions. Atmospheric windows; Interaction at ground surface - soils and rocks, vegetation, water, etc.; Geometric basis of interaction. Platform and sensors - Terrestrial, aerial and space platforms; Orbital characteristics of space platforms, sun & geo-synchronous; Sensor systems radiometers, optomechanical and push broom sensor; Resolution - spectral, spatial, radiometric and temporal; Data products from various air and space borne sensors - aerial photographs, LiDAR, Landsat, SPOT, IRS, ERS, IKONOS, etc. Image interpretation- Elements of interpretation; Manual and digital interpretation; Field verification. Geographical Information Systems: Components of GIS- data acquisition, spatial and attribute data, pre-processing, storage and management; Data structures-raster and vector data; GIS analysis functions; Errors and corrections; Data presentation and generation of thematic maps; GIS applications.

14B14CE856 Sustainable Design & Construction

Introduction to sustainable design and construction. Background: Ethics and Sustainability, Basic concepts, Major Environmental and Resource concerns, Green Building movement. Green Building Assessment: LEED Building Assessment Standard. Ecological Design. Green Building Process: Conventional versus Green Building Delivery Systems, Integrated Design Process. Sustainable sites and Landscaping. Energy and Atmosphere: Building Energy issues, Passive Design Strategy, Building Envelope, Internal load reduction, Innovative Energy optimization strategies. Building Hydrologic System: Low Flow and Ultra Low flow fixtures, Rainwater Harvesting, Graywater systems, Reclaimed water. Green Building Materials and Green Building Products. Indoor Environmental Quality: Indoor Environment Factors, HVAC systems, Best Practices for IAQ.

14B14CE857 Repair, Retrofitting & Rehabilitation of Structures

Maintenance and repair strategies: Maintenance, repair and rehabilitation, Facets of Maintenance, importance of Maintenance various aspects of Inspection, Assessment procedure for evaluating a damaged structure, causes of deterioration, Local and Global Methods of Seismic Retrofitting of RC Buildings: System completion; Strengthening of existing components; RC, Steel and FRP Jacketing; Addition of new components - frames, shear walls and braced frames; Introduction to supplemental energy dissipation and base isolation. Serviceability and durability of concrete: Quality assurance for concrete construction concrete properties- strength, permeability, thermal properties and cracking - Effects due to climate, temperature, chemicals, corrosion - design and construction errors - Effects of cover thickness and cracking. Materials for repair: Special concretes and mortar, concrete chemicals, special elements for accelerated strength gain, Expansive cement, polymer concrete, Sulphur infiltrated concrete, Ferro cement, Fiber reinforced concrete. Techniques for repair and demolition: Rust eliminators and polymers coating for rebars during repair, foamed concrete, mortar and dry pack, vacuum concrete, Guniting and Shotcrete, Epoxy injection, Mortar repair for cracks, shoring and underpinning. Methods of corrosion protection, corrosion inhibitors, corrosion resistant steels, coatings and cathodic protection. Engineered demolition techniques for dilapidated structures - case studies. Repairs, rehabilitation and retrofitting of structures: Causes of distress, evaluation methods for condition, strength, serviceability; repair materials, repair techniques, and quality control methods for repair of concrete. Criteria for rehabilitation; retrofit techniques required in structures resulting from change in function, loading, and seismic forces.

14B14CE858 Forensic Geotechnical Engineering

Introduction to forensic engineering, types of damages; forensic geotechnical and foundation investigations: settlement of structures, expansive soils and related problems, lateral movements, other geotechnical and foundation problems, such as, earthquakes, erosion, deterioration, tree roots, bearing capacity failures, ground water and moisture problems. Repairs: slab-on-grade foundations, foundation repair alternatives, slope failures and landslides repair using pier walls

14B19CE891 Project Part-II

Project is a course requirement wherein under the guidance of a faculty member, a final year student is required to do an innovative work with application of knowledge earned while undergoing various courses and laboratories in the course of study. The student is expected to do literature survey and carry out development and/or experimentation. Through project work the student has to exhibit both analytical and practical skills. The project is done in two semesters, i.e. 7th and 8th , on a continuous problem.