S. V. National Institute of Technology, Surat

Civil Engineering Department

Revised Curriculum for B. Tech. (I, II, III & IV) (Civil Engineering)

EFFECTIVE FROM – July 2014

Teaching Scheme of B. Tech.-I (Semester I & II)

DIVISIONS – A, B, C, D & E

SEMESTER – I

Sr. No.	Subject	Code	Scheme	Credit
1	Engg. Mathematics-I	ASM 101	3-1-0	04
2	Engg. Physics	ASP 102 ABC	3-0-2	04
3	Engg. Chemistry	ASC 103 ABC	3-0-2	04
4	Engg. Mechanics	AMD 104 ABC	3-0-2	04
5	Engg. Drawing	CIME 105 ABC	2-0-4	04
6	Basics of Civil & Environmental Engg.	CICH 106 ABC	4-0-2	05
		Total	**18-1-12=31**	**25**

SEMESTER – II

Sr. No.	Subject	Code	Scheme	Credit
1	Engg. Mathematics-II	ASM 201	3-1-0	04
2	Electro-Techniques	ELE 207 ABC	4-0-2	05
3	Fundamentals of Computers & Programming	COM 208 ABC	3-0-2	04
4	Basics of Electronics Engg.	ECE 209 ABC	3-0-2	04
5	Basic Mechanical Systems	MED 210 ABC	3-0-2	04
6	English & Communications Skills	ASE 211 ABC	2-0-0	02
7	Workshop Practice	MED 212 ABC	0-0-4	02
		Total	**18-1-12=31**	**25**

Teaching Scheme of B. Tech.-I (Semester I & II)

DIVISIONS – F, G, H, I & J

SEMESTER – I

Sr. No.	Subject	Code	Scheme	Credit
1	Engg. Mathematics-I	ASM 101	3-1-0	04
2	Electro-Techniques	ELE 107 DEF	4-0-2	05
3	Fundamentals of Computers & Programming	COM 108 DEF	3-0-2	04
4	Basics of Electronics Engg.	ECE 109 DEF	3-0-2	04
5	Basic Mechanical Systems	MED 110 DEF	3-0-2	04
6	English & Communications Skills	ASE 111 DEF	2-0-0	02
7	Workshop Practice	MED 112 DEF	0-0-4	02
		Total	**18-1-12=31**	**25**

Semester – II

Sr. No.	Subject	Code	Scheme	Credit
1	Engg. Mathematics-II	ASM 201	3-1-0	04
2	Engg. Physics	ASP 202 DEF	3-0-2	04
3	Engg. Chemistry	ASC 203 DEF	3-0-2	04
4	Engg. Mechanics	AMD 204 DEF	3-0-2	04
5	Engg. Drawing	CIME 205 DEF	2-0-4	04
6	Basic of Civil & Environmental Engg.	CICH 206 DEF	4-0-2	05
		Total	**18-1-12=31**	**25**

Detailed Syllabus of B.Tech I

Engineering Drawing

	L	T	P	Credit
CEME 105 S1				
CEME 105 S2	**2**	**0**	**4**	**04**

COURSE OBJECTIVES:

CO-1: Convert sketches to engineering drawings.
CO-2: Draw orthographic and isometric projections of solid objects.
CO-3: Familiarity with engineering drawing standards and practices.
CO-4: Prepare simple civil engineering buildings as plan, elevation and section.

- **INTRODUCTION (01 Hours)**
  Importance of Engineering Drawing, Drawing instruments and materials, B.I.S.and ISO Conventions, First angle and third angle projection method.

- **ENGINEERING CURVES (03 Hours)**
  Classification of engineering curves, construction of conics, cycloidal curves, Involutes and spirals.

- **PROJECTION OF POINTS, LINES AND PLANES (04 Hours)**
  Introduction to principal planes of projection, Projections of the points located in same and different quadrant, projection of lines with its inclination to the reference planes, true length of the lines and its inclination with reference planes, projection of planes with its inclination with two reference planes, concept of auxiliary plane method for projection of planes.

- **PROJECTION AND SECTION OF SOLIDS (03 Hours)**
  Classification of the solids, projections of the solids like cylinder, cone, pyramid and prism with its inclination to two reference planes, Section of such solids and true shape of the section

- **PENETRATION CURVE (03 Hours)**
  Classification, line of interaction, line/generator method and section plane method; intersection of two prisms, two cylinders, interaction of cone and cylinder, pyramid with prism.

- **DEVELOPMENT OF THE LATERAL SURFACES (02 Hours)**
  Method of development, parallel line development, radial line development, developments of cylinder, cone, prism, pyramid, true length of edges – oblique surface.

- **ORTHOGRAPHIC PROJECTIONS (04 Hours)**
  Projections from pictorial view of the object on the principle planes for view from front, top and side using first and third angle of projection method

- **ISOMETRIC PROJECTIONS (04 Hours)**
  Terminology, isometric scale, isometric view and isometric projection, isometric axes and lines

- **INTRODUCTION TO COMPUTER AIDED DRAFTING (04 Hours)**
  Introduction of the drafting and modeling tools and demonstration of its application in latest machines.

(Total Lecture Hours: 42)

PRACTICALS: Practice with drawing sheets

1. Orthographic views
2. Isometric views
3. Engineering curves.
4. Projection of points and planes
5. Projection of solids.
6. Section of solids
7. Penetration curve and surface development
8. Demonstration of computer aided drafting and demonstration of its application in latest machines.

BOOKS RECOMMENDED:

1. Bhatt N. D., Engineering drawing, Charotar publishing house, 2014
2. Shah P. J., Engineering Graphics, S. Chand and Company, 2013

Energy and Environmental Engineering

	L	T	P	Credit
CEME 106 S1				
CEME 106 S2	**3**	**0**	**2**	**04**

- **ENVIRONMENT AND ECOSYSTEMS** **(12 hours)**

  Introduction: Concept of an ecosystem- structure and functions of ecosystem. Components of ecosystem - producers, consumers, decomposers, Food chains, food webs, ecological pyramids, Energy flow in ecosystem. Bio-geo- chemical cycles, Hydrologic cycle Components of Environment and their relationship, Impact of technology on environment, Environmental degradation. Environmental planning of urban network services such as water supply, sewerage, solid waste management.

- **ENVIRONMENTAL POLLUTION** **(10 hours)**

  Water, air, soil, noise, thermal and radioactive, marine pollution: sources, effects and engineering control strategies. Drinking water quality and standards, Ambient air and noise qualitystandards

- **GLOBAL ENVIRONMENTAL ISSUES AND ITS MANAGEMENT (8 hours)**

  Engineering aspects of climate change. Acid rain, depletion of ozone layer. Concept of carbon credit. Concepts of Environmental impact assessment and Environmental audit. Environmental life cycle assessment

- **ENERGY FUNDAMENTALS** **(8 hours)**

  Energy systems.Importance of energy. Quantifying energy, types of energy sources and end uses. Energy conversion processes.Conventional energy sources.Non-conventional energy sources.

- **ENERGY AND THE ENVIRONMENT** **(7 hours)**

  Global and Indian energy demand and growth. Environmental impacts of energy production – air and water. Climate change and energy.Energy and environment policy.Transportation and energy. Built environment and energy

(Total Lecture Hours: 42)

REFERENCES:

1. Daniel B Botkin& Edward AKeller,Environmental Sciences, John Wiley & Sons
2. R. Rajagopalan, Environmental Studies, Oxford UniversityPress
3. Benny Joseph,Environmental Studies, TMHpublishers
4. Dr. Suresh K Dhameja,Environmental Studies, S K Kataria& Sons, 2007
5. U K Khare,Basics of Environmental Studies, Tata McGrawHill, 2011

PRACTICALS:

1. Study of different ecosystem and different Biochemical cycles.
2. Study of Water Treatment Plant.
3. Study of Water Distribution Network.
4. Study of Effluent Treatment Plant
5. Study of Solid Waste Management system for urban area.
6. Demonstration of air pollution and noise monitoring equipment
7. Exercise on life cycle Assessment
8. Exercise on EIA
9. Exercise on Quantifying energy and energy growth demand
10. Analysis of Carbon Credit
11. Tutorial on Energy in Built environment

Introduction to Surveying		L	T	P	Credit
CECE 102 S1	Scheme	3	0	2	04

- **BASIC CONCEPT OF SURVEYING** **(06 Hours)**

  Role of Civil Engineer in Surveying, Definition, Basic measurements, Scale and Mapping, Types of Maps and their uses, Map sheet numbers, Map projections, Principles of Surveying, Classification of Surveying, Division of Surveying, Control networks, Locating position and topographic detail

- **MEASUREMENT OF DISTANCE** **(06 Hours)**

  Linear Measurement, Chain and Tapes, Field work, Distance adjustment, Errors in taping, Accuracies, Optical distance measurement (ODM), Electromagnetic distance measurement (EDM)

- **MEASUREMENT OF ANGLES** **(12 Hours)**

  Angle Measurement, Bearing and Direction, Equipment viz. Compass and Theodolite, Field procedure, Measurement of Horizontal and Vertical Angles, Method of Repetition, Method of Reiteration, Theodolite Traverse, Adjustment of traverse, Gale's Traverse Table

- **VERTICAL CONTROL** **(10 Hours)**

  Definitions, Principle of leveling, Methods of leveling, About Equipment, Instrument adjustment, Different types of Leveling, Curvature and refraction, Leveling applications viz. Reciprocal leveling, Profile leveling and cross sectioning, Precise leveling, Digital leveling, Trigonometrical leveling, Contouring and Characteristics of Contours

- **PLANE TABLE SURVEY** **(04 Hours)**

  Definitions, Plane table accessories, Advantages & Disadvantages, Methods of plotting – Radiation, Intersection & Traversing.

- **LAYOUT SURVEYS** **(04 Hours)**

  Protection and referencing, Basic setting-out procedures using coordinates, Technique for setting out a direction, Use of grids, Setting out buildings, Roads etc., Controlling verticality, Controlling grading excavation

(Total Lecture Hours: 42)

PRACTICALS / DRAWING*:

1. Study of various types of maps and symbols used
2. Introduction of Various Basic Surveying Equipments
3. Introduction of Leveling Equipment
4. Exercise on Leveling (Differential Method)
5. Exercise on Profile leveling/Cross Sectioning and contouring
6. Introduction of Angle Measuring Equipment 1 – Various types of Compass
7. Introduction of Angle Measuring Equipment 2 – Vernier Theodolite
8. Introduction of Angle Measuring Equipment 3 – Digital Theodolite
9. Measurement of Horizontal angels by Repetition and Reiteration method
10. Exercise on Theodolite Traversing

11. Introduction of Area Measuring Equipment – Plannimeter (Mechanical and Digital)
12. Evaluation of Area of map with irregular boundary
13. Setting out of a building
14. Final Submission

** Student has to prepare a journal with description of practical as well as to prepare drawing of given exercise in prescribed drawing sheet by the teacher and has to submit the same.*

. **BOOKS RECOMMENDED:**

1. W. Schofield, “Engineering Surveying”, Butterworth-Heinemann Publication, New Delhi(2001)
2. Arora K. R., "Surveying and Levelling, Vol. I & II", Standard Publications, Delhi (2000).
3. Kanitkar T.P. & Kulkarni S.V., "Surveying and Levelling, Vol. I & II", Vidyarthi Gruh Prakashan, Pune(1995).
4. Punmia B.C., “Surveying and Levelling, Vol. II & III”, Laxmi Publications Pvt. Ltd., New Delhi(1994)
5. Basak, N. N., “Surveying and Levelling“, Tata McGraw-Hill Publishing Co. Ltd., New Delhi(1994)

Building Technology		L	T	P	Credit
CECE 113 S2	Scheme	3	0	2	04

- **BUILDING MATERIALS** **(12 Hours)**

  Types of stones and bricks, uses and tests, building codes, I. S. specifications, manufacturing process, tiles, stone ware pipes ,Types of limes and cements, applications in building construction, Characteristics and tests. Mortars, mix proportions and uses, cement concrete, mixes and uses, formworks, placing, compacting and curing , reinforced concrete, reinforcement of foundations, columns, beams and slabs, formworks. Timber, polymers and plastics, energy saving materials, aluminum, glass, paints, surface coatings.

- **BUILDING STRUCTURAL COMPONENTS** **(12 Hours)**

  Foundations: Objectives, types, field applications, failures, precautionary measures. Maonary**:** Brick and stone, bonds, cavity, composite and partition walls, arches. Concrete: Plain, R.C.C., Pre-stressed, Precast concrete, slabs, beams, columns, lintels chajjas, cantilever, Formwork, ready mix concrete plant, batching, mixing, testing laying and curing, Strengths of concrete Timbering: Scaffolding, Shoring, Underpinning Flooring: Types, conventional flooring, terrazzo, mosaic tiles, IPS floor, timber and jack arch floors, tiles, rubber, PVC covering, leak proof techniques.

- **BUILDING JOINERY SYSTEMS** **(8 Hours)**

  Openings and staircases**:** Doors, windows, ventilators, nomenclature, fixtures and choices, Staircase terminology, types, structural forms, selection criteria Roofs**:** Types, terminology, Trusses, special roofs, coverings, ACC and GI sheets. Finishes: Plastering, pointing, mortar proportions, choices, white and colour washing, distempering, cement painting, varnishing and painting of woodwork and steel, weatheringeffects.

- **ELEMENTS OF BUILDING PLAN** **(4 Hours)**

  Basics and practice of building plan drawings, Basic AutoCad commands for building plans.

- **BUILDING AND ENVIRONMENT: (6 Hours)**

  Building materials, environment and carbon emission, Concept of Green buildings and rating systems LEED and GRIHA, Role of IGBC, CBRI

(Total Lecture Hours: 42)

BOOKS RECOMMENDED:

1. Arora D. S., "Geology for Engineers ", Mohindra Capital Publishers, Chandigarh.(1992)
2. Arora and Bindra , " A Textbook of Building Construction " , DhanpatRai& Sons, New Delhi. (1993)
3. Barry , " Building Constructions", Vol. I , II & III , ELBS Publications. (1989)
4. Ghosh D. N., " Materials of Construction ", Tata McGraw Hill Publication, New Delhi. (1991)

5. McCay , " Building Construction " , Vol. I , II & III , ELBS Publications. (1986)
6. Chudley, "Construction Technology – Volumes 1 and 2," 2nd Edition, Longman, UK, (1987).
7. Mehta Madan, Scarborough Walter, and Armpriest Diane, "Building Construction – Principles, Materials, and Systems" 2nd Edition, Pearson Education Inc.USA, (2008)
8. Edward Allen and Joseph Iano, "Fundamentals of Building Construction: Materials and Methods", Wiley Publication, (2008)

B.TECH.-II (CIVIL)

THIRD SEMESTER

Sr. No.	Course	Course Code	Teaching Scheme Hours per Week			Credits	Examination Scheme				
							Theory	TU	TW	Pract	Total Marks
			L	TU	PR		Marks	Marks	Marks	Marks	
1	Surveying	CE201	3	1	2	5	100	25	20	30	175
2	Fluid Mechanics	CE203	3	1	2	5	100	25	20	30	175
3	Solids Mechanics	AM207	3	1	2	5	100	25	20	30	175
4	Programming Applications in Civil Engineering	CO205	3	-	2	4	100	-	20	30	150
5	Engineering Economics & Management	MH207	3	-	-	3	100	-	-	-	100
Total contact hours per week = 26 Total Credit = 22 Total Marks =775											

FOURTH SEMESTER

Sr. No.	Course	Course Code	Teaching Scheme Hours per Week			Credit	Examination Scheme				
							Theory	TU	TW	Pract	Total Marks
			L	TU	PR		Marks	Marks	Marks	Marks	
1	Geomatics Surveying	CE202	3	1	2	5	100	25	20	30	175
2	Basic Transportation Systems	CE204	3	1	-	4	100	25	-	-	125
3	Structural Analysis - I	AM206	3	1	2	5	100	25	20	30	175
4	Engineering Mathematics-III	MH210	3	1	-	4	100	25	-	-	125
5	Hydraulics & Hydraulic Machines	CE206	3	1	2	5	100	**25**	20	30	**175**
Total contact hours per week = 26 Total Credit = 23 Total Marks =775											

B. TECH. II (CIVIL) SEMESTER – III	L	T	P	C
CE 201: SURVEYING	**3**	**1**	**2**	**5**

COURSE OBJECTIVES:

CO-1: Understand the concept of measurement techniques as well as map and associated details
CO-2: Computation of ground profile using different levelling technique
CO-3: Estimation of area and volume by field measurement as well as using formulae
CO-4: Location and marking of buildings, roads, rails various features etc using method of Plane Table Survey and Theodolite Survey
CO-5: Analysis of problem and its remedial measures pertaining to hydrograph and curve setting

- **MAPS AND ASSOCIATED DETAILS** **(04 Hours)**
  Types of Maps & their uses – Map sheet numbers – Map projections, Principle of EDM

- **LEVELLING** **(08 Hours)**
  Methods of levelling - Curvature and Refraction - Reciprocal Levelling - Profile Levelling and Cross-sectioning - Errors in Levelling - Contouring, Characteristics of Contours - Methods of Plotting Contours - Uses of Contour Maps - Applications of levelling in sewer line - Road alignment

- **PLANE TABLE SURVEY** **(07 Hours)**
  Plane table and its accessories - Plane table techniques, Two point and three point problems - Advantages and disadvantages of plane tabling.

- **COMPUTATION OF AREAS AND VOLUMES** **(07 Hours)**
  Areas from field measurements and plans - Different methods - Trapezoidal and Simpson's rule – Plannimeter - Volume by trapezoidal and prismoidal formula - Calculation of earthwork in cutting and embankment for civil engineering works - Mass haul diagram - Volume by spot levels - Capacity of reservoir.

- **THEODOLITE SURVEY** **(08 Hours)**
  Introduction, types of theodolite - Temporary adjustment of theodolite - field operations with theodolite - Measurement of Horizontal and Vertical Angles - Method of Repetition - Method of Reiteration - Theodolite Traverse - Gale's Traverse Table

- **CURVE SURVEYING** **(06 Hours)**
  Introduction, classification of curves - Simple Circular Curves - Definition and Notations - Methods of Setting out Curves - Compound Curve - Transition Curves

- **HYDROGRAPHIC SURVEYS** **(03 Hours)**
  Introduction – Equipment used - Sounding method

- **LAYOUT SURVEYS** **(02 Hours)**
  Introduction - Setting out buildings, Roads.

(Total Contact Time: 45 Hours)

PRACTICALS / DRAWING:

1. Study of various types of maps and symbols used
2. Exercise on Profile leveling/Cross Sectioning and contouring
3. Plane table survey
4. Evaluation of Area of irregular Figure
5. Various parts of Theodolite and its temporary adjustment
6. Measurement of Horizontal and Vertical angels by Repetition and Reiteration method
7. Exercise on Theodolite Traversing
8. Setting out a simple Circular curve
9. Setting out of a building
10. Project on Profile leveling/Cross Sectioning, Theodolite Traversing and Setting of simple Circular curve in the field*

*** For the project work field visit to be arranged for 3 to 4 days during semester**

BOOKS RECOMMENDED:

1. Arora K. R., "Surveying and Levelling, Vol. I & II", Standard Publications, Delhi (2000).
2. Kanitkar T.P. & Kulkarni S.V., "Surveying and Levelling, Vol. I & II", Vidyarthi Gruh Prakashan, Pune(1995).
3. Duggal K. S., "Surveying and Levelling, Vol. I & II", Tata McGraw-Hill Publishing Co. Ltd.,New Delhi (1995)
4. Punmia B.C., “Surveying and Levelling, Vol. II & III”, Laxmi Publications Pvt. Ltd., New Delhi(1994)
5. Basak, N. N., “Surveying and Levelling“, Tata McGraw-Hill Publishing Co. Ltd., New Delhi(1994)

B. Tech. II (Civil Engineering), Semester-III	L	T	P	C
CE 203: FLUID MECHANICS	3	1	2	5

COURSE OBJECTIVES:

CO- 1: Conceptualise basic fluid properties including behaviour of Newtonian fluid at rest and motion.

CO- 2: Apply mass, momentum and energy equation in open channel flow.

CO- 3: Estimate velocity distribution, Shear stress distribution and head loss in laminar and turbulent flow in pipes.

CO- 4: Analyse of pipes in series and parallels; and water distribution networks.

CO- 5: Measure flow through pipes using various flow measuring devices.

- **FLUID PROPERTIES (03Hours)**
  Scope of fluid mechanics, definition of fluid, fluid continuum concept, fluid properties and classification of fluids.

- **FLUID STATICS (04Hours)**
  Fluid pressure at a point and its measurements, manometry, hydrostatic forces on plane and curved surfaces, buoyancy and floatation, relative equilibrium under linear acceleration and constant rotation.

- **FLUID KINEMATICS (05Hours)**
  velocity field, classification of fluid flows based on space & time, one-, two- and three-dimensional flows. Eulerian and Lagrangian approaches, stream lines, path lines and streak lines, stream tubes, continuity equation, translation, linear deformation, rotation and angular deformation of fluid elements, vorticity, rotational and irrotational flows, circulation, velocity potential and stream functions, flownet and its characteristics , local , convective and substantial acceleration of fluid particles.

- **FLUID DYNAMICS (08 Hours)**
  Concept of control mass and control volume, Reynolds transport theorem, conservation of mass, momentum equation, Euler's equation , Navier-Stokes equations. Derivation of Bernoulli's equations from Euler's equation and applications of momentum and energy equations (pitot tube, weirs and sudden head loss due to expansion), energy and momentum correction factors.

- **FUNDAMENTALS OF LAMINAR AND TURBULENT FLOWS (09 Hours)**
  Reynolds experiment, critical Reynolds number and its determination, laminar flow through pipes and Hagen-Poiseuille equation, laminar flow through porous media, coquettes flow, measurement of viscosity, causes, characteristics and factors affecting turbulence, types of turbulence, shear and pressure relationships, Darcy-Weisbach equation for turbulent flow through pipe, shear stress velocity distribution in pipes.

- **FUNDAMENTALS OF BOUNDARY LAYER (08 Hours)**
  Boundary layer concept, applications of boundary layer in various fields, thicknesses of boundary layer, laminar and turbulent boundary layers, laminar sub layer, application of Momentum equation, stream lined and bluff bodies, integral momentum equation, Prandtl's boundary layer equations. Boundary layer on rough surfaces, boundary layer separation and methods to avoid separation, wake, concepts of drag and lift on submerged bodies, types of drags and its determination.

- **PIPE FLOW PROBLEMS (05 Hours)**
  Friction loss in pipes, minor losses in pipes, concept of equivalent length and diameter of pipes, siphons, parallel and compound pipe lines, branching of pipe lines, pipe networks and methods of analysis, three reservoir problem, water hammer and methods of analysis.

- **FLUID FLOW MEASUREMENT (03Hours)**
  Flow measuring devices: nozzle, Venturi and bend meters, notches, weirs and Pitot tubes, orifices and mouthpieces.

PRACTICALS:

1. To determine relationship between hydrostatic pressure & depth of Immersion.
2. Dermination of metacentric height.
3. Determination of the co-efficient of discharge, velocity and contraction for a circular orifice.
4. Calibration of rectangular & triangular notches.
5. Calibration of venturi meter.
6. Calibration of nozzle meter.
7. Calibration of orifice meter.
8. Calibration of centrifugal head meter
9. Verification of Bernoulli's theorem.
10. Determination of friction factor of given pipe system for laminar flow & turbulent flow for single and multiple pipes.
11. Reynolds experiment: Establishment of laminar, transition & turbulent flows.
12. Characteristics of free and forced Vortex.

BOOKS RECOMMENDED:

1. Garde R. J. and Mirajgaoker A. G. "Engineering Fluid Mechanics", Scitech Publications(India)Pvt. Ltd., Chennai, 2003.
2. Fox W.R. and McDonald, A.T., “Introduction to Fluid Mechanics”, Wiley andSons Inc., New York, 1998.
3. Asawa G L, “Fluid Flow in Pipes and Channels”, CBS Publishers, New Delhi, 2008
4. Jain A K, “Fluid Mechanics including Hydraulic Machines”, Khanna Publishers, New Delhi, 2000.
5. Streeter V.L., Bedford K. and Wylie E. B., “Fluid Mechanics”, McGraw Hill Book Company Ltd., New York, 1998.

B. Tech. – II (Civil), Semester - III	L	T	P	C
AM 207: SOLID MECHANICS	**3**	**1**	**2**	**5**

COURSE OBJECTIVES:

CO- 1: Able to understand the fundamental properties of various materials and analyse the elastic member using basic principles.
Co- 2: Able to solve the problems related to structural member subjected to tension, compression, torsion and bending using fundamental concepts of stress, strain, basic principles.
CO-3: Able to draw the behaviour diagram of shear force and bending moments of beams.
CO- 4: Able to analyse and illustrate and evaluate the stress distribution due to various types of mechanical forces.
CO- 5: Able to apply concepts of failure theories while designing structural member.
CO- 6: Student will identify when theory applies and when theory is limited by simplifying assumptions.
CO- 7: Student will identity reasons why actual measurements will differ from theoretical calculation.
CO- 8: Student will use the laboratory equipment correctly and safely to perform all experiment.

- **STRESSES AND STRAINS (Hours-05)**
  Concept of stresses and strains – Types of stresses – Hook's Law – Lateral strain – Poisson's ratio – Elongation due to own weight – Tapering sections – Varying cross sections – Composite sections – Relation between Modulus of Elasticity, Modulus of Rigidity and Bulk Modulus – Thermal Stresses – Eccentric load – Limit of eccentricity – Core /Kernel of the section.

- **SHEAR FORCE DIAGRAM AND BENDING MOMENT DIAGRAM (Hours-05)**
  Types of beams – Types of supports – Types of loads – shear force – Bending moment – Sign conventions – Overhanging beams – Point of contra flexure – Varying loads – Relation between SF and BM.

- **STRESSES IN BEAMS (Hours-05)**
  Theory of simple bending – Moment of Resistance – Beam of Uniform strength – Flitched beams – Shear stress concept – Derivation of shear stress – Shear stress variation in rectangular, circular, T-section and I – section

- **SPRINGS (Hours-04)**
  Types of springs – Close coiled helical spring subjected to axial load and twist – Leaf springs – Semi elliptical and Quarter elliptical leaf springs

- **PRINCIPAL STRESSES** **(Hours-02)**
  Principal plane – Principal stress – Tangential and normal stress – Derivation of Major and Minor principal stresses for different cases – Mohr's circle graphical method

- **THEORIES OF FAILURE** **(Hours – 02)**

- **THIN CYLINDERS** **(Hours - 03)**
  Stresses in cylinders – Thin cylinders and thin spheres – Volumetric strain – Wire wound thin cylinders

- **WELDED JOINTS** **(Hours-02)**

- **TORSION** **(Hours-05)**
  Basic theory of Torsion – Solid shaft – Hollow shaft – Power transmitted by shaft – Composite shafts

- **COLUMN AND STRUTS** **(Hours-05)**
  Euler's theory for columns – Different end conditions – Rankine's formula – Limitations of Euler's theory

- **STRAIN ENERGY** **(Hours-04)**
  Strain energy – Resilience – Strain energy due to Tension and compression - Strain energy due to freely falling load

---

PRACTICALS:

1. Tension Test on MS and CI specimens
2. Torsion Test on MS Specimen
3. Charpy Impact Test
4. Transverse Test on Wooden beam
5. Spring Test
6. Compression test on CI Columns
7. Shear Strength Test
8. Hardness Test

BOOKS RECOMMENDED:

1. Timoshenko S & Young D H "Elements of Strength of Materials", Tata Mc Graw Hill, New Delhi,2006
2. Ryder G H, "Strength of Material", English Language Book Society, New Delhi, 2006
3. Bhavikatti S S "Strength of Materials", Vikas Publication House, New Delhi,2007
4. Egar P. Popov & Toader A . Balan "Engineering Mechanics of Solids" 2nd Edition, Pretice Hall of India Pvt Ltd, New Delhi, 2002
5. Beer F. P. & Johnston S J, "Strength of Materials" Tata Mc Graw Hill Publication, New Delhi,2004

B. Tech. II (CIVIL), Semester - III	L	T	P	C
MH 207: ENGINEERING ECONOMICS & MANAGEMENT	3	0	0	3

COURSE OBJECTIVES:

CO- 1: Development of managerial skills.

CO- 2: Development of future engineering managers.

CO- 3: Development of skills related to various functional area of management (Marketing, finance, operational etc.)

CO- 4: Development of awareness about modern management concepts (ERP, SCM, e- CRM, Etc.)

- **ECONOMICS: (12 Hours)**

  Introduction To Economics, Micro & Macro Economics, Applications & Scopes Of Economics, Demand Analysis, Demand Forecasting, Factors Of Production, Types Of Cost, Market Structures, Break Even Analysis, Concept Of Supply, National Income

- **MANAGEMENT: (16 Hours)**
  - Introduction To Management, Features Of Management, Nature Of Management, Development Of Management Thoughts – Scientific Management By Taylor & Contribution Of Henry Fayol, Coordination & Functions Of Management, Centralization & Decentralization, Decision Making
  - Fundamentals Of Planning
  - Objectives & MBO
  - Types Of Business Organizations: Private Sector, Public Sector & Joint Sector
  - Organizational Behavior: Theories Of Motivation, Individual & Group Behavior, Perception, Value, Attitude, Leadership
- **FUNCTIONAL MANAGEMENT: (12 Hours)**
  - Marketing Management: Core Concepts Of Marketing, Marketing Mix (4p), Segmentation – Targeting – Positioning, Marketing Research, Marketing Information System, Concept Of International Marketing, Difference Between Domestic Marketing & International Marketing
  - Personnel Management: Roles & Functions Of Personnel Manager, Recruitment, Selection, Training

- Financial Management: Goal Of Financial Management, Key Activities In Financial Management, Organization Of Financial Management, Financial Institutions, Financial Instruments, Sources Of Finance

- **MODERN MANAGEMENT ASPECTS: (05 Hours)**

  Introduction to ERP, e – CRM, SCM, RE – Engineering, WTO, IPR Etc.

(**Total Contact Hours: 45 Hours)**

BOOKS RECOMMENDED:

1. Prasad L.M., "Principles & Practice Of Management", Sultan Chand & Sons, 1994
2. Banga T. R. & Shrama S.C., "Industrial Organisation & Engineering Economics", Khanna Publishers, 1995
3. Robbins S., "Organizational Behavior" , Phi (Pearson), 1998
4. Kotler P., Keller, Koshi & Jha, "Marketing Management – A South Asian Perspective", Pearson, 2007
5. Aswathapa K, "Human Resource and Personnel Management", Tata McGraw Hill, 2001

B. Tech. II (Civil) Semester - 3	L	T	P	C
CO205 : Programming Application In Civil Engineering	**3**	**0**	**2**	**4**

COURSE OBJECTIVES:

CO- 1: Understand the foundational ideas in computer science and be able to se this knowledge to guide their thinking in technical problem solving applied to Civil Engineering Applications.

CO-2: Be effective in the design and construction of software applications applied to civil engineering applications.

CO- 3: Be able to work effectively on teams working on software project. This includes oral and written communication skills as well as collaborating programming skills.

CO- 4: Be informed in social issues that affect and are affected by the application of computing technology applied to civil engineering.

- **INTRODUCTION** **(06 Hours)**
  Programming Introduction to Programming methodology, Introduction to Data Structure, Primitive and Non-primitive data structure.

- **LINEAR DATA STRUCTURE** **(06 Hours)**
  Definition and analysis of Array, Stack, Queue, String, Link List and application.

- **NON LINEAR DATA STRUCTURE** **(04 Hours)**
  Definition and analysis of Trees, Graph.

- **FILE PROCESSING** **(08 Hours)**
  Study and implementation of Different file organization & access techniques.

- **OBJECT ORIENTED PROGRAMMING** **(04 Hours)**
  Introduction to Class and Object, Basic Characteristic of Object Oriented Programming.

- **APPLICATIONS IN CIVIL ENGINEERING** **(14 Hours)**
  Sorting and Searching Methods, Dictionaries, Sparse matrix and its representation, Matrix Structural Analysis, Numerical Methods, Graphics and applications, Stress Calculation application, Strom water Management, Strom drain water Management, Surveying, Road Transportation.

(Total Contact Time: 42 Hours)

PRACTICALS:

1. Implementation of Array, Stack, Queue.
2. Implementation of Link List, Tree and Graph
3. Implementation of Graphics primitives and GUI design
4. Mini Project (Implementation of Civil Engineering Applications)

BOOKS RECOMMENDED:

1. Trembley&Sorenson, "An Introduction to Data Structures with Applications", TMH,2/E,1993, Reprint 1995
2. Tanenbaum A.M. & Augenstein M. J., "Data Structures using C and c++", PHI, 1981, Reprint 1996
3. Shastri S.S., "Methods of Numerical Analysis", PHI,2004
4. Gere Weaver :"Matrix Analysis of Framed Structures", Van Nostrand Reinhold,3/E,1990
5. Birdi G.S., "Basic Civil Engineering", Dhanpat rai & sons publication,1994

B. TECH. II (CIVIL) SEMESTER – IV	L	T	P	C
CE 202: GEOMATICS SURVEYING	3	1	2	5

COURSE OBJECTIVES:

CO- 1: Understand advanced surveying techniques and geospatial techniques.

CO- 2: Establishment of horizontal control points and preparation of topographic map of hilly region.

CO- 3: Computation and measurement of relief displacement, development of mosaic etc. Using principle of photogrammetry.

CO- 4: Measurement and mapping of area using concept of Global Positioning System.

CO- 5: Analysis of problem and its solution using application of remote sensing and GIS.

- **TACHEOMETRIC SURVEY** **(06 Hours)**
  Principles of tacheometry - Different systems of tacheometry – Traversing, trilateration & triangulation
- **GEODETIC SURVEYING** **(07 Hours)**
  Principles - Classification if triangulation systems - Selection of stations - Signals and towers - Baseline measurement and correction - Extension of base - base net - Satellite station - Reduction to center - Introduction to theory of errors and technical terms
- **TOTAL STATION SURVEY** **(04 Hours)**
  Principle – Data observations – Software
- **TERRAIN DATA COLLECTION** **(04 Hours)**
  Airborne laser thematic mapper (ALTM) – LIDAR – Profiles – Digital elevation models
- **PHOTOGRAMMETRIC SURVEY** **(09 Hours)**
  Introduction - Technical terms - Aerial photogrammetry – Types of photographs - Vertical photographs – Uses of aerial photographs, Flying height & scale – Relief displacement – Stereoscopy – Measurement of parallax and height determination – Mosaic preparation.
- **GPS** **(05 Hours)**
  Introduction to GPS – Geodesy - Working principle of GPS - Measurement and mapping techniques.
- **REMOTE SENSING** **(05 Hours)**
  Concepts and fundamentals of remote sensing - Energy sources - Energy interactions, ideal remote sensing systems – Various types of images & their uses
- **GIS** **(05 Hours)**
  Overview of GIS, data input and output, data management.

(Total Contact Time: 45 Hours)

PRACTICALS / DRAWING:

1. Tacheometric Exercise with Vernier Theodolite, Theo 020 and Theo 120
2. Measurement of Horizontal Angle with Digital Theodolite DT6 and Digital Theodolite DT500
3. Exercise on Triangulation Work including satellite Station
4. Demonstration of total station and its uses
5. Comparison between aerial photographs and map.
6. Use of parallax bar
7. Determination of height of objects from aerial photographs.
8. Demonstration of GPS and its uses
9. Remote sensing data analysis and Demonstration on GIS software
10. Project on Tacheometric Survey and Triangulation Survey in the field*

*** For the project work field visit to be arranged for 5 to 6 days during semester**

BOOKS RECOMMENDED:

1. Arora K.R., "Surveying and Levelling, Vol. II and III", Standard Publications, Delhi (2000).
2. Kanitkar T.P. & Kulkarni S.V., " Surveying and Levelling, Vol. II and III", Vidyarthi Gruh Prakashan, Pune(1995).
3. Lillesand T. M. and Kiefer. R.W., "Remote Sensing and Image Interpretation", 4th Edition, John Wiley and Sons, New York, (2002).
4. Agrawal N.K., "Essentials of GPS" Spatial Network Pvt. Ltd., Hydrabad(1997).
   Stan Aronoff, "Geographic Information Systems: A management perspective", WDL Publications, Canada, (1989).

B.Tech. II (Civil) Semester-IV	L	T	P	C
CE204: BASIC TRANSPORTATION SYSTEMS	**3**	**1**	**0**	**4**

COURSE OBJECTIVES:

CO- 1: Select the effective transportation mode considering the socio economical, geographical, geological and political aspects.

CO- 2: Carryout different surveys in selecting the site for planning of a new transportation system. (ie Railway, waterways or Airways)

CO- 3: Identify the forces and stresses to be considered while designing various transportation structures like railway track, harbour components, runway, bridge and tunnels.

CO- 4: Design the layout of terminal facilities like railway station, yards for railways, docks and harbours for waterways and airport for airways.

CO- 5: Apply the knowledge of various carrier characteristics in design of transportation structures.

- **INTRODUCTION TO TRANSPORTATION SYSTEMS (02 HOURS)**
  Transport Systems - Introduction, development of road transport, air transport, waterways, Comparison of various modes of transportation.

- **RAILWAYS (15 HOURS)**
  Permanent Way - Preliminary survey, reconnaissance survey, location survey, development, gauges, uniformity of gauges, types and functions of various components such as rails, sleepers, ballast, rail fastening etc., coning of wheels, gradient and grade compensation, Points and Crossings - Terminology, various types of track junctions, turnout and diamond crossing, Construction and Maintenance - Plants & laying, material requirements, construction methods, Stations & yards.

- **TRANSPORTATION STRUCTURES (08 HOURS)**
  Types – Culverts, Bridge, fly-overs, tunnels, components, classification, requirements, site selection, alignment, bridge sub structure, Bridge Super Structure - Super structure elements, bridge flooring, slab bridges & girder bridges, bridge bearings, joints in bridges, piers, abutments, wing walls and approaches, loads and stresses.

- **DOCKS AND HARBOURS (08 HOURS)**
  Harbours and Ports: Classification of ports, requirements of a good port, classification of harbour, harbour planning, requirements of harbour, Docks and Spillways - Introduction, advantages of docks, moles, shape of docks and basins, dock entrance, entrance docks, quays, jetties and wharves, tide, wind and wave, dry dock, types of breakwaters.

- **AIR TRANSPORT** **(12 HOURS)**
  Air port planning, Surveys for site selection, Wind rose diagram and its utility, Runway Design, Taxiway, Apron, Hanger, Radar, Planning of terminal area of air port, Classification of air ports, Instrument Landing System, Air Traffic Control, ICAO, FAA, AAI.

BOOKS RECOMMENDED:

1. Vazirani V.N. and Chandola C.D., "Transportation Engineering – Vol. I to IV", Khanna Publishers, Delhi. 1999
2. Horenjeff Robert, "Planning & Design of Airports", McGraw Hill Book Co., New Delhi,1985
3. Saxena S.C., Arora K.L., "Railway Engineering", Dhanpat Rai & Sons, New Delhi 1995
4. Morlok E.W., "Introduction to Transportation Engineering", Mc-Graw Hill Publishing Co., New Delhi 1978
5. Bindra S.P., "Bridge Engineering", Dhanpat Rai & Sons, New Delhi 1997.

B. Tech. – II (Civil), Semester - IV	L	T	P	C
AM 206: STRUCTURAL ANALYSIS-I	**3**	**1**	**2**	**5**

COURSE OBJECTIVES:

CO- 1: Apply fundamentals of structural analysis in:

- Types of structural components
- Types of structures
- Determinacy and indeterminacy of structures
- Types of loadings etc.

CO- 2: Analyse determinate structures including trusses, beams and frames with and without internal hinges.

CO- 3: Analyse compound trusses, Analysis of 2D and 3D trusses using tension coefficient method

C0- 4: Plot influence line diagrams for moving loads on girder.

CO- 5: Determine deflection in beams using various methods foe determination of deflection including successive integrity, conjugate beam method etc.

CO-6: Determine deflection in trusses using virtual work method.

CO- 7: Apply fundamentals of force and displacement methods of analysis (flexibility and Stiffness method)

CO- 8: Analyse indeterminate trusses using force and displacement methods, method of superposition and method of consistent deformation.

CO- 9: Apply basic principles of vibration theory.

- **BASIC INTRODUCTORY CONCEPTS (Hours – 4)**
  Structural Systems - Equilibrium and compatibility - Stability and Indeterminateness - Types of Loadings - Free body diagram.

- **ANALYSIS OF FORCES IN STATICALLY DETERMINES STRUCTURES (Hours –6)**
  Analysis Trusses (Including compound trusses), Beams and Frames (Including internal hinges) – Analysis of Beams and Frames (Including internal hinges)

- **ANALYSIS OF SPACE TRUSSES USING TENSION COEFFICIENT METHOD. (Hours – 4)**

- **ANALYSIS FOR MOVING LOADS (Hours – 12)**
  Influence lines for determinate beams and trusses - Criteria for maxima of internal forces for beams and trusses.

- **DISPLACEMENT OF STATICALLY DETERMINE STRUCTURES (Hours – 6)**
  Determination of slope and deflections of beams using successive integration and conjugate Beam methods – Determination of deflection of trusses using virtual work method – Williot Mohr Diagram

- **INTRODUCTION TO FORCE (FLEXIBILITY) AND DISPLACEMENT (STIFFNESS) METHOD OF ANALYSIS (Hours-3)**

- **ANALYSIS OF INDETERMINATE TRUSSES (Hours-7)**
  Statically indeterminate structures –Force and Displacement method of analysis - Analysis by superposition – Selection of redundant restraints – Method of consistent deformations

PRACTICAL:

1. Determination of Shear force for simply supported beams.
2. Determination of Bending Moment for simply supported beams
3. Determination of Slope of continuation beams.
4. Determination of Deflection of continuous beams.
5. Determination of deflection of pin-jointed trusses.
6. Determination of reaction of portal frames
7. Determination of deflected shape of portal frames.
8. Determination of influence line of determinate beams.

BOOKS RECOMMENDED:

1. Gupta S P and Pandit G S, " Theory of Structures" Volume 1 and 2, Tata Mc Graw Hill, New Delhi, 1999
2. Vaidyanatnan, R and Perumal P "Structural Analysis", Vol – I & II, 3rd edition, Laxmi Publication, New Delhi, 2007
3. Negi L S and Jangid R S, "Structural Analysis", Tata Mc Graw Hill, New Delhi, 1999
4. Utku, S, Norris, C H and Wilbur, J B "elementary Structural Analysis", Mc Gra Hill, NY, USA., 1991
5. Hibbler R C, "Structural Analysis",6th edition, Prentice Hall, NJ, USA, 2006

B. Tech II (Civil Engineering), Semester- IV **L T P C**

CE 206: HYDRAULICS AND HYDRAULIC MACHINES **3 1 2 5**

COURSE OBJECTIVES:

CO- 1: Classify open channel flow and compute velocity distribution and pressure distribution in open channel flow.

CO- 2: Compute normal and critical depth and design efficient channel.

CO- 3: Identify and compute backwater and drawdown profiles in open channel encountered in water resources project.

CO- 4: Locate the hydraulic jump encountered in design of hydraulic structures in open channel.

CO- 5: Select and design hydraulic machines based on the system requirements.

- **DIMENSIONAL ANALYSIS AND MODELLING (04 Hours)**
  Dimensions, different systems of units, dimensional homogeneity, Buckingham's pi-theorem, non-dimensional numbers and their physical significance. geometric, kinematic and dynamic similarities, model laws, model testing and its analysis, scale effects, undistorted and distorted models.

- **BASIC CONCEPTS OF OPEN CHANNEL FLOW (04 Hours)**
  Open channel flow vs pipe flow, classification of open channel flow based on space and time criteria, effect of viscosity and gravity; velocity distribution and pressure distribution in open channel, continuity equation, momentum equation and energy equation in open channel.

- **UNIFORM FLOW IN OPEN CHANNEL (05 Hours)**
  Development of uniform flow, resistance law, factors affecting Manning's roughness coefficient, conveyance, section factor for uniform flow computations, computation of uniform flow, efficient channel sections, hydraulic exponent for uniform flow computations.

- **SPECIFIC ENERGY AND SPECIFIC FORCE (10 Hours)**
  Specific energy, Specific energy curve and its limitations, critical depth and section factor for critical flow computations, open channel flow transitions, standing wave & Venturi flumes, control sections and hydraulic exponent for critical flow computations, specific force curve and its application in the analysis of hydraulic jump, hydraulic jump characteristics

- **GRADUALLY VARIED FLOW (07 Hours)**
  Assumptions in GVF analysis, dynamic equation of GVF, classification of channel slopes, GVF profiles, its identification and computation

- **HYDRAULIC MACHINES (15 Hours)**
  Impact of jet: Introduction, impulse-momentum principle, jet impingement upon a stationary flat plate, force exerted by a jet on a hinged plate, jet impingement upon a moving

flat plate, jet impingement at the centre of a vane, jet impingement upon a stationary vane with jet striking tangentially at one tip, jet impingement upon a moving vane with jet striking tangentially at one tip, jet propulsion of ships.

Impulse and reaction turbines : Pelton turbine, work done and efficiency of a Pelton wheel, effective head, available power and efficiency, design aspects of Pelton wheel, radial flow impulse turbine, Francis turbine, working proportions of Francis turbine runner, propeller and Kaplan turbines, draft tube, unit quantities, specific speed and normal relationships, scale effect, cavitation.

Pumps : classification and selection criterion, pump applications, centrifugal pumps, classification of centrifugal pumps, pressure changes in a pumps, velocity vector diagrams and work done, vane shape, pumps losses and efficiencies, pressure rise in the impeller, minimum speed of pump to deliver liquid, design considerations, loss of head due to reduced or increased flow, multistage pumps, similarly relations and specific speed, cavitation and maximum suction lift, priming, performance characteristics of centrifugal pumps, pump problems, axial flow pumps, bore hole pump/ deep well pump/ submersible pump, operation of a reciprocating pump, volumetric efficiency and slip, work and power input, effect of acceleration on indicator diagram, effect of friction, effect of acceleration and friction, effect of air vessels, centrifugal pumps versus reciprocating pumps, rotary displacement pumps.

PRACTICALS

1. Velocity distributions in open channel using Pitot tube.
2. Velocity distributions in open channel using current meter.
3. Determination of Chezy's and Manning's coefficients.
4. Calibration of Venturi flume and its submergence characteristics.
5. Calibration of broad crested weir and its submergence characteristics.
6. Establishment of sub critical, critical and supercritical flows in open channel.
7. Characteristics of hydraulic jump.
8. Impact of jets on plane and curved surfaces
9. Main characteristics of Pelton wheel turbine
10. Main characteristics of Francis wheel turbine
11. Operating characteristics of centrifugal pumps

BOOKS RECOMMENDED:

1. Chow V. T. "Open Channel Hydraulics", McGraw-Hill book company, International edition, New Delhi, 1973.
2. Ranga Raju K. G., Flow through Open channel, Tata McGraw-Hill Publishing Company Ltd, New Delhi, 1997.
3. Subramanya K. "Flow in Open Channels", Tata McGraw-Hill Publishing Company Ltd, New Delhi, 1998.
4. Modi P N and Seth S M, "Hydraulics and Hydraulic Machines", Standard Book House, Nai Sarak New Delhi, 2000.
5. Jain A K, "Fluid Mechanics including Hydraulic Machines", Khanna Publishers, New Delhi, 2000.

B. Tech II (Civil), Semester - IV	**L**	**T**	**P**	**C**
MH 210: Engg. Mathematics III	**3**	**1**	**0**	**4**

- **CALCULUS, MULTIPLE INTEGRALS** **(08 Hours)**

  Reorientation of concepts of integrals, Double and Triple integrals, evaluation techniques, change of order of Integration, change of variable, Application of double and triple integrals for evaluation of area, volume and mass.

- **BASIC CONCEPTS OF VECTOR CALCULUS** **(08 Hours)**

  Line Integrals, scalar and vector point function, differential operator, gradient, directional derivative, physical meaning of gradient, divergence, curl and Laplacian with their properties, Surface Integral, Volume integral, Green's ,Gauss and Stoke's theorem & application.

- **FOURIER SERIES** **(06 Hours)**

  Definition, Fourier series with arbitrary period, in particular periodic function with period 2π. Fourier series of even and odd function, Half range Fourier series.

- **PARTIAL DIFFERENTIAL EQUATION** **(06 Hours)**

  Second order PDE of mathematical physics (Heat, wave and Laplace equation, one dimensional with standard boundary conditions, solution by separation of variable method using Fourier series.

- **STATISTICS** **(06 Hours)**

  Correlation between two variable, application of correlation, evaluation of coefficients of correlation, Rank correlation, Regression, frequency distribution, Binomial, Poisson's distribution and Normal distribution, application to industrial problem.

- **TESTING OF HYPOTHESIS** **(05 Hours)**

  Test of significance, Chi-square (χ^2) test, student's t Test, application of the t-test, F-distribution.

- **TIME SERIES ANALYSIS** **(05 Hours)**

  Short term fluctuation, trend, Decision theory.

(Total Contact Time: 44 Hours)

BOOKS RECOMMENDED:

1. Kreyszing E., 'Advanced Engineering Mathematics', John Wiley & Sons, Singapore, Int. Student Ed. 1995.
2. Wiley C. R., 'Advanced Engineering Mathematics', McGraw Hill Inc., New York Ed. 1993.
3. O'Neil Peter., 'Advanced Engg. Mathematics', Thompson, Singapore, Ind. Ed. 2002.
4. Greenbar Michael D., 'Advanced Engg. Mathematics', Pearson, Singapore, Ind. Ed. 2007.
5. Ramana D. V., 'Higher Engg. Mathematics', The MaGraw-Hill Inc., New Delhi, 2007.

B.TECH.-III (CIVIL) (With Effect from August 2008)

FIFTH SEMESTER

Sr. No.	Course	Course Code	Teaching Scheme Hours per Week			Credits	Examination Scheme				
			L	TU	PR		Theory Marks	TU Marks	TW Marks	Pract Marks	Total Marks
1	Water Resources Engineering-I	CE301	3	1	2	5	100	25	20	30	175
2	Building Planning	CE303	3	1	2	5	100	25	20	30	175
3	Building Materials and Construction	CE305	3	1	2	5	100	25	20	30	175
4	Geotechnical Engineering	AM307	3	1	2	5	100	25	20	30	175
5	EIS I	-	3	-	-	3	100	-	-	-	100
Total contact hours per week = 27						**Total Credit = 23**					**Total Marks =800**

SIXTH SEMESTER

Sr. No.	Course	Course Code	Teaching Scheme Hours per Week			Credits	Examination Scheme				
			L	TU	PR		Theory Marks	TU Marks	TW Marks	Pract Marks	Total Marks
1	Estimation & Cost Analysis	CE302	3	1	2	5	100	25	20	30	175
2	Water Treatment And Distribution System	CE304	3	1	2	5	100	25	20	30	175
3	Structural Analysis - II	AM306	3	1	2	5	100	25	20	30	175
4	Design of Steel Structures	AM308	3	1	2	5	100	25	20	30	175
5	EIS II	-	3	-	-	3	100	-	-	-	100

Total contact hours per week = 27	**Total Credit = 23**	**Total Marks =800**

B. Tech. III (Civil), Semester-V	L	T	P	C
CE 301: WATER RESOURCES ENGINEERING- I	**3**	**1**	**2**	**5**

COURSE OBJECTIVES:

CO-1: Understand the concept of hydrological cycle, mechanism of precipitation, evapotranspiration and infiltration

CO-2: Measure and compute serial rainfall and intensity-duration curve.

CO-3: Estimate floods using rational, empirical unit hydrograph and flood frequency analysis

C0-4: Compute aquifer parameters using the concept of flow through porous media.

CO-5: Estimate water requirements of crops and storage capacity of reservoir

- **INTRODUCTION TO WATERRESOURCES ENGINEERING (02Hours)**
  Need Of water resources projects, Preliminary aspects of Environmental Impact Assessment of Water Resources Projects, Hydrologic cycle, scope and application, hydro-metrology, hydrologic equation, hydrologic models, water resources engineering

- **PRECIPITATION AND ABSTRACTIONS (08Hours)**
  Mechanism of precipitation, types and forms of precipitation, measurement techniques, rain gauge network, variability in precipitation, estimation of missing data, test for consistency of rainfall record, rainfall hyetograph, rainfall mass curve, areal average rainfall, intensity duration curves, evaporation, factors affecting evaporation, evaporimeters, estimation of evaporation, evapotranspiration, measurement of evapotranspiration, initial loss, infiltration and infiltration indices**.**

- **RUN OFF AND HYDROGRAPH (08Hours)**
  Direct runoff and base flow; run off characteristics of streams, computation of runoff, rainfall-runoff relationships, components of hydrograph and factors affecting shape of hydrograph, base flow separation, effective rainfall hyetograph, unit hydrograph theory, derivation of unit hydrograph of different duration, synthetic unit hydrograph, IUH

- **STREAM GAUGING AND DESIGN FLOOD (06Hours)**
  Site selection for stream gauging, direct methods of discharge measurements, computation of design flood using rational, empirical, unit hydrograph and flood frequency methods.

- **FLOOD ROUTING (03Hours)**
  Reservoir and channel flood routing methods

- **GROUND WATER HYDROLOGY (06Hours)**
  Occurrence, distribution of ground water, specific yield of aquifers, movement of groundwater, Darcy's law, permeability, safe yield of a basin, compressibility of aquifer, storage coefficient, specific storage, hydraulics of wells under steady & introduction to unsteady condition in

confined and unconfined aquifers, yield of wells, pumping and recuperation tests, types of tube wells.

- **IRRIGATION ENGINEERING (03Hours)**
  Definition of irrigation, necessity, drainage problems of irrigation , advantages and disadvantages of irrigation, types of irrigation, quality of irrigation water, various methods of irrigation, suitability of various methods of irrigation, bandhara irrigation

- **WATER REQUIREMENTS OF CROPS (05Hours)**
  Classes and availability of soil water, available moisture depth, frequency of irrigation, relationship between duty a delta and base period, factors affecting duty, methods of improving duty, irrigation efficiencies, command areas, kharif, rabi and perennial crops, crop rotation, irrigation water requirement, design discharge of canal and storage capacit of reservoir based on irrigation requirement.

- **WATER LOGGING AND DRAINAGE (04Hours)**
  Definition, effects, causes and remedial measures of water logging, types of land drains, layout and spacing of tile drains.

PRACTICALS:

1. Study of recording and non-recording rain gauges.
2. Study of pan evaporimeter.
3. Study of infiltrometer.
4. Study of rainfall runoff relationship for given duration of storm
5. Study of effect of rainfall intensity on runoff due to specific duration of storm.
6. Preparation of run off hydrograph using rainfall simulator.
7. Study of rate of ground water recharge.
8. Study of Hele-Shaw apparatus.

BOOKS RECOMMENDED:

1. Chow V T, Maidment D R and Mays L W, “Applied Hydrology”, McGraw-Hill Book Company, New York, 1988.
2. Raghunath H. M., “Hydrology, Principles, Analysis and Design”, New Age International (P) Ltd, New Delhi, 2000.
3. K. Subramanya, “ Engineering Hydrology”, Tata Mc-Graw Hill Publishing Co. Ltd., New Delhi,1990.
4. Asawa G.L.,”Irrigation and water resources Engineering”, New Age International Publishers, New Delhi, 2005.
5. Garg S. K., “Irrigation Engineering and Hydraulic Structures”, Khanna Publishers, New Delhi, 1996.
6. V.P.Singh,”Elemantary Hydrology”, Prentice Hall Publication, New Delhi, 1994.

B. Tech. III (CIVIL) SEMESTER – V	L	T	P	C
CE 303: BUILDING PLANNING	3	1	2	5

COURSE OBJECTIVES

CO-1: Understanding the approach and process of planning of residential and nonresidential buildings

CO -2: Learn different building forms and building modification

CO-3: Understand the world engineering principles of building designs

C0-4: Understand the prevailing regulations & Bye-Laws

CO-5. Develop capability to prepare drawings of residential buildings

- **PLANNING APPROACH** **(08 Hours)**
  Basic areas in residential buildings - Process of planning - Family requirements and analysis - Conceptual plan outlines - Principles and techniques of functional planning -Planning for services and landscaping. Architects role in changing urban area

- **BUILDING SYSTEMS** **(03 Hours)**
  Concept of art and creativity - Role of architect and engineer- Structural system and functional classification of buildings – Residential building forms.

- **PLANNING FOR RESIDENTIAL BUILDING** **(10 Hours)**
  Plan preparation for residential units - Structure, space forms and analysis- Activity space - Elements of human scale - Size and dimension decisions - Furniture layouts

- **PLANNING FOR NON-RESIDENTIAL BUILDINGS** **(08 Hours)**
  Approach of activity analysis for public buildings, hostels, schools, offices, primary health centers - Space norms, basic areas, functional setting areas

- **ARCHITECTURAL COMPOSITION** **(05 Hours)**
  Mass Composition - Principles of elevation development-techniques - Impacts of colour and structure character

- **BUILDING REGULATIONS** **(03 Hours)**
  Building byelaws - Provisions in developed and developing urban areas – Plan approval process

- **BUILDING DRAWING** **(08 Hours)**
  Key plan - Site plan and working drawings - Perspective drawings - Foundation and plumbing layouts - Building drawing softwares

PRACTICALS:

1. Plan sketches on site visits.
2. Building forms
3. Planning of residential building, Bungalow, apartment / Duplex / Raw House etc.
4. Planning of public building
5. Foundation and plumbing layout for ¾
6. Perspective drawings

BOOKS RECOMMENDED:

1. Shah M. G. Kale C. M., and S. Y. Patki, "Building Drawing", Tata Mc-Graw Hill Pub. Co. Ltd, New Delhi. (1997)
2. Sane Y. S., "Planning & Designing of Building ", Allies Book Stall, Poona 4. (1990)
3. "General Development Control Regulations", SUDA, Surat. (2006)
4. Ernest Pickering, "Architectural Design", John Wiley & Sons. (1993)
5. National Building Code.(2002)

B. Tech. III (Civil) Semester – V	L	T	P	C
CE-305 BUILDING MATERIALS & CONSTRUCTION	3	1	2	5

COURSE OBJECTIVES:

CO-1: Understand geological formation of earth surface utilizing various techniques to derive suitability in building construction.
CO-2: Understand different building components, methods of their construction and significance in execution
CO-3: Acquire knowledge about the construction methodology
CO-4: Can plan the construction methodology befitting with the local available materials and requirements of the region.
CO-5: Can supervise building components construction.
CO-6: Can take up the Building construction project independently
CO-7: Can plan sequence of construction.

PART-I BUILDING MATERIALS: (16 Hours)

- **GEOLOGICAL ASPECTS: (02 Hours)**
  Classification of minerals and rocks, geological structures, fold, faults, joints, dip and strike relation, Civil Engineering investigations.

- **STONES AND BRICKS: (03 Hours)**
  Types of building stones and bricks, I.S. specification for bricks, bricks manufacturing process, tiles, stone ware pipes and terra cotta production

- **LIME AND CEMENT: (05 Hours)**
  Types of limes and cements, and their usages,

- **MORTAR AND CONCRETE: (04 Hours)**
  Mortars-different type of mix proportions and their uses, concrete in construction, different concrete mixes and usage's, placing compacting and curing of concrete, reinforced concrete, reinforcement details of foundations, columns, beams and slabs, formworks.

- **MISCELLANEOUS BUILDING MATERIALS: (02 Hours)**
  Timber-usages in buildings, polymers and plastics, composites and smart materials, iron and structural steel, aluminum, glass, plastics, asphalts, varnishes, distempers, paints and cement paints.

PART-I BUILDING CONSTRUCTION **(29 Hours)**

- **FOUNDATIONS:** **(04 Hours)**
  Objectives and techniques of site investigation, decision process for choosing foundation, general failures, classifications

- **MASONRY:** **(04 Hours)**
  Brick and stone, selection criteria, bonding, masonry in building components, cavity brick masonry, composite walls, types and construction of partition walls, lintels and arches.

- **CONCRETE CONSTRUCTIONS:** **(06 Hours)**
  Plain, R.C.C., Prestressed and Precast concrete, concrete slabs, beams, columns, chajjas, cantilever, Formwork, norms for curing, ready mix concrete plant,batching,mixing,testing transporting, laying and curing

- **TEMPORARY TIMBERING**: **(02 Hours)**
  Scaffolding, Shoring, Underpinning

- **FLOORING:** **(04 Hours)**
  Types of floors, construction of conventional flooring, terrazzo, mosaic tiles, IPS floor, timber and jack arch floors, tiles, rubber, PVC covering, modern flooring techniques, leak proof techniques.

- **BUILDING OPENINGS & STAIRCASE:** **(03 Hours)**
  Doors, windows and ventilators types, nomenclature, fixtures and choices, Staircase terminology, types, structural forms, principles and selection criteria

- **ROOFING:** **(04 Hours)**
  Types, terminology, steel truss roofs, special type concrete roofs, roof coverings, ACC and GI sheets.

- **FINISHES:** **(02 Hours)**
  Different types of plastering, pointing, mortar proportions, choices, white and colour washing, distempering, cement painting, varnishing and painting of woodwork and steel, weathering effects.

PRACTICALS / STUDIO

(1) Foundation Construction.
(2) Masonry Construction and wall finishes
(3) Scaffolding, formwork and temporary timbering
(4) Concrete Construction.
(5) Flooring
(6) Roof Construction.
(7) Doors, Windows & Staircases
(8) Staircase Structural forms

TECHNICAL REPORT:

(1) Properties and economic aspects of modern Building materials.
(2) Site visit of various building construction.
(3) Model studies.

BOOKS RECOMMENDED:

1. Arora D. S., "Geology for Engineers ", Mohindra Capital Publishers, Chandigarh(1992)
   Arora and Bindra , " A Textbook of Building Construction " , Dhanpat Rai & Sons, New Delhi. (1993)
2. Barry, "Building Constructions ", Vol. I , II & III , ELBS Publications. (1989)
3. Ghosh D. N., " Materials of Construction ", Tata McGraw Hill Publication, New Delhi (1991)
   McCay , " Building Construction " , Vol. I , II & III , ELBS Publications. (1986)

B. Tech. III (CIVIL) SEMESTER – V	L	T	P	C
AM 307: GEOTECHNICAL ENGINEERING	3	1	2	5

COURSE OBJECTIVES:

CO-1: Classify the soils and identify the soil engineering properties
CO-2: Interpretation and field testing results.
CO-3: Analyze the stress distribution, slope stability, earth pressure and bearing capacity of soil
CO-4: Provide solutions for shallow and deep foundations for various structures
For Laboratory
CO-1: Performance of soil index and engineering properties, experiments for classification and identification of soil.

- **INTRODUCTION**
  Need for Soil Engineering Studies - Soil as an Engineering Material -Scope of Geotechnical Engineering.

- **BASIC PROPERTIES OF SOIL**
  Elementary properties and their measurements - Constituents of soil - Phase diagram - Definitions Interrelationship – Insitu determination of density - Relative density

- **SOIL CLASSIFICATION & CONSISTENCY LIMITS**
  Classification of soil based on particle size - Soil consistency limits - Soil indices

- **COMPACTION**
  Definition - objectives - Factors affecting compaction - Laboratory tests - Zero air void Line - Field compaction control - Relative compaction

- **PERMEABILITY AND SEEPAGE**
  Permeability - Darcy's law - Laboratory tests - Field tests - Permeability of stratified deposits – Seepage - Flow net - Quick sand condition

- **CONSOLIDATION**
  Consolidation test – Significance - Consolidation Parameters - Consolidation Settlement

- **SHEARING RESISTANCE**
  Shear parameters - Coulomb's law of shear strength – various laboratory methods to evaluate strength parameters - Drainage conditions

- **SOIL EXPLORATION**
  Purpose – Information - Objectives and Methods – Sampling - concept of stress distribution –

- **SHALLOW AND DEEP FOUNDATION**

Types of foundation Bearing capacity and settlement of foundations - Total settlement - Computation of settlement components - Pile foundation - Suitability of deep foundations - Load carrying capacity of pile - Static and dynamic formuii - Pile load test - Concept of group effect of piles for load carrying capacity.

- **EARTH PRESSURE**
  Definition,- Active - Passive and Earth pressure at rest conditions Coulomb's - Rankine's theories of earth pressure

- **STABILITY OF SLOPE**
  Infinite slope - Finite slope - Swedish method - Taylors stability number-Applications to design of earth dam, choice of shear parameters - Total and effective stress analysis and concept of factors of safety.

PRACTICAL:

1. Determination of moisture content density of soil
2. Grain size analysis
3. Consistency limits of soil.
4. Compaction test on soil
5. Determination of coefficient of permeability of soil..
6. Estimation of shear resistance of noncohesive by direct shear test.
7. Estimation of shear resistance of cohesive by vane and UCc tests.
8. Computation of consolidation parameters
9. Demonstration of triaxial shear test and computation of C & ϕ
10. Demonstration of Exploration program and study different field tests.

BOOKS RECOMMENDED:

1. K R Arora., "Soil Mechanics & Foundation Engineering", Standard Publishers, Ltd 2002
2. Terzaghi , Peck .and Mesri " Soil Mechanics in Engineering Practice " 1996
3. Bowles J E, "Foundation Analysis & Design", McGraw Hill Inc., New York, 1988
4. A V Shroff " Soil Mechanics and Geotechnical Engineering
5. Das B M, "Principles of Geotechnical Engineering", PWS Publishing Co., Boston, 1 990

LIST OF ELECTIVE INTER DISCIPLINARY SUBJECTS OFFERED BY CED

B.Tech. – III FIFTH SEMESTER

Sr. No.	Code	Subject
1	CE309	Industrial Safety & Environment
2	CE311	Geospatial Technologies
3	CE317	Hydropower Engineering

LIST OF ELECTIVE INTER DISCIPLINARY SUBJECTS OFFERED BY AMD

B.Tech. – III FIFTH SEMESTER

Sr. No.	Code	Subject
1	AM309	Introduction to Earthquake Engg
2	AM311	Introduction to Structural Engineering
3	AM313	Applications of ANN in Engineering
4	AM315	Design of Vessels
5	AM317	Introduction to Soil & Rock Mechanics

B.TECH. III (CIVIL) SEMESTER - V	L	T	P	C
CE 309: INDUSTRIAL SAFETY & ENVIRONMENT (EIS-I)	3	0	0	3

COURSE OBJECTIVES:

CO-1: Interlinking productivity with better safety practices and healthy environment
CO-2: Develop and implement safe operating procedures (SOPs) for various industrial active
CO-3: Being able to document and execute Health Safety and Environment (HSE) policy Environmental Management Systems like ISO-14001, Environment Audit.
C0-4: Commit to safety and environmental legislation.

- **INTRODUCTION (04 Hours)**
  Safety – Safety and Productivity – Role of Government – National Safety Council – National Safety Awards – House keeping

- **SAFETY STANDARDS AND LEGISLATION (05 Hours)**
  Standards – ILO Model code of safety regulation / legislation – Factory Act – Boiler Act – Electricity Act – Workman's compensation act

- **BASICS OF ENVIRONMENT (10 Hours)**
  Working environment – Types of working environment – Need of environment control – Effects of environmental factors on human body & mind – Basics of environment design - Improved efficiency and accuracy at work

- **PLANNING FOR SAFETY (06 Hours)**
  Purpose for planning – planning procedure – Range of plans – Safety policies – Elements of safety policy – Implementation

- **ENVIRONMENTAL STANDARDS (04 Hours)**
  ISO 14000 introduction – General description of ISO 14001 – Environment Management System (EMS) – Key elements of ISO 14001 and EMS

- **OCCUPATIONAL ERGONOMICS (06 Hours)**
  Ergonomics – Human-body – Health – Posture – Workplace or office ergonomics – Ergonomics for women at work – physical work and environment – Anthropometry

- **OCCUPATIONAL STRESS AND HEATH (10 hours)** Work related stress – Causes of stress – Signs of stress – Measurement of stress – Stress management systems – Prevention – Stress health and productivity – Occupational safety and health Act – Health program – First Aid

(Total Contact Time: 45 Hours)

BOOKS RECOMMENDED:

1. Anupama Prashar & Bansal, “Industrial Safety and Environment”, S.K. Kataria & sons, New Delhi, 2005.
2. S.K. Agrawal, “Industrial Environment Assessment and Strategy”, APH Publishing Corporation, New Delhi, 1996.
3. Safety- Health and working conditions: Training Manual, National Safety Council, Mumbai, 2000.
4. Guiding Principles for chemical accident Prevention, preparedness and response: Manual prepared by organization for economic co-operation and development, 1992.
5. “Major safety control: A practical Manual” National safety council, India, 1993.

B. TECH. III SEMESTER - V	L	T	P	C
CE 311: GEOSPATIAL TECHNOLOGIES (EIS-I)	3	-	-	3

COURSE OBJECTIVES

CO-1: Understand the fundamentals of Remote Sensing and Digital Image Processing
CO-2: Understand fundamentals and processes of GIS.
CO-3: Use GPS technology and different methods of measurements.
C0-4: Take up complex civil engineering applications using Geospatial Technologies with integrated approach.

- **INTRODUCTION (06 Hours)**

  Introduction to remote sensing - Geographical information systems and global positioning systems - Benefits and applications of remote sensing - GIS and GPS.

- **REMOTE SENSING (07 Hours)**

  Fundamentals of remote sensing - Energy interactions - Ideal remote sensing systems, - Fundamentals of interpretation - Basic equipments used for interpretation - Elements of air photo interpretation - Interpretation keys - Different types of sensors - Platforms and remote sensing images

- **DIGITAL IMAGE PROCESSING (06 Hours)**

  Characteristics of a digital image - Image enhancement - Contrast manipulation – Image registration – Digital image interpretation techniques

- **GEOGRAPHICAL INFORMATION SYSTEMS (08 Hours)**

  Introduction - Geo referenced data - Data input & output - Data quality and management - GIS analysis functions - Implementation of GIS - Airborne Laser Thematic Mapper (ALTM) LIDAR, Principles and methods of data collection – Digital Elevation Models

- **GLOBAL POSITIONING SYSTEM (07 Hours)**

  Earth Surface, datum – Co-ordinate systems - Segments of GPS System - GPS receivers and its components - Different methods of observation

- **ENGINEERING APPLICATIONS (11 Hours)**

  Landuse / Landcover mapping - Water resources mapping - Utility mapping - Urban and regional planning and environmental and other engineering applications

(Total Contact Time: 45 Hours)

BOOKS RECOMMENDED:

1. Agrawal N.K., "Essentials of GPS ", Spatial Network Pvt. Ltd., Hydrabad, 2004.
2. Anderle R, "The Global Positioning System", Royal Society of London, U.K., 1988.
3. Lillesand T.M. and Kieter R. W., "Remote Sensing and Image Interpretation", John Willey & Sons, New York, 2002).
4. Lueder D.A., "Aerial photographic Interpretation principles and applications", McGraw Hill Book Company, New York, 1959).
5. Stan Aronoff, "Geographical Information Systems", WDL Publications, Ottawa, Canada, 1989.

B. Tech. III Semester - V	L	T	P	C
CE 317: HYDROPOWER ENGINEERING (EIS-I)	3	-	-	3

COURSE OBJECTIVES:

CO-1: Identify Issues related to hydropower development in India.
CO-2: Analysis of hydrological parameters like rainfall, runoff etc.
CO-3: Planning of hydropower development
C0-4: Design of intake structures and water conveyance system

- **INTRODUCTION (2 Hours)**
  Sources of energy, Classification of energy, Tharmal power, Nuclear power, Tidal power, Wind power, Solar power, Gas turbine generation, Geothermal power, Biogas, Energy conservation.

- **ENVIRONMENT AND WATER POWER DEVELOPMENT (2 Hours)**
  Introduction, Concern about environment, Environmental planning and management, Environment and hydropower development, Conventional environmental concerns and new environmental concerns, Small hydropower schemes.

- **PRECIPITATION, RUNOFF AND STREAM FLOW (4 Hours)**
  Hydrologic cycle, Hydrologic equation, Measurement of rain fall, Interpritation of Rain gauge data, Graphical representation of rain fall, Runoff process, Stream flow analysis, Hydrograph, Mass curve, Flow duration curve, Rainfall – Runoff relationship, Interpretation of rain-gauge data, Factors affecting runoff, Methods of runoff estimation, Flood runoff, Unit hydrograph method.

- **PLANNING FOR WATER POWER DEVELOPMENT (5 Hours)**
  Introduction, Objectives of planning, Planning for water power development, Investigations and studies for water power development, Institutional framework, Definitions, Estimation of available water power, Power duration curve, Storage and pondage, Load studies, Load factor, Load duration curve, Variations in load factor, Power system load, Capacity factor, Utilization factor, Diversity factor, Firm power, Secondary power, System integrated operational studies, Load prediction, Market requirements of power, Installed capacity, Benefits evaluation for installed capacities, Size and number of units.

- **WATER POWER DEVELOPMENT (4 Hours)**
  Introduction, History of water power development, Advantages of hydropower, Hydro Vs thermal power, Hydropower potential and its development, Projected installed capacity, Hydro thermal mix, Constraints in hydropower development, Accelerated hydropower development, Classification of hydropower development, Water requirement for hydropower development, Economics of hydropower development, Economic value of

hydropower, Cost of water power, Total annual cost of a hydro project, Operation and maintenance of hydro plants.

- **STORAGE POWER DEVELOPMENT (4 Hours)**
  Introduction, Components of storage power development, Economic aspects.

- **RUN-OF-RIVER POWER DEVELOPMENT (4 Hours)**
  Introduction, Types of plants, Components of run-off-river power development, Run-of-power development on canal falls,

- **PUMPED STORAGE POWER DEVELOPMENT `(4 Hours)**
  Essential requirements of PSPP, Necessity for pumped storage power development, Advantages of PSP development, History of PSP development, Power potential PSP development, Classification of PSP development, Development plan for PSP development, Components of PSP development, Layout of PSP development, PSP plants and power system, Economics of PSPP, Cost of power generated.

- **SMALL HYDRO POWER DEVELOPMENT (2 Hours)**
  Introduction, Advantages of small hydropower, Classification of small hydropower, Small hydropower potential, Components of small hydropower development, Formulation of development schemes, Choice of units, Classification of turbines, Selection of turbines, Economics of small hydropower

- **POWER HOUSE PLANNING (6 Hours)**
  General layout of the power house and arrangement of hydropower units, Number and sizes of units, Substructure-spacing of the hydro-electric units, Shallow or deep setting of turbines, Super structure, Abbreviated power house, Semi-outdoor power house, Outdoor powerhouse, Advantages and disadvantages of abbreviated super-structure.

  Surface Power Station : power house structure, power house dimensions, Lighting and Ventilation, Variation in design of power house.

  Under Ground power Station : Types of underground power plants, Alignment and layout of cavities, Investigations and studies, Safety requirements, Sizing of a power house, Joints of hydropower plants,

  Submersible power house: Approximate dimensions of the power house, Tailrace.

- **WATER CONVEYANCE (8 Hours)**
  INTAKES: Types, Location and Alignment of intakes, Losses in Intakes,

  Air- Entrainment at Intakes, Inlet aeration, Trashracks.

PENSTOCKS AND PRESSURE SHAFTS: Introduction, Classification of penstocks, Layout of penstocks, Hydraulic design of penstocks, Branches and wyes, Bends, Anchor blocks.

HYDRAULIC VALVES AND GATES: Introduction, Hydraulic valves, Types of hydraulic valves, Gates, Spillway gates, Gate installation in penstocks.

HYDRAULIC TRANSIENTS AND SURGE TANKS: Introduction, Hydraulic transient, Control of hydraulic transients, Water hammer, Water hammer theory, Surges in power tunnels and penstocks, Surge in open channel, Surge tank, Necessity of surge tank, Location of surge tank, Types of surge tanks, Design of surge tank, Tailrace surge tank.

BOOKS RECOMMENDED:

1. Dandekar and Sharma," Water Power Engineering", Vikas Publishing House, New Delhi,1996.
2. Varshney R.S," Hydropower Structures", Nem chand and Bros., Roorkee (U.P.), 1992.
3. Deshmukh M.M.," Water Power Engineering", Dhanpat Rai Publications, New Delhi, 1998.
4. Barrows H. K., "Water Power Engineering", McGraw Hill Book Co., New York.,1943
5. R.K.SHARMA AND T.K.SHARMA, "Water Power Engineering" S.CHAND & Company, New Delhi, 2003.

B. Tech. – III (All branches) Semester - V	L	T	P	C
AM 309 : Introduction to Earthquake Engg. (EIS-I)	3	-	-	3

COURSE OBJECTIVES:

CO-1: Understand ground motion, magnitude, intensity, frequency and plate tectonics
CO-2: Compute ground motion intensity measures and attenuation relationships.
CO-3: Understand the earthquake hazard and design response spectra for the same.
C0-4: Apply building code earthquake requirements in design of structural systems.
C0-5: Apply the basics of structural dynamics in analysis of structures subjected to earthquakes

- **Introduction (Hours -4)**
  Inner & Outer core of earth plate tectonics & its circulation – Earthquake types – Types of faults – Different types of seismic waves – Measuring instruments of earthquake – Strong ground motion & it's characteristics - Magnitudes intensity of earthquake

- **Seism tectonic / Seismic Environment of Indian Region (Hours -4)**
  Seismic Geography and tectonic features of India – Seismic zones earthquake in India

- **Seismic effect on Structures (Hours -4)**
  Inertia force in structures & its foundation deformations in structure – Horizontal & vertical movement of structures - Drift - Twisting of structures during earthquake – Building codes – Importance of Architectural features – Building layout & its configuration., Crumple joints, IS: 4326

- **Seismic Design Philosophy (Hours -4)**
  Earthquake Design philosophy – Acceptance damage & ductility of building & capacity design concept – Quality control – Importance of Flexibility of structures – Indian seismic codes.

- **Seismic Effects on Masonry Structures (Hours -5)**
  Behaviour of Brick Masonry & stone masonry under earthquake engineering – Construction aspects to improve the behaviour of masonry wall – selection of building materials – Structure configuration of masonry buildings – Earthquake resistant features of masonry work, Earthquake Structure
- **Seismic effect on Reinforced Concrete Building (Hours -5)**
  Reinforced concrete buildings – Role of slab & masonry works – Behaviour R C Beams under seismic loadings, infill wall effect, shear wall position & effect.
- **Behaviour of Beam & Column Joints. (Hours -5)**
  Behaviour of RC Beams column joints – Seismic effect on Open – Ground storey building – Behaviour of short column – Energy absorption of FRC joint under cyclic loading
- **Base Isolation System (Hours -5)**

Introduction to seismic dampers – viscous damper – Friction dampers – Yielding devices, active isolation method, snubber for power reactor pipe lines.

BOOKS RECOMMENDED:

1. Pankaj Agrawal & Manish Sprikhande,(2004) " Earthquake Resistant Design of Structures" 1st edition, Prentice Hall of India Pvt Ltd, New Delhi.
2. Skinner R I & Robinson W H, (1999) "An Introduction to seismic Isolation Jonn wiley & sons, New Yourk.
3. Ambrose J S Vergun D, (1999), "Design for Earthquakes" John Wiley & Sons INC, New York \.
4. Paulay T & Priestley M J N,(1999) "Seismic Design of reinforced Concrete & Masonry buildings, John Wiley & Sons, New York.
5. Penelis G G & Kappos A J, (1997) "Earthquake Resistant Concrete Structures", E & FN Son, UK
6. Relevant Indian Standard Earthquake coded (IS: 1893-2000, 13920-1993, 13828- 1993, 4326 - 1996)

B. Tech. – III (All Branches), Semester – VI	L	T	P	C
AM 311: Introduction to Structural Engineering (EIS-I)	**3**	**-**	**-**	**3**

COURSE OBJECTIVE

CO-1: Understand the structural behaviour in both designing and analysing structures.

CO-2: Analyse and illustrate and evaluate the stress distribution due to various types of mechanical forces.

CO-3: Understand the concepts of strength through mass i.e. behaviour of slabs, beams, columns plates, etc. under loads.

C0-4: Know the concepts of strength through form i.e. behaviour of shells, folded plates tensegrity structures, etc. under load.

CO-5: Recognize proper material for design of structures.

- **Structure forces , Moment & Equilibrium (Hours – 8)**
  Review of forces, moment, couples, loads – Equilibrium conditions – Supports – Simple beam – Cantilever beam – Trusses – Cables.

- **Stress & Strain (Hours – 8)**
  Axial (tension & Compression) – Bending – Shear – Torsion – Shear force & bending moment diagrams – Failure Criteria

- **Strength through mass (Hours – 10)**
  Approximate analysis & Conceptual design of slabs – Plates – Beams – Columns – Case studies – towers – frames

- **Strength through form (Hours – 10)**
  Various types of shells – Folded Plates – Tensigrity Structures – Introduction to 3-dimension space structures – Innovative case studies

- **Materials for design (Hours – 6)**
  Steel - Concrete – Composite – Fibre Reinforced Plastic Composite – Innovative materials

BOOKS RECOMMENDED:

1. J P Parikh, (2000) "Understanding concept of Structural Analysis & Design", Charotar Publishing House,
2. Beer & Johnston "Strength of Materials", Tata Mc Graw Hill Publication Inc.

3. Subramanian N,(1999) " Principles of Space Structures", 2nd Edition, Wheeler Publishing, New Delhi.
4. Gladius Levis (1989) "Selection of Engineering Materials" Prentice Hall college division.
5. Ramaswamy G.S., Eekhout, M and Suresh G R (2002) "Analysis, Design & Construction of Steel Space Frames" Thoma Telford, London.

B. Tech. – III (All Branch), Semester – V	L	T	P	C
AM 313: Applications of ANN in Engineering (EIS-I)	**3**	**-**	**-**	**3**

COURSE OBJECTIVES:

CO-1: Important concepts and theories of artificial neural networks (ANN)
CO-2: ANN can be designed and trained Enable students to calculate simple examples of ANNs
CO-3: Provide knowledge of supervised learning in MLFFNN using back propagation algorithm.
C0-4: Feed forward neural networks, gradient descent learning and extensions, learning and generalization theory
CO-5: Radial basis function neural networks, unsupervised learning. Data Pre and Post Processing Learn training, verification and validation of neural network models
C0-6: Be able to evaluate whether neural networks are appropriate to a particular applications And be able to apply neural networks to particular know what steps to take to improve Performance

- **ARTIFICAL NEURAL SYSTEMS : PRELIMINARIES (Hours -2)**
  Neural processing – Historical development of Neural Networks – Some examples and applications.

- **NEURAL NETWORKS: CONCEPTS AND FUNDAMENTALS (Hours -4)**
  Biological Neural Networks – Basic building blocks of Artificial Neural Networks (ANNs) – Artificial Neural Network Terminologies

- **FUNDAMENTAL MODELS OF ARTIFICIAL NEURAL NETWORKS (Hours -6)**
  Network models – Learning and recall – Features of ANNs

- **FEED FORWAD NEURAL NETWORKS AND SUPERVISED LEARNING (Hours -10)**
  McCullock – Pitts Neuron model – Widrow – Hoff Learning Rule – Multilayer Perceptrons (MLPs) – Error Back Propagation (BP) algorithm – Training with BP algorithm – Practical consideration in implementing the BP algorithm

- **RADIAL BASIS FUNCTION NETWORKS (Hours -8)**
  Radial basis functions – Radial Basis Function (RBF) architecture, RBF network training, Comparison between RBF and BP Networks, An application example.

- **PRACTICAL ASPECTS OF USING NEURAL NETWORKS (Hours -12)**
  Selection of Neural Networks for solution to a problem - Design of Neural Networks – Data sources and processing of Neural Networks – Data Representation – Application of Neural Networks in Engineering

BOOKS RECOMMENDED:

1. Kumar Satish (2004) “Neural Networks: A classroom Approach”, Tata McGraw Hill, New Delhi
2. Tsoukalas, L H and Uhrig R E (1997) “Fuzzy and Neural approaches in engineering”, John Willey & Sons, NY, USA.
3. Callan, Robert (1999) “The essence of Neural Networks”, Prentice Hall, UK
4. Kartam, M, Flood, I and Garrate J K (1997) “Artificial Neural Networks for Civil Engineers: Fundamentals and Applications”, ASCE Publication, NY, USA.
5. Rajesekaran S and Pia, G A V (2003) “Neural Networks, Fuzy logic and Genetic algorithms: Synthesis and applications”, Prentice Hall of India, New Delhi..

B. Tech. –III (All branches) 5th Semester	L	T	P	C
AM 315: Design of Vessels (EIS-I)	**3**	**-**	**-**	**3**

COURSE OBJECTIVES:

CO-1: To identify the stress in pressure vessel.
CO-2: To analyse vessels for different types of stresses and loading
CO-3: To design pressure vessels with considering earthquake and wind effect
C0-4: To provide solution for Guyed Vessels and lug supports for pressure vessels.

- **Introduction to Pressure vessels (Hours -9)**
  Introduction to Pressure vessels – Stresses in Pressure vessels – General design criteria in vessel design

- **Design of Tall Vertical vessels (Hours -9)**
  Stresses in the shell – Axial & circumferential pressure stresses – Gayed Vessels – Checking shell comp. stresses for elastic stability. Buckling & stability of vessels. Earthquake & wind effect calculations.

- **Design of Supports for vertical vessels (Hours -9)**
  Skirt supports for vertical vessels – Lug supports for vertical vessels

- **Design of Horizontal vessels with saddle supports (Hours -9)**
  Longitudinal bending stresses – Tangential shear stress at horn of saddle – Additional stress in head used as stiffener – Design of ring stiffness.

Design must be done by relevant Codes: ASME – VIII, Division-1, IS code:2914

BOOKS RECOMMENDED:.

1. Moss D. R (2003). "Pressure Vessel Design Manual" 3rd edition, Gulf Professional Publication,
2. Harvey J F (1991), " Theory & Design of Pressure Vessels", 2nd edition, Van Nostrand Publication.
3. Brownell Young (2001), "Process Equipment Design", 2nd edition, Wiley – Intersciences
4. M H Jawad & J R Farr,(1989) "Structural Analysis & Design of Process equipment, 2nd edition, Willey Interscience.
5. S. Timoshenko, (1959), "Theory of Plate & Shells, 2nd edition, Tata McGraw Hill Publication Inc.

B. Tech. – III (All branches) 5th Semester	L	T	P	C
AM 317: Introduction to Soil & Rock Mechanics (EIS-I)	**3**	**-**	**-**	**3**

COURSE OBJECTIVES:

CO-1: Classify the soil and identify the soil and rock engineering properties
CO-2: Interpretation of laboratory test data for soil and rock
CO-3: Analysis of stress distribution in soil and rock
CO-4: Provide solutions for weak soil and rock deposits.

- **Introduction** **(Hours -4)**
  Soil Engineering – Origin of Soils – Formation of Soils – Major Soil deposits in India – Different type of soils
- **Basic Definitions** **(Hours -4)**
  Weight – volume relationships – Definitions – Phase diagram of soil – field tests
- **Particle Size Analysis** **(Hours -4)**
  Introduction – Mechanical analysis – Sieve analysis – Stoke's law – Hydrometer method – Uses of particle size distribution curves
- **Plasticity Characteristics of Soil** **(Hours -4)**
  Atterberg limits – Soil indices - sensitivity – Thixotrpohy – Activity of Soils
- **Soil Classification & Mineralogy** **(Hours -4)**
  Classification of fine grained and coarse grained soils – General characteristics of soils of different groups – Indian standard classification system – clay mineralogy and soil structure.
- **Permeability of Soil** **(Hours -4)**
  Introduction – Laboratory and Field tests to determine coefficient of permeability.
- **Compressibility & Strength** **(Hours -4)**
  Consolidation test – consolidation parameters – Shear strength of soil – Mohr Coulomb theory - shear parameters
- **Compaction of Soils** **(Hours -4)**

Introduction – Factors affecting compaction – Laboratory and field compaction – Soil stabilization – Compaction control – Dynamic compaction of soil

- **Stresses due to Applied load** **(Hours -4)**

  Introduction – Stress-strain parameters – Vertical stressed due to concentrated loads – Stress distribution methods – Contact pressure distribution methods.

- **Rock Mechanics** **(Hours -6)**

  Types of rocks – Mode of formation and their engineering properties – Geotechnical agents and their influence in various engineering projects – Engineering classification of intact rock and insitu rock masses – Index properties of rocks – Rock strength and failure criteria – Interpretation of geological map – Outcrop map – determination of dip and strike.

BOOKS RECOMMENDED:

1. Arora K R, "Soil Mechanics & Foundation Engineering" Standard Publishers Ltd.2002
2. D P Coduto (1998), "Geotechnical Engineering Principles and Practices" Prentice Hall of India Pvt Ltd, New Delhi
3. A V Shroff, (2003) "Soil Mechanics and Geotechnical Engineering
4. B M Das, (2005) Principles of Geotechnical Engineering" PWS publishing company New Delhi
5. Alam Singh "Soil Engineering in theory and practice " part -1

B. Tech III (Civil) Semester – VI	L	T	P	C
CE-302 ESTIMATION AND COST ANALYSIS	3	1	2	5

COURSE OBJECTIVES:

CO 1: To understand the purpose and importance of estimation and its tecANALYSI

CO-2: To workout detail estimate for load bearing, framed structure building and other civil engineering structures

CO-3: Rate Analysis for important building, item based on the market rates and SOR

C0-4: Understand the concepts of abstracting, billing and specification

- **GENERAL: (04 Hours)**
  Significance of estimation and specification, role of civil surveyors, types of estimates, working drawing details, BS codes for measurements, Cost Indices.

- **QUANTITY ANALYSIS OF BUILDINGS: (12 Hours)**
  Estimation of earthwork and masonry, flooring, walls, openings, RCC components, staircase, timber and steel work, load bearing and framed structures.

- **QUANTITY ANALYSIS OF SPECIAL STRUCTURES: (10 Hours)**
  Estimation of roads and CD works, earthen dams, irrigation channels, urban services estimation, electrical fixtures, approximate estimation of infrastructural elements.

- **BRIEF SPECIFICATIONS: (05 Hours)**
  Basic principles and purpose, types and details.

- **RATE ANALYSIS: (10 Hours)**
  Factors affecting rates of building items, output of work force, building and typical civil engineering items, schedule of rates.

- **ABSTRACTING: (04 Hours)**
  BS methods of abstracts, abstract statements, cost analysis, BOQ and tenders.

PRACTICALS:

Detailed Estimation of a residential Unit.

1) Market survey
2) Estimation of a M.D.R with C.D. works
3) Rate analysis.

BOOKS RECOMMENDED:

(1) Amarjit Aggarwal and A.K.Upadhyay,' Civil Estimating,costing and valuation',

Kataria & Sons,New Delhi. (1994)
(2) Birdie G. S.," Text /book of Estimating and Costing ", Dhanpat Rai & Sons, Delhi. (1996)
(3) Basin P. L. “Quantity Surveying” S. Chand & Co., New Delhi. (1990)
(4) Dutta B. N., "Estimating and Costing ", S. Dutta & Co., Lucknow-1. (1995)
(5) Rangwala S. C. “Elements of Estimating and Costing” Charotar Publishing Pvt Ltd.Anand. (1998)

B. TECH. III (CIVIL) SEMESTER - VI	L	T	P	C
CE 304: WATER TREATMENT AND DISTRIBUTION SYSTEM	3	1	2	5

COURSE OBJECTIVE:

CO-1: Analyse water quality from different sources for a given end use
CO-2: Explain the need of treating water from different sources for municipal use.
CO-3: Design a small pipe network for drinking water distribution
CO-4: Design a water treatment plant based on the source water quality
CO-5: Suggest suitable water treatment option for a given rural area situation.

- **INTRODUCTION (07 Hours)**
  Scope and importance of Environmental Engineering and Management - Introduction to Environmental pollution - Impact on human health - Present environmental scenario- Pollution standards - Pollution control and methods of abatement.

- **DEMAND AND SOURCES OF WATER (09 Hours)**
  Water demand - Population forecast - Water quality requirements - Sources and its yield for water requirements- Intake structures – Water quality parameters and their significance in domestic use - Drinking water quality standards.

- **WATER TREATMENT (15 Hours)**
  Need for water treatment - Design of treatment units such as aeration, sedimentation, coagulation and flocculation, filtration, Disinfection, water softening- Advanced water treatment methods.

- **WATER DISTRIBUTION SYSTEMS (10 Hours)**
  Pumps and pumping system – Pipes - Pipe appurtenances - Testing of water main - Distribution reservoirs - Distribution methods - Pipe network analysis - Planning of water supply project – use of software WATER CAD.

- **RURAL WATER SUPPLY AND TREATMENT (04 Hours)**
  Water demand and treatment techniques for rural area, water problems and remedial measures, packaged treatment plants.

(Total Contact Time: 45 Hours)

PRACTICALS:

1. Determination of Turbidity.
2. Determination of Chloride.
3. Determination of Hardness.
4. Determination of Carbonate, Bicarbonate and Hydroxide Alkalinity.
5. Determination of Chlorine Demand and Chlorine Residual.
6. Bacteriological Analysis of water.
7. Demonstration of air pollution monitoring equipment.
8. Demonstration of noise level meter.

BOOKS RECOMMENDED:

1. B. C. Punamia, Ashok Jain, Arun Jain, "Water Supply Engineering", Laxmi Pub., New Delhi. 2003.
2. Davis and Cornwell, "Elements of Water Supply and Waste water Disposal", John Wiley & Sons, New York. 1998.
3. Manual on Water Supply & Treatment 3rd Ed. Central Public Health & Environmentlal. Engg. Organization, Ministry of Urban Development, Govt. of India, New Delhi, 1991.
4. Ronald L. Droste, "Theory and Practice of Water and Wastewater Treatment", John Wiley & Sons, New York, 1997.
5. McGhee, T.J., "Water Supply & Sewerage", McGraw Hill International Edition, 1991.

B. Tech. – III (Civil), Semester - VI	L	T	P	C
AM 306: STRUCTURAL ANALYSIS - II	**3**	**1**	**2**	**5**

COURSE OBJECTIVE:

CO-1: Analyse water quality from different sources for a given end use
CO-2: Explain the need of treating water from different sources for municipal use.
CO-3: Design a small pipe network for drinking water distribution
CO-4: Design a water treatment plant based on the source water quality
CO-5: Suggest suitable water treatment option for a given rural area situation.

- **ANALYSIS OF INDETERMINATE STRUCTURES (Hours-10)**
  Concept of fixed and propped cantilever beams - Slope deflection method - Moment Distribution method for continuous beams and rigid frame with and without support settlement.

- **MATRIX METHOD OF ANALYSIS (Hours – 10)**
  Introduction to force and displacement method of analysis - Stiffness method of analysis using direct element approach

- **ANALYSIS FOR MOVING LOADS FOR INDETERMINATE BEAMS (Hours -5)**
  Construction of Influence lines for Beams - Application of Mueller Breslau's principle

- **ANALYSIS OF THREE AND TWO HINGED ARCHES, PARABOLIC & CIRCULAR ARCH (Hours -4)**
  Influence lines for Arches

- **PLASTIC ANALYSIS OF STRUCTURES, PORTAL and SWAY MECHANISM (Hours-4)**

- **APPROXIMATE METHODS OF ANALYSIS (Hours – 6)**
  Cantilever method and Portal method.

- **STRUCTURAL VIBRATIONS (Hours-03)**
  Study of Single and Multiple degrees of freedom system, damping.

PRACTICALS:

1. Fixed & Propped Cantilever Beam – Deflection measurement.
2. Influence Lines
3. Two and Three hinged arches
4. Application of Softwares for analysis

BOOKS RECOMMENDED:

1. Reddy C S (2007) "Basic Structural Analysis" 2nd edition, Tata Mc Graw Hill, New Delhi
2. Wang C K (1989) "Intermediate Structural Analysis" International edition, McGraw Hill, Singapore.
3. Meghere A S and Deshmukh S K (2003) "Matrix method of Structural Analysis" Charotar Publishing House, Anand.
4. Negi L S and Jangid R S (1999) "Structural Analysis", Tata Mc Graw Hill, New Delhi
5. Junarkar S B and Shah H J (1996) "Mechanics of Structures", Vol-2 , Charotar Publishing House, Anand.

B. Tech. – III (Civil), Semester - VI	L	T	P	C
AM 308: DESIGN OF STEEL STRUCTURES	**3**	**1**	**2**	**5**

COURSE OBJECTIVE:

CO-1: Use IS codes related to structural design of simple steel structure
CO-2: Calculate different load, load combination on its structure and its components.
CO-3: Design various component of steel structures like beam, column, axial force in truss and their welded and bolted connection as per limit stage design.
CO-4: Design typical industrial roof truss with gantry girder and multi-storied with plate girder.
CO-5: Develop the idea of innovative steel structure for Laboratory
CO-1: Design full unit (roof & building) using various codes in group.
CO-2: Prepare structural drawing for the simple steel structure design by them.
CO-3: Use various software for design and drawing

- **INTRODUCTION:**
  Introduction to engineering structures - principles of design, loads, factor of safety, properties of steel.

- **CONNECTIONS:**
  Connections with general design consideration- Introduction to riverted - Connections welded - Bolted connections introduction to flexible - Semi-rigid and rigid connections - Beam to beam, Beam to Column and Moment resistant connections for office / residential / industrial buildings.

- **DESIGN OF STRUCTURAL MEMBERS:**
  Design of Tension and compression members, design of flexural members – Beams, built up beams and plate girders - Design of built-up columns with slab base/ gusseted base foundation - Introduction to (i) Plastic Design of members and (ii) Load Resistance Factored Design (LRFD) method.

- **INDUSTRIAL ROOF:**
  Analysis and design of typical industrial roof trusses with gantry girder and portal frames

- **DESIGN OF STEEL TRUSSES BRIDGES:**
  - Railway Bridge

  Innovative, composite, cable stayed, suspension bridges introductions.

PRACTICALS:

1. Roof Truss: – D.L, L. L. Wind Load, Load Combinations, Design of members & Joints (2 Drg. Sheet).
2. Office Building: Simple beam, Plated beam, Beam to Beam connections, Beam to Column connections
   (1 Drg Sheet).
3. Plate girder: Design of Complete Plate Girder (1 Drg. Sheet)

BOOKS RECOMMENDED:

1. Ram Chandra "Design of Steel Structures". Vol – I & II Standard Book House, New Delhi.
2. Negi K S "Design of Steel Structures". Tata Mc Graw Hill Publisher Co. Ltd., New Delhi
3. Dugal S K "Design of Steel Structure", Tata Mc Graw Hill Publication, New Delhi, 2nd Edition (2007)
4. P Dayaratnam " Design of Steel Structures" S. Chand of Co., Delhi 2003 edition.
5. Arya A S & Ajamani J L., "Design of Steel Structure" Nem Chand Bros, Roorkee..

LIST OF ELECTIVE INTER DISCIPLINARY SUBJECTS OFFERED BY CED

B.Tech. – III SIXTH SEMESTER

Sr. No.	Code	Subject
1	CE312	GIS and Applications
2	CE316	Environment and Health
3	CE322	Advanced Fluid Mechanics

LIST OF ELECTIVE INTER DISCIPLINARY SUBJECTS OFFERED BY AMD

B.Tech. – III SIXTH SEMESTER

Sr. No.	Code	Subject
1	AM310	Machine foundation
2	AM312	Repair & Maintenance of Structures
3	AM314	Foundation Engineering
4	AM316	Introduction to Finite Element Method
5	AM318	Disaster Management

B. TECH. III SEMESTER - VI	L	T	P	C
CE 312: GIS AND APPLICATIONS	3	-	-	3

COURSE OBJECTIVE:

CO-1: Understand the GPS system, its segments and receivers.
CO 2: Execute different methods of observations.
CO3: Apply different types of corrections.
CO 4: To be up complex application of GPS using integrated approach.

- **GEOGRAPHICAL INFORMATION SYSTEMS**
  - Geographical concepts and terms – GIS and CAD packages - Applications and benefits of GIS **(04 Hours)**
  - Input data to GIS – Digitization and scanning from maps – Aerial photographs – Satellite images – Input from satellite images, input from GPS **(08 Hours)**
  - Raster & Vector Data – Conversion – Storage and compression techniques **(07 Hours)**
  - Registration and resampling of thematic layers – Projection system of layers **(04 Hours)**
  - Database creation – Spatial and non-spatial – Database retrieval and management – Query from database **(10 Hours)**
- **ENGINEERING APPLICATIONS (12 Hours)**
  - Landuse / Landcover mapping , Utility mapping - Water resources mapping - urban and regional planning – Hydrological modelling – digital terrain modelling - environmental and other engineering applications – Web GIS, Decision Support System (DSS)

REFERENCES:

1. Ghosh S.K., "Geographic Information Systems", Narosa Publications, New Delhi, 1994
2. Stan Aronoff, "Geographical Information Systems", WDL Publications, Ottawa, Canada, 1989.
3. Burrough P. A., "Principles of Geographical Information systems for Land Resources Assessment", Oxford Science Publications, U. K.,1981

B.TECH. III (CIVIL) SEMESTER - VI	L	T	P	C
CE 316: ENVIRONMENT AND HEALTH	3	0	0	3

COURSE OBJECTIVE:

CO-1: Being able to define and explain health and diseases.

CO-2: Demonstrate the significance of health, diseases and epidemiology in society.

CO-3: Commit to environmental legislations on water, waste water, air and noise.

C0-4: Create awareness about various pollution forms and effects.

- **INTRODUCTION** **(7 Hours)**
  Scope and importance of Environmental Health - Introduction to Environmental pollution – its impact on human health – epidemiology - agents of diseases and their pathways – chronic and communicable diseases – environmental disasters : case studies

- **AIR POLLUTION AND HEALTH** **(12 Hours)**
  Types of air pollutants – impacts on human health – air quality guidelines in protecting public health – global climatic changes and its impact on health – incineration of wastes: dioxins, furans and PCBs - air quality standards

- **WATER AND HEALTH** **(12 Hours)**
  Drinking water quality – water borne diseases – aspects of water and wastewater treatment – Fluoride and Arsenic in drinking water

- **SOLID WASTE AND HEALTH** **(06 Hours)**
  Solid waste collection, handling, treatment and disposal – microbial flora in waste streams – human exposure assessment and effects – bio-aerosols

- **PESTS AND PESTICIDES** **(04 Hours)**
  Arthropods, rodents and other pests – Fungicides, herbicides and rodenticides – pesticides – human risks - regulations

- **RADIATION AND HEALTH** **(04 Hours)**
  Understanding radiation – radioactivity and radiation exposure – sources of radiations – Radon and its effect on health – solar radiations: ultraviolet radiations – ozone holes

(Total Contact Time: 45 Hours)

BOOKS RECOMMENDED:

1. Cairncross and Feachem " Environmental Health Engineering in the Tropics" John Wiley and Sons, 1993.
2. Moeller D. W.," Environmental Health" Harward University Press, 2005.
3. Willgoose.," Environmental Health" William C Brown, 1988
4. Katheryn Hilenkamp, "Environmental Health : Ecological Perspective. Jones and Bartlett Publishers, 2006
5. J. E. Park, "Preventive and Social Medicine", Banarasidas Bhanot Publishers, Jabalpur, 1995.

B Tech. -III, Semester VI	L	T	P	C
CE 322: ADVANCED FLUID MECHANICS	3	0	0	3

COURSE OBJECTIVE:

CO-1: Identify the fluid flows and accordingly application of basic laws of fluid mechanics to solve real time problems.
CO-2: Analyse the combinations of flows to provide the solution to complex fluid problems.
CO-3: Investigate the stability analysis of flows to obtain the solution.
CO-4: Evaluate the pipe flow systems for its efficient use.
CO-5: Examine the pipe flow conveying system for sustainability.

- **BASIC LAWS OF FLUID MECHANICS (7 Hours)**
  Continuum fluid concept, concept of fluid particle, Lagrangian and Eulerian approaches for description of fluid motion, system control volume approaches, Reynolds transport theorem, law of conservation of mass-continuity equation, law of conservation of momentum-equation of motion, law of conservation of energy- energy equation.

- **POTENTIAL FLUID FLOW (8 Hours)**
  Standard flow pattern- uniform flow, source, irrotational vortex circulation, doublet, source and sink, vortex pair; source and vortex-spiral flow; source and uniform flow-flow past a half body; doublet and uniform flow-flow past a half body; source, sink and uniform flow-flow past a Rankine body; doublet and uniform flow-flow past cylinder, doublet; Doublet, vortex and uniform flow-flow past a cylinder with circulation; Magnus effect.

- **VISCOUS FLOW AND FLOW INSTABILITY (8 Hours)**
  Equation of motion – Navier-Stokes equation, Exact and approximate solutions of N-S equation, creeping motion**,** theory of instability of laminar flow- methods of small disturbance, stability analysis, Orr- Sommerfeld equation, solution of OSE equation- neutral stability curve, stages of transition from laminar to turbulent flow, factors affecting transition from laminar to turbulent flow.

- **BUNDARY LAYER THEORY (9 Hours)**
  Factors affecting growth of boundary layer, momentum thickness, displacement thickness, energy thickness, order of magnitude analysis, Prandtl's boundary layer equation, exact solution of laminar boundary layer equation for flow on a flat plate, von Karman momentum integral equation and its application in computation of boundary shear stress, drag, local and average coefficients of friction for laminar and turbulent boundary layers, factors affecting separation of boundary layer and its control**.**

- **TURBULENT FLOW (7 Hours)**
  Characteristics of turbulent flow, types of turbulent flow, averaging procedure, Reynolds equation for turbulent flow from N-S equation, Prandtl's mixing length theory for two-D

parallel flows, Karman-Prandtl's universal velocity distribution, smooth and and rough turbulent flow and their velocity distributions, Moody's diagram - friction factor and its variation with Reynolds number and relative roughness.

- **UNSTEADY FLOW IN PIPE** **(6 Hours)**

  Water hammer, Rigid and elastic water column theories, methods of analysis.

BOOKS RECOMMENDED:

1. Daily J.W. and Harlaman D.R.F., " Fluid Dynamics ", Addision Weasly
2. Garde R. J., ' Turbulent flow', New Age International (P) Limited, Publishers, New Delhi, 2000.
3. Streeter V.L., Bedford K. and Wylie E. B., "Fluid Mechanics", McGraw Hill Book Company Ltd., New York, 1998.
4. Vallentine H. R., 'Applied hydrodynamics' S. L. edition, The English Language Book Society and Butter Worths London, 1969
5. Schilichting, H., 'Boundary layer theory', McGraw Hill Book Co., Inc., New York,1955.
6. Asawa G L, "Fluid flow in pipes and channels", CBS Publishers, New Delhi, 2008.

B. Tech. – III (All Branch), Semester – VI	L	T	P	C
AM 310 : Machine foundation (EIS – II)	3	-	-	3

- **Soil Properties & Exploration**
  Soil Properties and it's applications – Bearing capacity of Soil – Determination of Dynamic Property of Soil – Soil Exploration.

- **Classification of Machine Foundation**
  General design requirement – Concept of Resonance condition – Permissible amplitude limit – Fibre Reinforced and Prestressed machine foundation

- **Block Type Machine Foundation**
  Degree of freedom – Horizontal and vertical vibration problem – Concept of vibrating soil – Impact type block foundation

- **Frame Type Machine Foundation**
  Different method of analysis of frame foundation - Under turned and over turned framed foundation – Turbine Position.

- **Vibration Isolation & Special Foundation**
  Wave propagation concept – Different method of vibration isolation – Position of machine on the floor – Well type and corrective machine foundation – dampers – Vibration – measurement.

BOOKS RECOMMENDED:.

1. Srinivasula & Vaidynathan, "Hand Book of Machine Foundation" by Tata Mc Graw Hill.1976
2. C. Venkatramaiah, "Geotechnical Engineering" by new Age International Publishers, 2007
3. Boweles J E "Foundation Analysis & Design" by Mc Graw Hill Inc, New York, 1988.
4. Alexander Major, "Vibration Analysis & Design of Foundation & Trubines", Collect'sHolding Limited, London.
5. D D Barken, " Dynamics of bases & foundation, "Mc Graw Hill Book Company, INC – NewYork, London.

B. Tech. – III (All Branch), Semester – VI	L	T	P	C
AM 312: Repair & Maintenance of Structures (EIS-II)	**3**	**-**	**-**	**3**

COURSE OBJECTIVES:

CO-I: Identify deterioration process and construction defect in structures.
CO-2: Analyse various non-destructive testing methods and interpret the results for the same.
CO-3: Provide solution for different methods of repairs in concrete.
C0-4: Identify repair materials for proper solutions of construction defects.

- Deterioration process in concrete structures – Construction and design defects – Diagnostic methods.
- Load Testing and non destructive testing – cause and Prevention of crack in masonry structures.
- Corrosion in Structures – Repair materials, Cement, aggregate, polymer and construction chemicals.
- Methods of repair in concrete – Steel and timber structural components – Corrosion damage of reinforced concrete and its repair
- Maintenance of Structures – Classification of Maintenance works – Surface deterioration – Efflorescence causes – Surface coating and painting - Water Proofing – Varnishing – Inspection and Planning – Budgeting and management

BOOKS RECOMMENDED:

1. Peter H Emons, "Concrete repair and maintenance Illustrated", Galgotia Publication Pvt Ltd, New Delhi (2001)
2. R T L Allen and S C Edwards "The Repair of Concrete Structures, "Blackie & Sons Ltd, Glasgow, London (1987)
3. R Jagadisa, "Structural Failures – Case Histories Oxford & IBH Publishing Co. Ltd, New Delhi (1995).
4. R N Raikar, "Diagnosis and Treatment of Structures in Distress, R & D Centres Structural Designers & Consultation Pvt Ltd, Vashi, New Bombay, 1994.
5. P K Ghua "Maintenance and Repair of Buildings, new Central Book Agency (P) Ltd, Kolkatta, 1995

B. Tech – III (All branches) Semester –VI	L	T	P	C
AM 314: Foundation Engineering (EIS –II)	**3**	**-**	**-**	**3**

COURSE OBJECTIVE

CO1: Identify Soil properties and prepare sub-soil investigation report.
CO2: Analyze the bearing capacity and settlement of foundations.
CO3: Provide solutions for the depth and dimensions of shallow and deep foundations.
C04: Design the pavement based as ground characteristics.

- **Soil Exploration** **(Hours -7)**
  Soil Properties and its applications – Sub soil exploration – Objectives – Methods of exploration – Sample disturbance – Sounding tests – Geo Physical methods – Borelog – Sub soil Investigation report.

- **Bearing capacity of Soil** **(Hours -7)**
  Introduction – Basic definitions – Bearing capacity theories – Types of shear failure – Effect of water table – Bearing capacity from plate load test.

- **Foundation Settlement** **(Hours -7)**
  Settlement of Foundations – Components of Settlement – Cause of Settlement – Computation of Immediate settlement – Consolidation of Soil – Consolidation parameters – Computation of magnitude of consolidation settlement – Time rate settlement – Differential settlement.

- **Design of Shallow and Deep Foundations** **(Hours -14)**
  Types of Shallow Foundations – Depth of Footing – Foundation loading – Principle of design of footings – Proportioning for equal settlement – combines footings – Common types of mat foundation – Design Raft foundation – Deep foundations – Necessity of pile foundation – Classification of piles – Load carrying capacity of piles methods – Pile load test – Negative skin friction – Settlement of pile – Group efficiency , Introduction of caisson and well foundation

- **Pavement Design** **(Hours -7)**
  Types of pavement – Basic requirements of pavements – functions of different components of pavements – Factor's affecting pavement design – California bearing capacity ratio test – Design of flexible pavements – coefficient of sub grade reaction

BOOKS RECOMMENDED:.

1. J E Bowles (1997) " Foundation Analysis and Design" Mc Graw Hill, New Delhi
2. Arora K R, "Soil Mechanics & Foundation Engineering" Standard Publishers Ltd.2002
3. B M Das (2005) "Principles of foundation Engineering PWS publiushing company
4. Kaniraj S R , "Design Aids in Soil Mechanics and Foundation Engineering Mc Graw Hill, New Delhi
5. A V Shroff (2003) "Soil Mechanics and Geotechnical Engineering"

B. Tech. – III (All branches) Semester - VI	L	T	P	C
AM 316: Introduction to Finite Element Method (EIS-II)	3	-	-	3

COURSE OBJECTIVE:

CO-1: Being able to define and explain health and diseases.

CO-2: Demonstrate the significance of health, diseases and epidemiology in society.

CO-3: Commit to environmental legislations on water, waste water, air and noise.

C0-4: Create awareness about various pollution forms and effects.

- Concept & Solution procedure for finite element displacement approach. **(Hours -03)**
- Principles of discretization. **(Hours -05)**
- Lagragian & Hermitian interpolation functions. **(Hours -04)**
- Shape function & numerical integration technique. **(Hours -04)**
- Element properties for one dimensional (bar & beam) element & two dimensional (rectangular, triangular & isoparametric elements using natural & area coordinate system. **(Hours -10)**
- Introduction to plate elements – shell elements – dynamics and vibration – buckling – Galerkin method **(Hours-8)**
- Pre and post processors, Solution Techniques & Software Packages. **(Hours -12)**

BOOKS RECOMMENDED:

1. Cook R. D. et. al. (2003)"Concept & application of finite element analysis" by John Wiley & Sons Inc., Singapore, 4th Edition,
2. Logan D L, (2004) " A first course in the Finite Element Method", 3rd Edition, Thomson Asia Pvt Ltdm Bangalore.
3. J N Reddy,(2005) "An Introduction to the Finite Element Method", 3rd edition, Tata McGraw Hill Pub.com Ltd, New Delhi
4. Chandrupatla, T. R. & Belegundu, A. D., (2002) "Introduction to Finite Elements in Engineering", 3rd edition, , Prentice – Hall of India Pvt. Ltd., New Delhi.
5. Rao, S. S.,(2005) "The Finite Element Method in Engineering" 4th Edition, Butterworth – Heinemann, Oxford, U. K.

B. Tech. – III (All Branches), Semester – VI	L	T	P	C
AM 318 : Disaster Management (EIS-II)	**3**	**-**	**-**	**3**

COURSE OBJECTIVE:

CO-1: Identify the various features of natural and manmade disaster and safety measures for them.

CO-2: Formulate the structure of disaster management (NDMA & GSDMA).

CO-3: Design mitigation preparedness, early warning system for various disasters.

CO-4: Prepare disaster management plan for any system.

CO-5: Analysis of the failure from various case studies.

- Types of Disasters – its dimensions – Impact of Disasters – Forecasting – Role of Remote Sensing and Geographical Information System in Disaster management – Vulnerability – Disaster Reduction Strategies – Multi Hazard Mapping – Financial Management – Losses from Global Disasters and Expenses in Reconstruction and Retrofitting of structures – Role of NGO, Government Bodies and Public, Social and Economic Development of Disaster Prone areas – Emergency Planning
- Structure of Disaster Management in India
- Disaster Management – Process and Main steaming

BOOKS RECOMMENDED:.

1. ISDR (2003), A draft framework to guide and monitor Disaster Risk Reduction.
2. EMI (2004), The cross cutting Capacity Development (3cd) Program: Program Definition and Implementation Plan.
3. Urban Agglomerations (2001), United Nations Population Division, Department of Economics and Social Affairs.
4. Frernandex J., Mattingly S,(2005) EMI Contribution to the World Conference on Disaster Risk Reduction
5. Singh S K (2004) Disaster Management in Mumbai, First Coordination workshop of EMI's 3cd programm, Seeheim, Germany, June 26-27

Mumbai Disaster Management Plan (1999), Government of Maharasthra

B.TECH.-IV (CIVIL) (With Effect from August 2009)

SEVENTH SEMESTER

Sr. No.	Course	Course Code	Teaching Scheme Hours per Week			Credits	Examination Scheme				
							Theory	TU	TW	Pract	Total Marks
			L	TU	PR		Marks	Marks	Marks	Marks	
1	Highway Engineering	CE401	3	-	2	4	100	-	20	30	150
2	Municipal Wastewater Engineering	CE403	3	-	2	4	100	-	20	30	150
3	Town Planning	CE405	3	-	0	3	100	-	-	-	100
4	Design of Concrete Structures	AM407	3	1	2	5	100	25	20	30	175
5	ES I *	-	3	-	-	3	100	-	-	-	100
6	Seminar	CE409	-	-	2	1	-	-	20	30 +	50
7	Project Preliminaries	CE411	-	-	4	2	-	-	40	60	100
Total contact hours per week = 28						**Total Credit = 22**			**Total Marks = 825**		

* Students have to opt one subject from group of Elective Subject I.

EIGTH SEMESTER

Sr. No.	Course	Course Code	Teaching Scheme Hours per Week			Credits	Examination Scheme				
							Theory	TU	TW	Pract	Total Marks
			L	TU	PR		Marks	Marks	Marks	Marks	
1	Water Resources Engineering-II	CE402	3	-	2	4	100	-	20	30	150
2	Professional Practices	CE404	3	1	-	4	100	25	-	-	125
3	Heavy Construction & Project Management	CE406	3	1	-	4	100	25	-	-	125
4	Concrete Technology	AM408	2	-	2	4	100	-	20	30	150
5	ES II *	-	3	-	-	3	100	-	-	-	100
6	Project (CED/AMD)	CE 412	-	-	8	4	-	-	80	120	200
Total contact hours per week = 28						**Total Credit = 23**			**Total Marks = 850**		

* Students have to opt one subject from group of Elective Subject II.

B.Tech. IV (Civil) Semester-VII **L T P C**

CE401: HIGHWAY ENGINEERING **3 0 2 4**

COURSE OBJECTIVES:

CO-1: Carry out laboratory investigations for characterisation of highway materials.

CO-2: Carry out design of geometric elements of highways.

CO-3: Carry out design of flexible & rigid pavement.

CO-4: Plan and conduct traffic studies and analyse traffic condition.

CO-5: Synthesise pavement condition with maintenance needs.

- **HIGHWAY PLANNING AND ADMINISTRATION (03 HOURS)**
  History of road development, Road planning in India, Highway administration, Highway project preparation, surveys and investigations, project estimates.

- **HIGHWAY GEOMETRICS (06 HOURS)**
  Design controls & criteria, Cross sectional elements, Sight distance considerations, Design of horizontal and vertical alignment

- **HIGHWAY MATERIAL AND CONSTRUCTION (10 HOURS)**
  Sub grade soil investigation and properties, Desirable properties of aggregates and bitumen, Testing of aggregates, binders and mixes, IRC specifications for materials, Construction of low-cost roads, WBM, WMM, Types of bituminous surfaces and C.C. roads, IRC specification for construction, Tools, Equipments and Plants, Highways in hilly region, waterlogged areas and other area specific issues.

- **PAVEMENT DESIGN (09 HOURS)**
  Types of pavements, Design factors and analysis, Design of flexible and rigid pavements, various design methods, IRC code of practice.

- **HIGHWAY MAINTENANCE (05 HOURS)**
  Pavement evaluation, Surface and sub-surface drainage, Maintenance of bituminous and concrete roads, Concepts of overlay design, Pavement Management System.

- **TRAFFIC ENGINEERING (12 HOURS)**
  Basic parameters, Traffic studies, Different traffic control devices, Signs , markings, signals, Traffic management and regulation, Concepts of at-grade & grade separated intersections, highway capacity, level of service.

PRACTICALS:

(A) Test on subgrade soil and road aggregates

1. Determination of C.B.R. value of Subgrade Base Course
2. Determination of Abrasion & Attrition Value

3. Determination of Impact & Crushing value
4. Determination of Flakiness & Elongation Indices

(B) Tests on bituminous binder

5. Determination of ductility
6. Determination of softening point
7. Determination of penetration value
8. Determination of viscosity

(C) Traffic studies

9. Mixed Traffic Volume Study.
10. Speed studies of fast and slow vehicles.
11. Driver Test – I
12. Driver Test – II

BOOKS RECOMMENDED:

1. Kadiyali L. R., "Principles and Practice of Highway Engineering", Khanna Technical Publications, Delhi. 2005
2. Khanna S.K., Justo C.E.G., "Highway Engineering", Nem Chand & Bros., Roorkee 1987
3. Yoder C.J., Witizak M.W., "Principles of pavement design", John Willey & Sons, 1978
4. Matson, Smith, Hurd, "Traffic Engineering", Mc Graw Hill Book Co., 2002
   Pignataro L.J., "Traffic Engineering-Theory & Practice", John Willey & Sons, 1985

B.TECH. IV (CIVIL) SEMESTER - VII	L	T	P	C
CE 403: MUNICIPAL WASTEWATER ENGINEERING	3	0	2	4

COURSE OBJECTIVE:

CO-1: Analyse the characteristics of wastewater and describe its impact on environment.

CO-2: Identify the processes for designing a sewage treatment plant.

CO-3: Design and provide an appropriate sewerage system.

CO-4: Design and monitor a sewage treatment plant.

- **WASTEWATER GENERATION, COLLECTION AND CONVEYANCE (10 Hours)** Wastewater Quantity - Classification of wastewater - Sewerage system for domestic wastewater and storm water - Collections, and appurtenances - Design and layout of sewerage systems - Maintenance of sewerage systems - Physical, Chemical & Biological characteristics and their significance.

- **PRIMARY TREATMENT OF WASTEWATER (10 Hours)** Objectives of Wastewater treatment- Treatment methods: Unit Operations and Processes Design criteria - Design of primary treatment System

- **SECONDARY TREATMENT OF WASTEWATER: (12 Hours)** Concepts of Biological treatment and removal mechanism – Aerobic and Anaerobic systems - Design of suspended and attached growth processes – Introduction to extended aeration processes and waste stabilization pond - Design of anaerobic system.

- **SLUDGE HANDLING (05 Hours)** Quantity and quality of sludge, Methods of sludge treatment: sludge digestion and drying beds – Disposal of sludges.

- **WASTEWATER DISPOSAL (05 Hours)** Alternative disposal methods - Self purification of stream - Standards for disposal alternatives, natural purification of polluted streams.

- **HOUSE DRAINAGE & ENVIRONMENTAL SANITATION : (03 Hours)** General principles - House drainage system - traps and sanitary fitting - Low cost sanitation system

(Total Contacts hours: 45 Hours)

PRACTICALS:

1. Determination of solids.
2. Determination of pH.
3. Measurement of colour.
4. Determination of carbonate, bi-carbonate and hydroxide alkalinity.
5. Determination of oil and grease.
6. Determination of phosphorus as PO_4^{-3}.

7. Determination of sulphate.
8. Determination of Biochemical Oxygen Demand of wastewater.
9. Determination of Chemical Oxygen Demand of a given sample.

BOOKS RECOMMENDED:

1. Metcalf and Eddy, “Wastewater Engineering”: Treatment, Disposal Reuse”, Tata McGraw Hill Ed. New Delhi, 1995.
2. G.L. Karia and R.A. Christian, “Wastewater Treatment Concepts & Design Approach”, Prentice-Hall of India Pvt. Ltd., New Delhi, 2006.
3. Manual on Sewerage and Sewage Treatment, CPH and EE Organisation, Ministry of works and housing Govt. of India, New Delhi, 1991.
4. McGhee, T. J., "Water Supply & Sewerage", McGraw Hill International Edition, New Delhi,1991.
5. H. S. Peavy, D. R. Row and G. Tchobanoglous, “Environmental Engineering”, McGraw Hill International Edition, New Delhi, 1995.

B. Tech. IV (Civil) Semester – VII	L	T	P	C
CE 405 TOWN PLANNING	3	0	0	3

COURSE OBJECTIVES:

CO-1 Perceive significance of town with respect to legislation and administration
CO-2: Analyse urbanization growth with land use planning
CO-3: Design of Housing Society based on development control regulations
CO-4: Plan community base city centre and CBD areas
CO-5: Plan industrial and transportation hub with infrastructure
CO-6: Analyse urban projects under National Urban Renewal Mission

- **TOWN PLANNING CONCEPT,EVOLUTION & DEVELOPMENT: (06 Hours)**
  Significance of town planning, Planning in Ancient, Medieval, Modern Periods, Contribution of noted urban planners, Planning legislation and administration, National Planning Institutions.

- **URBAN SETTLEMENT CLASSIFICATION & STRUCTURE: (06 Hours)**
  India's Urbanization, Growth theories, urban form, Activity system, Land use and density structure, Town classification, Multinuclei urban development.

- **URBAN SURVEYS & APPLICATIONS: (05 Hours)**
  Significance of surveys, Types, Planning parameters, Analysis and Applications.

- **URBAN PLANNING & DESIGN: (05 Hours)**
  Objectives & principals, Conventional and system approach in planning, Land use planning, Neighborhood planning, Development plan and control regulations, T.P. Scheme norms & methodology, New towns, Metro regions, Issues & concept of urban design, Zonal planning.

- **ENVIRONMENTALPLANNING: (06 Hours)**
  Concept, Issues of developing nations, Industrial & transportation Planning, Infrastructure, Water, Drainage, Storm Water Planning, waste disposal site selection criteria.

- **URBAN CENTER & RENEWAL: (06 Hours)**
  CBD components, Town centers, National urban renewal missions & Programme, Industries types, Sites for industries.

- **INDUSTRIES: (04 Hours)**
  Types, location, environmental consideration.

- **HOUSING: (07 Hours)**
  Planning of residential area in T.P. Scheme, byelaws, density, Building forms, Neighbourhood housing, Issues of MIG, EWS & slum housing, Low cost housing

BOOKS RECOMMENDED:

1. Modak N.V. and V.N. Ambdekar, “Town and Country Planning and Housing”, Orient Longman Ltd., New Delhi. (1995)
2. Hiraskar G.K. “Fundamentals of Town Planning”, Dhanpat Rai & Sons, Delhi (1993).
3. Gallion A.B. and Simon Eisner, “The Urban Pattern”, CBS Publishers, Delhi (1984).
4. Govt. of Gujarat, “Gujarat Town Planning Act”, (1976) (Amendment-1999)
5. Reading Materials-Institute of Town Planners,India,New Delhi.Vol I to XI (2005)

B. Tech. – IV (Civil), Semester - VII	L	T	P	C
AM 407: DESIGN OF CONCRETE STRUCTURE	**3**	**2**	**2**	**6**

COURSE OBJECTIVES:

CO-1: Know types of structural elements of a building and types of live load and dead load
CO-2: Identify the methods of structural design.
CO-3: Design of singly, doubly and flanged RCC beams
C0-4: Detailed design of one way, two way and cantilever slab and staircase
CO-5:Conceptual design of short and long columns along with foundation for Laboratory

For Laboratory

CO-1: Draw sectional elevation and plan of different structural elements.
CO-2: Auto CAD drawings of simply supported and continuous beams
CO-3: Auto CAD drawings of slabs-one way, two way and cantilever beams.
CO-4: Sectional elevation and plan detailing of columns and footing.
CO-5**:** Detailed structural details of staircase and site visits.

- **INTRODUCTION** **(Hours – 07)**
  Loads – Methods of Design – Reinforcement Detailing & Bending
- **BEAMS** **(Hours – 06)**
  Singly and doubly reinforced beams – Flanged beams (Tee & Ell beams) – Shear criteria – Development length and torsion – Design of simply supported and continuous beams
- **SLABS** **(Hours – 06)**
  Design of one way and two way slabs
- **COLUMNS** **(Hours – 06)**
  Design of axially loaded short and long columns
- **FOOTINGS** **(Hours – 05)**
  Design of isolated sloped footings
- **STAIRCASE** **(Hours – 06)**
  Design of simple stair case - Dog legged stair case
- **INTRODUCTION TO EARTHQUAKE RESISTANT DESIGN** **(Hours – 06)**
  Introduction to CAD & application of software to above mentioned topic
- **RELEVANT IS CODE**
  All the design will be as per the relevant IS code, Seismic coefficient method,(IS:456, IS:875, IS:1893, IS:13920)SP :22,SP34.

PRACTICALS:

1. Design of rectangular, T, L beam of Singly / Doubly Reinforced types.
2. Design of one way simply supported slab.
3. Design of two way simply supported slab.
4. Design of one way continuous slab.
5. Design of two way continuous slab for different boundary conditions.
6. Design of footing
7. Design of Stair case
8. Application of different softwares.

BOOKS RECOMMENDED:

1. Pillai SU, and Menon D, "Reinforced Concrete Design", 2nd edition, Tata Mc Graw Hill Publication Ltd, New Delhi. 2006
2. Sinha S. N. "Reinforced Concrete Design", 2nd edition, Tata <c Graw Hill Publishing Co., Ltd, New Delhi, 2006.
3. Shah H J, "Reinforced Concrete", Vol-I 6th Edition, Charotar Publishing House, Anand (2007)
4. Park R and Paulay T, "Reinforced Concrete Structures", John Wiley & Sons, New Delhi, 2005.
5. Jain A K, "Reinforced Concrete – Limit State Design" Nem Chand & Bros, Roorkee (2005).

LIST OF ELECTIVE SUBJECTS

B.E. – IV (CIVIL) SEVENTH SEMESTER

ELECTIVE GROUP – I

Sr. No.	Code	Subject
1	CE413	Urban Transportation Planning
2	CE415	Rural Planning & Development
3	CE417	Water & Waste Water Treatment
4	CE419	Computational Fluid Dynamics
5	CE423	GPS and Applications
6	CE425	Computer Aided Design In Civil Engineering
7	CE 427	Alluvial River Hydraulics
8	AM429	Design of Industrial Structures
9	AM431	Design of Advanced Concrete Structures
10	AM433	Design of Precast & Prestressed Structures
11	AM435	Design of Tall Structures
12	AM437	Ground Engineering
13	AM439	Planning and Design of Earthen Dams

B. Tech. IV (Civil) Semester-VII	L	T	P	C
CE413: URBAN TRANSPORTATION PLANNING (ES-I)	**3**	**0**	**0**	**3**

COURSE OBJECTIVES:

CO-1: Plan and carry out transport planning surveys in cities

CO2: Synthesize NUTP goals with transport planning practice

CO-3: Generate travel demand patterns for a city based on the land use, transport network and socio-economic data.

CO-4: Design transit system for a city

CO-5: Carry out economic evaluation of transport projects

- **INTRODUCTION (04 HOURS)**
  Urban transportation in India, need for planning, land use and traffic & their interrelation, transportation planning process, systems approach.

- **TRANSPORTATION SURVEYS (06 HOURS)**
  Study area, zoning, inventory, classification studies, cordon surveys, screen line survey O – D surveys, traffic impact studies, survey methods, sampling.

- **DEMAND FORECASTING (15 HOURS)**
  Trip generation factors, trip generation models, rates, trip distribution and models, Assignment techniques, modal split, mode choice modeling, land use transport interaction models, Lowry and other models.

- **PUBLIC TRANSPORTATION PLANNING (10 HOURS)**
  Classification of public transportation system, Rapid transit, Para-transit, City bus services, transport demand, planning & scheduling bus route network, public transportation in India issues.

- **EVALUATION OF TRANSPORTATION PLANS (10 HOURS)**
  Transport economics fundamentals, Economic evaluation, Environmental Impact Assessment, HDM-IV

BOOKS RECOMMENDED:

1. Kadiyali L. R., “Traffic Engineering and Transportation Planning”, Khanna Publishers, Delhi. 2002.
2. Das Animesh, Chakraborty Parth, “Introduction to Transportation Engineering”, Prentice Hall Of India Pvt. Ltd., New Delhi, 2003
3. Papacostas C. S. , “ Fundamentals of transportation engineering ”, Prentice Hall Of India Pvt. Ltd., New Delhi, 2002

4. Hutchinson B.G., “Principles of Urban Transportation Systems Planning”, Mc Graw Hill Publishers, 1974
5. Khisty C.J., Lall B.K., “Transportation Engineering – An Introduction”, Prentice Hall, NJ, 2005

B. Tech IV (CIVIL) SEMESTER-VII	L	T	P	C
CE 415: RURAL PLANNING AND DEVELOPMENT (ES-I)	3	0	0	3

COURSE OBJECTIVES:

CO-1: Significant thinking of housing and infrastructural issues.
CO-2: Empathize rural socio-economic issues.
CO-3: Be trained for rural housing technology
CO-4: Arrange cost effective methods of development.
CO-5: Appreciate rural culture for housing.
CO-6: Associate rural development to check urban flow

- **RURAL PLANNING : (08 Hours)**
  India's rural scenario- Planning issues, Urban Rural Differentiation- socio-economic structure - nature and scope, water supply and drainage planning, issues of tribal rural area

- **PLANNING APPROACH: (13 Hours)**
  Classifications based on use and geography, topography and demography, agricultural and rural resources, ecological planning, integrated approach in planning and development, water supply and drainage planning

- **REQUIREMENTS OF RURAL AREAS : (08 Hours)**
  Economic aspects, social aspects, educational factors affecting rural set up- rural development resources, development approach , India's rural development policy and Programme co-ordination, cultural issues in planning

- **DEVELOPMENT OF INFRASTRUCTURE : (08 Hours)**
  Rural Industrialization, low cost rural technology, rural infrastructural facilities, village-plan amenities, rural waste disposal techniques, Alternative sources of energy environmental issues

- **RURAL HOUSING : (08 Hours)**
  Housing materials, Application and durability, rural building forms, rural building plans, rural building services

BOOKS RECOMMENDED:

1. Rakesh Upadhyaya, "Integrated Rural Development in India", Himalaya Publishers House. (1989).
2. Khatkar R.K., "Rural Development", Northern Book Centre, New Delhi (1989).
3. Venkata Reddy, "Rural Development in India", Himalaya Publishers House. (1996)
4. Arora R.C., "Integrated Rural Development", S, Chand & Co. Ltd., New Delhi. (1994)

B. E. IV (CIVIL) SEMESTER – VII	L	T	P	C
CE 417: WATER AND WASTE WATER TREATMENT (ES-I)	3	0	0	3

COURSE OBJECTIVES:

CO-1: Interpret the results of analysis of water and wastewater samples and suggest suitable treatment options.

CO-2: Derive simple mathematical models for river water quality and apply it to solve problems.

CO-3: Design small natural wastewater treatment systems.

CO-4: Design a wastewater treatment plant for reuse of wastewater with advanced treatment.

- **INTRODUCTION (06 Hours)**
  Objectives of water and waste-water treatment - classification of treatments, parameters commonly employed to indicate pollution strength – standards for water quality and wastewater disposal – Self-purification of water bodies – Simple Mathematical models.

- **WATER TREATMENT PROCESSES (12 Hours)**
  Theory and design of Sedimentation, Coagulation, Clariflocculator, Filtration, Disinfection and Aeration

- **WASTEWATER TREATMENT PROCESSES (12 Hours)**
  Introduction to process selection and analysis - Measurement of wastewater flow - Variation in wastewater flow – Equalisation – Neutralization - Secondary treatment units and their design concepts - Wastewater disinfection.

- **NATURAL WASTEWATER TREATMENT SYSTEMS (04 Hours)**
  Aquatic Plant Systems, Constructed Wetlands and Vermi-culture

- **ADVANCED WATER TREATMENT PROCESSES (05 Hours)**
  Ion-exchange, reverse osmosis, adsorption, ultra-filtration, electro-dialysis. Desalination

- **RECLAMATION AND REUSE OF WASTEWATER (06 Hours)**
  Tertiary treatment for removal of residual organics, removal of nutrients, recycling and reuse of wastewater.

(Total Contact Time: 45 Hours)

BOOKS RECOMMENDED:

1. Metcalf and Eddy, “Wastewater Engineering Treatment, Disposal, Refuse, T.M.H. Edition, New Delhi, 1995.
2. Manual on Water Supply & Treatment 3rd Ed. Pub: CPH & Env. Engg. Organization, Ministry of Urban Development, Govt. of India, New Delhi, 1991.
3. H. S. Peavy, D. R. Rowe & G. Tchobanoglous “Environmental Engineering” , Mc Graw Hill Int., New Delhi, 1985.
4. Manual on Wastewater Treatment 3rd Ed. Pub: CPH & Env. Engg. Organization, Ministry of Urban Development, Govt. of India, New Delhi, 1991.
5. T. J. McGhee, “Water Supply and Sewerage” Pub: Mc Graw Hill Int., New Delhi, 1991.

B. Tech. IV (Civil), Semester-VII	L	T	P	C
CE 419: COMPUTATIONAL FLUID DYNAMICS (ES-I)	**3**	**-**	**0**	**3**

- **Equations of Fluid Dynamics**
  Basic Concepts - Eulerian, Lagrangian methods of describing fluid motion, acceleration and deformation of fluid particle, vorticity. Laws governing fluid motion, continuity, Navier-Stokes & energy equations. Boundary layer equation, Euler equations, potentional flow motions, Bernoulli's equation and vorticity transport equation. Initial and boundary conditions. Classification of equation of motions- hyperbolic, parabolic, elliptic.
- **Mathematical Preliminaries :Numerical integration**
  Review of linear algebra, solution of simultaneous linear algebraic equations-matrix inversion, solvers-direct methods, elimination methods, ill conditioned systems, Gauss-Seidel method, successive over relaxation method.
- **Grid Generation**
  Transformation of co-ordinates. General principles of grid generation- structured grids in 2-D & 3-D, algebraic grid generation, differential equation based grid generation, elliptic grid generation, algorithm, Grid clustering, Grid refinement, Adaptive grids, Moving grids. Algorithms, CAD interfaces to grid generation. Techniques for complex and large problems, Multi block methods.
- **Finite Difference Discretisation**
  Elementary finite difference coefficients, basic aspects of finite difference equations, consistency, explicit- implicit methods, errors and stability analysis. Stability of elliptic and hyperbolic equations. Fundamentals of fluid flow modeling-conservative property, upwind scheme, transporting property, higher order upwinding. Finite difference applications in heat transfer-conduction, convection.

- **Finite Volume Method**
  Introduction, application of FVM in diffusion and convection problems, NS equations-staggered grid, collocated grid, SIMPLE algorithm. Solution of discretised equations using TDMA. Finite volume methods for unsteady problems- explicit schemes, implicit schemes.
- **Finite Element Method**:
  Introduction. Weighted residual, and variational formulations. Interpolation in 1D- 2D cases. Application of FEM to 1D and 2D problems in fluid flow and heat transfer.

BOOKS RECOMMENDED:

1. Ferziger J. H., Springer P. M.; Computational Methods for Fluid Dynamics; Verlag Berling
2. Anderson J. D. Jr. Computational Fluid Dynamics; Mc Graw Hill, 1995
3. Patankar S. P. Numerical Heat Transfer and Fluid Flow,
4. Sunderarajan T and Muralidhar K Computational Fluid Flow and Heat Transfer 2nd edition, Narosa Publishing
5. Bates, Lane and Ferguson, Computational Fluid Dynamics – Application in Environmental Hydraulics, John Wylie & Sons Lts, 2005.

B. TECH. IV SEMESTER - VII	L	T	P	C
CE 423: GPS AND APPLICATIONS (ES-I)	3	-	-	3

COURSE OBJECTIVE:

CO-1: Understand the GPS system, its segments and receivers.
CO-2: Execute different methods of observations.
CO-3: Apply different types of corrections.
CO-4: To be up complex application of GPS using integrated approach.

- **INTRODUCTION** **(05 Hours)**
  Geodesy - Earth surface - Datum – Co-ordinate systems - Projection systems
- **GLOBAL POSITIONING SYSTEM** **(10 hours)**
  Introduction - Segments of GPS system - GPS receivers and its components - Different types of GPS systems
- **METHODS OF OBSERVATIONS** **(07 hours)**
  Absolute positioning - Relative positioning - Differential GPS - Kinematic GPS
- **ERRORS AND CORRECTIONS** **(05 hours)**
  Types of errors - Accuracy and precision - Basic statistical concept - Least square model
- **APPLICATIONS OF GPS** **(08 hours)**
  General applications - Engineering applications - Special applications - Innovative applications - 3D modelling
- **GPS AND INFORMATION TECHNOLOGY** **(10 hours)**
  GPS-GIS integrated system - GPS and Remote Sensing - Web based development - Real life projects - Use of GPS software

(Total Contact Time: 45 Hours)

BOOKS RECOMMENDED:

1. Agrawal N.K., "Essentials of GPS ", Spatial Network Pvt. Ltd., Hydrabad (2004).
2. Anderle R, "The Global Positioning System", Royal Society of London, U.K. (1988).
3. Kulkarni M.N., "Proceedings of CEP Training Course on The Global Positioning System and its Applications, IIT Bombay, Mumbai (2003)
4. Leick, "Global Positioning Systems" Academic Press.
5. Kulkarni M.N., "Proceedings of CEP Training Course on Global Positioning system and its Application in Atmospheric and Ionospheric Studies, IIT Bombay, Mumbai (2007)

B. Tech. IV (CIVIL) SEMESTER - VII **L T P C**

CE 425 COMPUTER AIDED DESIGN IN CIVIL ENGINEERING (ES-I) 3 0 0 3

COURSE OBJECTIVES:

CO-1: Apply programming skills to interprete and analyze data pertaining to Civil Engineering problems
CO-2: Design building, water resources, transportation water and waste water related systems
CO-3: Apply GIS tools to interprete and analyze data pertaining to Civil Engineering problems
CO-4: Apply advanced computer aided tools to solve complex problems in Civil Engineering

---

- **BASICS :** **(06 Hours)**
  Role of CAD in Civil Engineering, programming languages, Introduction to Civil Engineering Software's, Data processing

- **BUILDING DESIGN AND URBAN PLANNING:** **(08 Hours)**
  Building planning, drawing generation, interior design, landscaping, Application of AutoCAD and 3D home preparation of TP Scheme

- **WATER RESOURCES ENGINEERING:** **(06 Hours)**
  Programming and spreadsheet applications in the analysis and design of water resources systems such as Reservoir planning, Dam design and river training works.

- **TRANSPORTATION ENGINEERING:** **(08 Hours)**
  Programming and spreadsheet applications in the design and analysis of transportation systems, pavement design and related planning aspects

- **ENVIRONMENTAL ENGINEERING:** **(06 Hours)**
  Programming and spreadsheet applications in the design and analysis of water and waste treatment, management and disposal systems, Simulation Techniques

- **GEOGRAPHICAL INFORMATION SYSTEM:** **(06 Hours)**
  Basics of GIS, GIS applications in the above mentioned areas.

- **RECENT ADVANCES IN COMPUTER APPLICATIONS:** **(05 Hours)**
  Applications of artificial intelligence, expert systems, Neural networks, Fuzzy logic, Genetic Algorithms, Simulated Annealing etc.

BOOKS RECOMMENDED:

1.0 Computer aided architectural design, Lee Kaiman, (1989)

2.0 AutoCAD 13 , BPB Publications (1991)

3.0 Genetic Algorithms, David E. Goldberg (1985)

4.0 C++, Neural Networks and Fuzzy logic, V.Rao, H Rao, BPB (1996)

B. Tech. IV (Civil Engineering), VII semester	L	T	P	C
CE 427 : ALLUVIAL RIVER HYDRAULICS (ES-I)	**3**	**0**	**0**	**3**

COURSE OBJECTIVES:

CO-1: Compute incipient motion conditions of uniform and non-uniform sediments
CO-2: Classify flow regimes and compute resistance to flow in alluvial channels
CO-3: Estimation of bed loads and suspended load transports in alluvial channels
CO-4: Design of lined and unlined canals to carry clear and sediment laden water
CO-5: Identification and estimation of bed level variation in alluvial streams
CO-6: Computation of scours around bridge piers.

- **ORIGIN AND PROPERTIES OF SEDIMENTS (4 Hours)**
  Scope of sediment transport in alluvial stream problem, origin of sediments, individual and bulk properties of sediments.

- **INCIPIENT MOTION OF SEDIMENTS (4 Hours)**
  Semi-theoretical and empirical approaches for critical tractive stress of uniform and non-uniform sediments.

- **REGIMES OF FLOW (7Hours)**
  Regimes of flow like ripples, dunes, washing out of dunes, standing wave and anti-dunes, prediction of regimes of flow in alluvial streams, importance of regimes of flow, resistance law in loose boundary channel, form resistance and grain resistance, preparation of stage-discharge curve of alluvial streams.

- **TRANSPORT OF SEDIMENTS IN ALLUVIAL STREAMS (10Hours)**
  Modes of sediment transport in alluvial rivers, Einstein's approach for bed load transport of sediments, Roorkee approaches for transport of uniform and non-uniform sediments. Samaga's approach for transport of suspended load for uniform and non-uniform sediments, design of stable channels based on sediment transport concept.

- **HYDRAULIC GEOMETRY OF ALLUVIAL RIVERS (5Hours)**
  Stages of alluvial streams, dependent and independent variables in alluvial river problems, shape of streams in plan and cross section.

- **VARIATION OF BED LEVEL OF ALLUVIAL STREAMS (10Hours)**
  Continuity equation of sediments, aggradation, degradation and their locations in alluvial

streams, rotational and parallel degradation, aggradation and degradation models of alluvial streams, mechanism of local scour around bridge piers.

- **SILT CONTROL IN HYDROPOWER PROJECTS (5Hours)**
  Preventive and curative silt control measures in power canals, design aspects of desilting chambers in hydropower projects.

BOOKS RECOMMENDED

1. Garde R. J. and Ranga Raju K. G., "Mechanics of sediment transportation and alluvial stream problems", Third edition, New Age International (P) Limited, New Delhi, 2000.
2. Raudkivi, A. J., Loose boundary hydraulics, Pergamon Press, Oxford (U. K.), 2nd edition, 1976.
3. Yalin, M. S. "Mechanics of sediment transport",Pergamon Press, Oxford (U K),1971.
4. Garde R. J., 'River morphology, New Age International Publisher, New Delhi-110042, 2006.
5. GardeR. J., 'History of fluvial hydraulics, New Age International Publisher, New Delhi-110042, 1995.

B. Tech. – IV (Civil), Semester - VII	L	T	P	C
AM 429: DESIGN OF INDUSTRIAL STRUCTURES (ES-I)	3	-	-	3

COURSE OBJECTIVES:

CO-1: Plan various industrial structures considering the statutory requirements
CO-2: Calculate force analysis and design of various components of industrial buildings and gable frames
CO-3: design foot-bridge, towers, silos, gantry girders and different cable roofs
CO-4: Design industrial foundations
CO-5: Solve any innovative design and analyze it

- **PLANNING OF INDUSTRIAL STRUCTURES (Hours -10)**
  Classification of industries and local regulations - Factors affecting planning - General Aspects - Civil Engineering Aspects - Light and Ventilation.

- **DESIGN OF INDUSTRIAL STRUCTURES (Hours -08)**
  Types of Loads - Structural configurations - Components of a typical industrial building and overview of design procedure - Analysis of industrial buildings and Gable frames - Analysis of columns supporting Crane Girders

- **LARGE SPAN STRUCTURES IN INDUSTRIES (Hours -08)**
  Cable roofs - Types of cable roofs - Analysis of a cable subjected to concentrated loads and uniformly distributed load, Complexities in the analysis of a cable roof, Overview of deep beams, Virrendel Girder, Castellated Girders - Introduction to earthquake forces

- **SILOS AND BUNKERS (Hours -08)**
  Concept of Angle of Repose - Pressure distribution - Dynamic loads - Stability of bunkers - Foundations.

- **FOUNDATIONS FOR INDUSTRIAL STRUCTURES (Hours -08)**
  Machine foundations - General requirements - Design criteria - General analysis - Design of a block foundation for vertical compressor - Vibration Isolation - Foundations for Chimney and Microwave Towers

TUTORIALS

1. Design of Industrial Building.
2. Design of Silo / Bunkers
3. Design of Machine Foundation.

RECOMMENDED BOOKS

1. Srinivasula P. “Hand Book of Machine Foundation”, First Edition, Tata McGraw Hill Publications, New Delhi., 2000
2. Ramchandra, “Design of Steel Structures”, Seventh Edition, Standard Book House, New Delhi,2000.
3. Raghupati M., “Design of Steel Structures”, First Edition, Tata McGraw Hill Publication, Delhi, 2003.
4. Dayaratnam P. “Design of Steel Structures” Wheelr’s Publishers, Allahabad, 1995.
5. Anand Arya & Ajmani J. L., “Design of Steel Structures”, Forth Edition, Nemchand & Bros., Roorkee, U.P. , India, 2004.
6. Lambert F.W. ,“The Theory & Practical Design of Bunkers”, The British Constructional Steelwork Association Ltd., London, UK, 2000.

B. Tech. – IV (Civil), Semester - VII	L	T	P	C
AM 431: DESIGN OF ADVANCED CONCRETE STRUCTURE	3	-	-	3

COURSE OBJECTIVES:

CO-1: Student are able to design component of concrete members subjected to torsion
CO-2: Detailed structural design of flat slabs
CO-3: Capability to analyze and design of spherical domes
CO-4: methodology for analysis and design of different portal and building frames
CO-5: Structural design of RCC bunkers and silos

- **DESIGN OF MEMBERS SUBJECTED TO TORSION**
  Semicircular beam with slab, torsion factor, stresses due to torsion in concrete beams, reinforcement due to torsion, applications.

- **FLAT SLAB**
  Components, Direct design method, equivalent frame method, shear in flat slab, reinforcement detailing.

- **DOMES**
  Nature of stresses in spherical domes, analysis, stresses due to wind load.

- **PORTAL FRAMES & BUILDING FRAMES**
  Analysis & design of rectangular portal frame, with vertical loads, design of hinge at the base.
  Frames – Substitute frames, frames subjected to horizontal forces, portal method, cantilever method, factor method.
  Introduction to earthquake forces

- **BUNKERS & SILOS**
  Janssen's theory, Airy's theory, Hopper bottom, Design of beans.

TUTORIALS

1. Design of Circular Beams
2. Design of Flat Slab
3. Design of Domes
4. Analysis & Design of Building Frame
5. Design of Bunker / Silo.

BOOKS RECOMMENDED:

1. Mallick S.K. and Gupta A.P. , '**Reinforced Concrete'**, Oxford and IBH Publishing Company, New Delhi, (1998).
2. Vazirani V.N. and Ratwani M.M., '**Concrete Structures'**, Khanna Publishers, New Delhi, (1998).
3. Safarian S.S. and Harris E.C. **'Design and Construction of Siols and Bunkers'**, Van Norstrand Co., New York,(1998).

B. Tech. – IV (Civil), Semester - VII	L	T	P	C
AM 433: DESIGN OF PRECAST AND	3	-	-	3
PRESTRESSED CONCRETE STRUCTURES (ES-I)				

COURSE OBJECTIVES:

CO-1: Principle and general features of precast construction technology
CO-2: To understand manufacturing methods of precast elements
CO-3: Design criteria for precast beam-column-slab-roof
CO-4: Basic analysis and design of pre-stressed concrete
CO-5: Design of pre-stressed concrete poles-sleeper joints detailing

- **PRINCIPLES AND GENERAL FEATURES OF PRECAST CONSTRUCTION** **(Hours – 12)**
  Advantages and Disadvantages, Type standardization and Component Standardization, Construction principles, Manufacture of precast components and material properties

- **DESIGN CRITERIA** **(Hours – 10)**
  Precast structural elements such as beam - Column, Slab and Roof.

- **ANALYSIS AND DESIGN** **(Hours – 10)**
  Prestressed concrete building components
- **DESIGN OF PRESTRESSED** **(Hours – 10)**
  Concrete poles and sleepers Joint design, Detailing, Earthquake forces.

TUTORIALS

1. Design of Precast Beam
2. Design of Precast Column
3. Design of Precast Slab
4. Design of Pre-stressed Beam
5. Design of Pre-stressed Column
6. Design of Pre-stressed Slab
7. Design of Pre-stressed Concrete Pole
8. Design of Pre-stressed Concrete Sleepers

BOOKS RECOMMENDED

1. Koncz, I.T., Manual of precast concrete construction, Vol. 1,2,3, Bauverlag GMBH, Berlin (2003).
2. Grover C.W., Structural precast concrete, Asia Publishing House, Bombay (2003).
3. Krishna Raju N., Prestressed concrete, Tata McGraw Hill Publishing Co. Ltd., New Delhi (2006).
4. Lin T.Y., Burns, N.H., Design of prestressed concrete structures, John Wiley & Sons, New York.
5. *Dayaratnam. P, "Prestressed Concrete" Oxford – 1 BH Publication, New Delhi (2006).*

B. Tech. – IV (Civil), Semester - VII	L	T	P	C
AM 435 : DESIGN OF TALL STRUCTURES (ES – I)	3	-	-	3

COURSE OBJECTIVES:

CO-1: To identify tall structures and classify according to geometrical and structural configurations

CO-2: To analyze high tension transmission lines, towers TV and microwaves towers considering dynamic analysis

CO-3: To design different types of tall structures like multistory buildings, tall chimney foundations

CO-4: To provide solutions for guyed chimney and other tall structures considering earthquakes and wind loading

- **HIGH TENSION TRANSMISSION LINE TOWER**
  Various forces acting on tower, classification of tower – Various type of span – Effect of ice coated cable – Sag tension calculation – Type of Bracing patterns – Foundation – Different condition for design – Joint's in tower. I.S. Code provisions .

- **T.V./ MICROWAVE TOWER**
  Self supporting – Guyed tower – Concept of solidarity ratio – Stability and foundation design – Limiting criteria for tall / short tower – Concept of dynamic analysis – Approximate dynamic analysis – Stack (Shaft) supported tower – Concept of mode shapes – Tower mounted on building, it's I.S. code provision – Concept of multipurpose tower – Trestles and Masts – Concept of multi purpose tower – wind turbine tower.

- **TALL CHIMNEY**
  Types of chimney – Free standing, Guyed with fixed base, Pin base – Stability of chimney, Concrete and steel – Foundation design – Conceptual design – Concept of Earthquake force – Multipurpose chimney – Forces acting on chimney – Concept of vortex induced vibration – It's remedial measures – Cooling tower.

- **MULTISTORIED BUILDING**
  Planning of tall structure, Different between multistoried building and Ultra High Rise building – Forces acting on normal multistoried building and additional forces acting on Ultra high rise building – Earthquake forces calculation for building – Concept of approximate cantilever method – Wind force calculation for building – Structural configuration required for tall building, with field example – Some provision of I.S. : 1893 (Earthquake code) for building - Types of Foundation used for building – Shear core application – Application of elf compacting concrete & high strength material like epoxy, FRC etc.

BOOKS RECOMMENDED

1. Taranath “Mulitistoried building”.
2. Pankaj Agrawal & Manish Shrikhande,”Earthquake Engineering”.
3. Edmund Booth, Oye Arup & Partners (1994), “Concrete Structures in Earthquake Regions”, First Edition, John Wiley & Sons, New York, U.S.A.
4. Nainan P. Kurian (1994), “Design of Foundation Systems”, 2nd revised edition, Narosa Publishing House, New Delhi-17.
5. Manhar S. N. (1985), “Tall Chimneys Design & Calculations”, Tata McGraw Hill, New Delhi, (First edition)
6. Krishna Raju (1988), “Advanced Reinforced Concrete”, 2nd edition, CBS Publishers, Oxford pergamon Press.

B. Tech. – IV (Civil), Semester - VII	L	T	P	C
AM 437: GROUND ENGINEERING (ES – I)	3	-	-	3

COURSE OBJECTIVES:

CO-1: Geotechnical field investigations and interpretations
CO-2: Identify the expansive soil and collapsible soils and provede solutions to rest foundations on same soil
CO-3: Evaluate soil dynamic properties and analyze the parameters for design of machine foundations
CO-4: Provide solutions for treatment of weak deposits such as soft clays loose sand etc
CO-5: Evaluate liquefactions, susceptibility from laboratory and field testing results

- **EXPLORATION TECHNIQUES (Hours – 7)**
  Objectives – Methods – Suitability – Sub soil investigation – Bore log – Penetration tests – Geophysical methods – Report preparation.

- **FOUNDATION ON EXPANSIVE SOIL (Hours – 7)**
  Properties – Problems – Identification – Classification – Remedial measures – case studies

- **FOUNDATION ON COLLAPSIBLE SOIL (Hours – 7)**
  Definition – Types of collapsible soil – Physical parameters for identification – Procedure for calculating collapse settlement – case histories of stabilization of collapsible soil.

- **FOUNDATIONS FOR MACHINES (Hours – 7)**
  Classification – General requirements – Dynamic parameters of Soil – Foundations for reciprocating and impact type machines – Vibration isolation.
- **PRELOADING AND SAND RAIN (Hours – 7)**
  Precompression – general considerations – sand drains and its application – prefabricated vertical drains.

- **EARTHQUAKE GEOTECHNIQUES (Hours – 7)**
  Types – Seismic waves – location of earthquake – factors influencing ground motion – Liquefaction evaluation of liquefaction susceptibility

RECOMMENDED BOOKS

1. B M Das (2005), “Principles of foundation Engineering” PWS publishing
2. Gullhati S K & Datta M (2005) “Geotechnical Engineering”, Tata McGraw Hill Publishers Co. Ltd, New Delhi

3. R W Day (2001), “Geotechnical Engineering, Portable Handbook” Mc Graw Hill Publishers, New York, USA.
4. Hasuman M R (1990), “Engineering Principles of Ground Modification”, Mc Graw Hill Publishing Co, New York, USA
5. P. Purushottoma Raj, (1995) “Geotechnical Engineering”, Tata McGraw Hill Publishing Co, Ltd New Delhi
6. F.H. Chen, “Expansive Soil” Tata Mc Graw Hill Publishing Co. Ltd, New York.

B. Tech. – IV (Civil), Semester – VII	L	T	P	C
AM 439: PLANNING & DESIGN OF EARTHEN DAM (ES- I)	3	-	-	3

- **TYPES OF EARTH DAMS**
  Types, Components and their functions, free board, selection of site.

- **BORROW AREA SURVEY**
  Selection of borrow pits, programme of exploration, qualitative and quantitative estimates of soils available, borrow pit zoning and allocations.

- **EXPLORATION OF SUBSOIL FOR FOUNDATION**
  Programme of exploration, covering extent, depth, methods and cost, stages of explorations, foundation profile, ground water survey, engineering properties of each stratification in profile, special techniques of field explorations.

- **FAILURE & DAMAGES**
  Review of natural failures, differential settlement failures, slides in embankment and foundations, earthquake, reservoir's ware action piping etc.

- **STABILITY ANALYSIS**
  Applications of Swedish and Bishop's simplified method, total and effective stress analysis, methods of estimating pore pressure during construction and drawdown, selection of design parameters and design conditions, factor of safety of upstream and down stream slopes.

- **FOUNDATION DESIGN**
  Techniques of seepage control, drainage, and improving the in-situ strength, relative merits, control of piping and liquefaction, Applications of geotextiles.

BOOKS RECOMMENDED

1. Sherard J. L. 'Earth and rock fill dams' John Wiley.
2. Anderson M. G. and Richard K. S. 'Slope stability' John Wiley 1987.
3. McCarthy D.F. "Essentials of Soil Mechanics and Foundation" ,Practice Hall, London – 1988.
4. Chowdhary R.N. "Slope Analysis", E.I. Sevier, London – 1978.
5. Nayak N. V. "Foundation Design Manual" Dhanpatirai & Sons, Delhi – 1985.

B. Tech. IV (Civil), Semester-VIII	L	T	P	C
CE 402: WATER RESOURCES ENGINEERING - II	**3**	**-**	**2**	**4**

COURSE OBJECTIVES:

CO-1: Design of gravity and embankment dams
CO-2: Planning in the section of dams site reservoir capacity and operations
CO-3: Analysis of weir and barrages, river traing and flood control methods
CO-4: Design and selection of cross drainage works

- **HYDRAULICS OF ALLUVIAL CHANNELS (04 hours)**
  Incipient motion condition of sediments, Shield's diagram, regimes of flow, resistance law, transport of sediments

- **CANAL IRRIGATION (04 Hours)**
  Classifications of canals, alignment of canal, design of lined canal to carry clear and sediment laden water, design of unlined canal to carry sediment laden water (regime approaches) and clear water (tractive stress approach), cross section of irrigation channels, necessity, advantages, disadvantages, suitability and types of lining, economics of canal lining, management of irrigation canals, maintenance of irrigation channels .

- **DIVERSION HEADWORKS (05 Hours)**
  Design aspects of subsurface flow on permeable foundation, Bligh's, Lane's and Khosla's theories for design of floor for subsurface flow, Planning and layout of the diversion headwork, component parts of diversion headwork, types of weir & barrages, causes of failure of weirs and their remedies, silt control, location of headworks.

- **CANAL REGULATION STRUCTURES (04 Hours)**
  Necessity, location and types of canal falls, design aspects of Sarda type fall,functions and design aspects of head regulator and cross regulator, canal escapes, canal outlets.

- **CROSS-DRAINAGE STRUCTURES (04 Hours)**
  Types of cross-drainage structures, selection of suitable type, classification of aqueducts, design aspects of cross-drainage structures.

- **RESERVOIR PLANNING & SEDIMENTATION (05 Hours)**
  Types of reservoirs, investigations for reservoir planning, site selection, storage zones, yield, mass inflow curve, determining capacity of reservoir, apportionment of total cost of a multipurpose reservoir, determination of life of reservoir, control of sediment, reservoir losses, control of evaporation loss.

- **DAMS** **(02 Hours)**
  Types of dams, their advantages and disadvantages, selection of site for dam, site investigations.

- **GRAVITY DAM** **(04 Hours)**
  Design of gravity dam, principal and shear stresses, failure of dam and its stability, elementary & practical profile of the gravity dam, joints, galleries, shafts, foundation treatment.

- **EMBANKMENT DAMS** **(05 Hours)**
  Types of embankment dams, factors affecting design of embankment dam, causes of failure of embankment dams, criteria of design of earth dams, computation of free board in embankment dam, seepage analysis of homogenous and zoned dams, seepage control through embankment dam and its foundation, stability analysis of the earth dam

- **SPILLWAYS AND ENERGY DISSIPATION** **(04 Hours)**
  Types of spillways, design aspects of ogee spillway, spillway gates, jump-height curve and tail water curves, different types of energy dissipaters.

- **RIVER TRAINING AND FLOOD CONTROL** **(04 Hours)**
  Methods of river training and flood control

PRACTICALS:

1. Numerical problems on water requirements of crops
2. Design of diversion headworks
3. Design of canal regulation structures
4. Design of cross drainage works
5. Numerical problems on reservoir and sedimentation
6. Design of gravity dam
7. Design of embankment dam
8. Design of spillway
9. Design of energy dissipators

BOOKS RECOMMENDED

1. USBR, Design of Gravity Dams, Design manual for concrete gravity dams, , Denver, Colorado, (1976).
2. Sherad J L, Woodward R J Gizienski, S C and Clevenger W A, Earth and Earth and Rock fill dams, John Wiley and Sons Inc.,USA, (1963).
3. Creager William P., Justin Joel D, Hinds Julian, Engineering for dams, Nem Chand and Bros, Roorkee (U P), (1995).
4. Asawa G L, Irrigation Engineering, New Age International (P)Ltd, New Delhi, (1996).
5. Garg S K, Irrigation Engineering and Hydraulic Structures, Khanna Publishers, New Delhi, (1999).
6. Varshney R S , Gupta S C and Gupta S L, Theory and design of Irrigation Structures Vol II, Nem Chand Bross, Civil Lines, Rroorkee-247667, India, (1993).

B. Tech. IV (Civil) Semester-VIII **L T P C**

CE404: PROFESSIONAL PRACTICE **3 1 0 4**

COURSE OBJECTIVES:

CO-1: Prepare tender and contract documents following Acts and byelaws.
CO-2: Prepare valuation report for civil engineering projects.
CO-3: Solve the disputes in construction industry through Arbitration.
CO-4: Can take up the challenge of entrepreneurship development.
CO-5: File patent, design, trademark, etc IP rights.
CO-6: Work as team member / leader in all type of organizations with its legal responsibilities per prevailing Acts.

- **OFFICE PRACTICE** **(04 HOURS)**
  Organisational set up, working of professional firms, office procedures, construction contracts, legal aspects, professional charges, role of architect, developer, builder and contractor.

- **TENDERING AND CONTRACTING** **(12 HOURS)**
  Tender and tendering process, types of tenders, Dynamics of contracting, contract documents, condition of contract, Indian contract act, improper work and defect liability period, liquidated damages, contract breach, certificates and payments, duties and liabilities.

- **ARBITRATION & EASEMENT** **(08 HOURS)**
  The purpose of arbitration, the powers and duties of arbitrator, arbitration and building contract. Types of arbitration, fire insurance, easement characteristics types.

- **VALUATION** **(13 HOURS)**
  Definition, market value, freehold and leasehold, sinking fund, depreciation methods of valuation, rental method of valuation, land and building based development method of valuation.

- **P.W.D. ACCOUNTS AND PROCEDURE OF WORKS** **(04 HOURS)**
  Organisation set up, classification of work, execution of work, book keeping, measurement book, store procedure, mode of payments, public works accounting system.

- **ENTREPRENEURSHIP DEVELOPMENT** **(02 HOURS)**
  Concept need and scope of entrepreneurship, characteristic of entrepreneurship, forms of business organization.

- **IPR AND PATENT ACT** **(02 HOURS)**
  Importance and scope, forms of IPR, patents, copy rights, trademarks, relevant acts.

BOOKS RECOMMENDED:

1) Patil B.S., “Civil Engineering Contracts”. Vol. – I, Orient Longman Publication, 1998.
2) Dutta. B.N., “Estimating & Costing in Civil Engineering”, USB Publishers, Bombay, 1996.
3) Roshan Nanavati, “Professional Practice”, Lakhani Book Depot, Mumbai.
4) Guha Thakurta S.K., Shah K.R., “Manual of Construction Project Management”, Multi-tech Publishing Co., Mumbai, 2002
5) Holdon, Fish, Smith, “Top Management Organization & Control”, Mc-Graw Hill, 1999.

B. Tech. IV (CIVIL) SEMESTER VIII	L	T	P	C
CE 406: HEAVY CONSTRUCTION AND PROJECT MANAGEMENT	3	1	0	4

COURSE OBJECTIVES:

CO-1: Identify and select suitable heavy construction equipment with its advantages dis-advantages and limitations

CO-2: Select suitable foundation with appropriate construction technique for deep foundations

CO-3: Identify managerial requirements of handling mega construction projects

CO-4: Design suitable project duration on the basis of dependency of various construction events and activities applying knowledge of PERT and CPM.

CO-5: Manage a project which is about to be delayed, with its implications and impact on project

- **CONSTRUCTION PROJECTS: (04 Hours)**
  Construction Industry in India - Project Categories - Project Planning & Organization Systems - Heavy Construction Projects

- **HEAVY CONSTRUCTION EQUIPMENTS: (12 Hours)**
  Types & characteristics - Equipment Capacities & Costs - Machine Power - Dozers, Scrapers – Excavators - Trucks & hauling equipment - Draglines & Clamshells - Pile Driving Equipments

- **CONSTRUCTION OF HEAVY FOUNDATIONS: (08 Hours)**
  Pile Foundation - Caissons, Coffer Dams, Raft Foundation

- **PROJECT FINANCE & APPRAISAL: (04 Hours)**
  Need & Types of Appraisals - Finance Source and Methods – Major Financing Bodies - Economic Evaluation - Time Value of Money - Discounted and Non-discounted Cash flow Methods

- **PROJECT MANAGEMENT: (17 Hours)**
  Bar Charts - Network Elements - Network Development – PERT, CPM, PD Techniques - Network Updating - Resource Allocation - Leveling & Smoothing - Time–Cost Analysis - Project Cost Control - Quality Control Methods - Construction Safety, HR practices in construction, MIS in construction.

BOOKS RECOMMENDED:

1. Chitkara, K.K., Construction Project Management: Planning, Scheduling & Controlling, Tata McGraw - Hill Publishing Co. Ltd., New Delhi. (1998)
2. Jagman Singh, Heavy Construction Planning, Equipment and Methods, Oxford & IBH Publishing Co., New Delhi. (1997)
3. Peurifoy, R.L., Construction Planning, Equipment, and Methods, Tata McGraw - Hill Publishing Co. Ltd., New Delhi. (2002)

4. Seetharaman, S., Construction Engineering & Management, Umesh Publications, New Delhi. (2000)
5. Vohra, N.D., Quantitative Techniques in Management, Tata McGraw - Hill Publishing Co. Ltd., New Delhi. (1990)

B. Tech. – IV (Civil), Semester - VIII	L	T	P	C
AM 408: CONCRETE TECHNOLOGY	2	-	2	3

COURSE OBJECTIVES:

CO-1: Compare different engineering materials with concrete with respect to various engineering properties

CO-2: Evaluate the properties of constituent materials i.e., sand course aggregate and cement for making of concrete

CO-3: Evaluate properties of fresh and hardened concrete.

CO-4: Appraise about different techniques of testing of destructive and non-destructive concrete

CO-5: Compare different methods of Mix design of concrete and study the economies of making concrete.

- **PROPERTIES OF CEMENT**
  Manufacturing of Portland cement - Chemical composition of Portland cement - Hydration of cement and action of gypsum - Setting of cement - Physical and chemical test for cement as per IS:4031, IS:269 - Different types of cement - Chemical composition - Important properties and applications - Admixtures – Accelerators - Retarder water reducing agents – Plasticizers - Water proofing compounds - Pumping aids.

- **PROPERTIES OF AGGREGATES**
  Classification of aggregates - Important physical properties - Mechanical properties - Specific gravity, bulk density - Moisture content - Water absorption of aggregates - Sieve analysis - Grading curves - Fineness modulus - Gap Grading, Deleterious Substances in aggregates, alkali aggregate reaction, Maximum size of aggregates.

- **FRESH CONCRETE**
  Definition of workability, factors affecting workability - Measurement of workability - Slump test, compacting factor test -, Segregation and blending of concrete - Mixing of concrete - Types of mixtures - Vibration of concrete - Types of vibrators - Internal external surface and table vibrators - Concreting in hot and cold weather - Ready mixed concrete - Pumped concrete - Pre placed aggregate concrete - Vacuum processed concrete - Shotcrete or guniting.

- **STRENGTH OF CONCRETE**
  Factors affecting strength of concrete - Different methods of Curing and Steam Curing at Atmospheric Pressure and High Pressure Curing - Warm water method.

- **TESTING OF HARDENED CONCRETE**
  Need for testing, Compression test – Cube, cylinder - Prism and equivalent cube test - Effects of various factors on test results e.g. end conditions – Capping - Moisture content - Height/Diameter

ratio - Shape of specimen - Rate of loading - Size of specimen - Comparison of strength of cubes and cylinders - Flexure test - Split tensile test - Non-destructive testing, needs and applications - Rebound hammer test – Ultrasonic Pulse Velocoty test - Test cores.

- **MIX DESIGN**
  Definition and need for designing mixes - Methods of mix design - IS method of mix design in detail with examples.

- **SPECIAL CONCRETE**
  Polymer Concrete - Fibre Reinforced Concrete - Light Weight Concrete - High Density Concrete - Use of Silica Fume & Metacaoline in Concrete - Flyash Concrete

PRACTICALS

1. Properties of fine and coarse aggregate.
2. Properties of cement
3. Mix Design, Casting of at-least two mixes, testing of 7 days & 28 days cubes.
4. Workability, Slump Test, Compacting factor.
5. Effect of admixtures
6. Effect of curing
7. Use of Plasticinzers

BOOKS RECOMMENDED

1. Neville A.M. (1973) "Properties of Concrete" 3rd ed., Pitman Publishing Company, Bath, U.K.
2. Shetty M. S.(1986)–"Concrete Technology",Theory and Practice" 2nd ed., S.Chand & Company, New Delhi.
3. Gambhir M. L. (1986) "Concrete Technology" 1st Ed., Tata McGraw Hill Company, New Delhi.
4. Shanthakumar " Concrete Technology"
5. G E Troxell & H E Davis, " Composition and Properties of Concrete, Mc Graw Hill Publication

LIST OF ELECTIVE SUBJECTS

B.E. – IV (CIVIL) EIGHTH SEMESTER

ELECTIVE GROUP – II

Sr. No.	Code	Subject
1	CE414	Traffic Engineering
2	CE416	Housing
3	CE418	Municipal Solid Waste Management
4	CE422	Hydropower Engineering
5	CE424	Building Maintenance
6	CE426	Entrepreneurship Development
7	CE428	Construction of Bridges and Tunnels
8	CE432	Coastal Engineering & Marine Structures
9	AM434	Design of Bridge Structures
10	AM436	Computer Aided Design of Structures
11	AM438	Rehabilitation and Strengthening ofStructures
12	AM442	Advanced Structural Analysis
13	AM444	Ground Improvement Techniques
14	AM446	Rock Mechanics

B.Tech. IV (Civil) Semester-VIII	L	T	P	C
CE414: TRAFFIC ENGINEERING (ELECTIVE-II) (ES-II)	3	0	0	3

COURSE OBJECTIVES:

CO-1: Design field traffic surveys and generate the data of interpretation and analysis
CO-2: Apply capacity and level of service analysis for highways
CO-3: Design signalized and rotary intersection
CO-4: Plan provision of various signs and design regulations for traffic facilities

- **INTRODUCTION (02 HOURS)**
  Scope functions and administration, traffic issues in Indian Cities.

- **TRAFFIC STUDIES AND ANALYSIS (12 HOURS)**
  Road-user characteristics, vehicle characteristics, traffic flow characteristics, different traffic studies and analysis for volume, speed and delays, origin and destination, parking and accident, presentation & interpretation, traffic forecasting.

- **TRAFFIC GEOMETRICS (12 HOURS)**
  Basic geometric elements, design of intersections, rotary intersections, grade separated intersections, design of parking and terminal facilities.

- **TRAFFIC FLOW STUDY (04 HOURS)**
  Vehicular stream models, car following model, Q- K -V models, highway capacity, level of service, shock wave phenomenon, queuing.

- **TRAFFIC CONTROL, REGULATION & MANAGEMENT (15 HOURS)**
  Traffic control, regulations & management for vehicles, drivers and flow , traffic control devices, markings, signage, signals, channelisation, design of traffic signal system, urban traffic management techniques, street lighting, Introduction to Intelligent Transportation System.

BOOKS RECOMMENDED:

1. Kadiyali L. R., “Traffic Engineering and Transportation Planning”, Khanna Publishers, Delhi, 2002.
2. Pignataro L. J., “Traffic Engineering - Theory and Practice”, John Willey & Sons, 1985.
3. Davies E., “Traffic Engineering Practice”, E. and F. Span Ltd., London, 1987
4. O’Flaherty C.A., “Highways, Traffic Planning & Engineering”, Edward Arnold, UK, 1997
5. Matson, Smith, Hurd, “Traffic Engineering”, Mc Graw Hill Book Co., 2002

B. Tech IV (CIVIL) SEMESTER-VIII	L	T	P	C
CE 416 HOUSING (ES-II)	3	1	0	4

COURSE OBJECTIVES:

CO-1: Analyze the urbanization housing demand and identify the housing problems in urban and rural India
CO-2: Analyze the national housing policy and role of financial institutes for private and public sectors
CO-3: Design housing society and neighborhood planning under different environmental conditions by using development guidelines
CO-4: Prepare Detailed Project Report (DPR) for mass housing and Industrial Township
CO-5: Plan the low cost housing scheme for urban poor

- **HOUSING IN INDIAN CONTEXT** : **(10 Hours)**
  Urban and rural settlements, urbanization housing demand, problems of housing in urban and rural areas, Building forms, quality, distribution, rural and social housing schemes, housing activities in five year plans

- **HOUSING POLICY & FINANCE :** **(06 Hours)**
  National Housing policy- objectives, housing in private and public sector, housing financing institutes, role of HUDCO, HDFC, State Housing Boards.

- **HOUSING REGULATIONS:** **(08 Hours)**
  T.P. Schemes and housing, group housing, byelaws and regulations, high-rise, row house regulations, Housing legislation scheme approval procedure.

- **HOUSING ECOFRIENDLY DESIGN :** **(10 Hours)**
  Housing & Environment: Environmental Factors, Climate and Comfort – Elements of Climate, Tropical Climates, thermal comfort, daylight. Housing for hot – dry and warm humid climates. Framing of Housing for different income groups, housing densities. Mass Housing layouts, plot and cluster based schemes, mixed development, Neighborhood planning - Standards, development guide lines.

- **HOUSING PROJECTS :** **(06 Hours)**
  Framing of requirements, development of housing layouts, preparations of project, documentation estimation, housing analysis, project analysis and estimate, mixed housing development: pattern of mixed mixed development, development of housing societies, apartment layouts, typical case studies; mass housing projects,Industrial township

- **SLUM HOUSING:** **(05Hours)**

Causes, effect and remedial measures, transit camps, unauthorized construction, substitute building materials, slum up gradation, site and service schemes, Low cost housing schemes, Low cost techniques. Environmental and Health aspects, public participation

REFERENCES:

1. F. Gibberd, "Town Design", Architectural Press, London. (1988)
2. Modak and Ambdekar, "Town and Country Planning and Housing", Orient Longman Ltd., Bombay. (1995)
3. Heggode, D. and Cherunilam, F., "Housing In India", Himalaya Publishing House. (1990)
4. Koenigshurger, O. H., "Manual of Tropical Housing & Building", Orient Longman Ltd., Chennai. (1986)

B. E. IV (CIVIL) SEMESTER – VIII	L	T	P	C
CE 418 : MUNICIPAL SOLID WASTE MANAGEMENT(ES-II)	3	0	0	3

COURSE OBJECTIVES:

CO-1: Explain sampling and classification of solid waste management system
CO-2: Design collection, transfer and transport system for solid waste management facility
CO-3: Suggest suitable treatment and disposal option for waste management facility
CO-4: Explain implementation of different handling waste management rules

- **INTRODUCTION (06 Hours)**
  Sources and classification of solid wastes – Sampling and characteristics - generation rates - solid waste management systems and planning.

- **COLLECTION, TRANSFER AND TRANSPORT (09 Hours)**
  On site handling and storage Planning of Collection routes - Transfer stations- Transport methods,

- **TREATMENT PROCESSES (09 Hours)**
  Process techniques - Mechanical and chemical volume reduction - Component separation- Drying and dewatering, Incineration and pyrolysis

- **RESOURCE RECOVERY (06 Hours)**
  Materials processing -Recovery systems - Recovery of chemical and biological conversion products – Composting - Recovery of energy from conversion products.

- **DISPOSAL METHODS (10 Hours)**
  Land filling methods – Components and Design of Landfill – ocean disposal

- **BIOMEDICAL AND HAZARDOUS WASTE (05 Hours)**
  Characteristics and types of hazardous waste – Biomedical waste handling and disposal.

(Total Contact Time: 45 Hours)

BOOKS RECOMMENDED:

1 Tchobanoglous G., "Solid Wastes - Engineering Principles And Management Issues", Mc Graw Hill Book Company, 1977.
2 Neal Hommer, "Solid Waste Management and Environment" Prentice Hall, New Jersey, 1988.
3 Dewan J.M. And Sudarshan K.N., "Solid Waste Management"., Discovery Publ. House, New Delhi, 1996.
4 Charles A. Wantz, "Hazardous waste Management", Mc Graw Hill Book Company, 1998.
5 Manual on "Solid Waste Management", Ministry of Environment & Forest, New Delhi, 2000.

B. Tech. IV (Civil), Semester-VIII	L	T	P	C
CE 422: HYDROPOWER ENGINEERING	**3**	**-**	**-**	**3**

- **INTRODUCTION** **(3 Hours)**
  Sources of energy, hydroelectric power vs. other sources of power estimation of water power potential.

- **HYDROPOWER TERMS** **(4 Hours)**
  Load curve, load factor, capacity factor, utilization factor, diversity factor, load duration curve, firm power, secondary power, Load prediction.

- **HYDROPOWER PLANTS** **(8 Hours)**
  Run-off-river plants, valley dam plants, diversion canal plants, low-and high-head plants. Pumped storage plants with their efficiencies, study of some typical hydropower Plants.

- **SURFACE POWER PLANTS** **(8 Hours)**
  Surface power stations, criteria for determining their size, lighting and ventilation.

- **UNDERGROUND POWER PLANTS** **(8 Hours)**
  Types and location of underground power station, its components, types of layout, limitations of underground power plants.

- **PENSTOCKS AND WATER HAMMER** **(7 Hours)**
  Types of penstocks and their design criteria, economical diameter of penstock, valves, bends, manifolds, effect of water-hammer in penstock, types and design of surge tanks.

- **GATES & VALVES** **(7 Hours)**
  Design principles of gates for low and high heads, different types of gates and valves with their characteristics and suitability.

BOOKS RECOMMENDED

1. Dandekar and Sharma," Water Power Engineering", Vikas Publishing House, New Delhi,1996.
2. Varshney R.S," Hydropower Structures", Nem chand and Bros., Roorkee (U.P.), 1992.
3. Deshmukh M.M.," Water Power Engineering", Dhanpat Rai Publications, New Delhi, 1998.
4. Barrows H. K., "Water Power Engineering", McGraw Hill Book Co., New York.,1943
5. Ivan E Houk, "Irrigation Engineering Vol-II," John Willy & Sons, New York, 1951

B. Tech IV (CIVIL) SEMESTER - VIII	L	T	P	C
CE 424 BUILDING MAINTENANCE (ES-II)	3	0	0	4

COURSE OBJECTIVES:

CO-1: Realize significant in national context
CO-2: Economic analysis of methods and materials
CO-3: Grasp the method through case study
CO-4: Propose implementable solutions of maintenance
CO-5: Challenge to develop mastery for future consultancy
CO-6: become skilled at the need of field expertise at national level

- **DURABILITY OF BUILDINGS: (10 Hours)**
  Terminology of maintenance and repairs-Life expectancy of buildings – Methods and estimate for checking building strength and durability-Effect of environmental elements on buildings – Effect of chemical agents on buildings and building materials – Effect of pollution on buildings – Damage by biological agents like plants, trees, algae, fungus, moss, insects etc.

- **FAILURE AND REPAIR OF BUILDINGS: (10 Hours)**
  Definitions of building failure – Functional, structural and aesthetical failures – Case studies – Methodology or investigation of failures – Diagnostic testing methods and equipments – Effect of fire on buildings.

  Repair of cracks in concrete and masonry – grouting, guniting, etc. – Repair and strengthening of concrete buildings – Foundation repair and strengthening – Underpinning – Leakage of roofs and methods of repair.

- **MAINTENANCE OF BUILDINGS: (10 Hours)**
  Preventive and corrective maintenance- Reliability engineering principles and its application in selection of systems of buildings – Routine maintenance of buildings – Maintenance cost – Specifications for maintenance works – Construction details for prevention of dampness – Termite proofing – Fire protection – Maintenance of flooring, roofing and services-maintenance of joints

- **REHABILITATION**: **(05 Hours)**
  Analysis-planning-Cost estimates-Tender-Methodology-construction Methods-Modern materials for repairs

- **CONSERVATION: (10 Hours)**
  Historical buildings – Conservation movement – Materials and methods for conservation work – Case studies.

BOOKS RECOMMENDED:

1. Philip. H. Perkins, “Concrete Structure–Repair, Water proofing and Projection”. (1987)
2. S. M. Johnson, “Deterioration Maintenance & Repair of Buildings”, McGraw Hill Pub. (1990)
3. Raikar R. N., “Technology of Building Repairs”, Raikar Pub., Bombay. (1994)
4. Eldridge H. J., “Common defects in Buildings”, HMSO. Publishers. (1986)
5. National Building Code. (2002)

B. Tech IV (CIVIL) SEMESTER - VIII	L	T	P	C
CE 426 ENTREPRENEURSHIP DEVELOPMENT (ES-II)	3	0	0	4

COURSE OBJECTIVES:

CO-1: Understand the human behavior within the societal framework
CO-2: Work as team member or a leader in various types of organizational structures
CO-3: Plan the project based on techno-economic feasibility with finance, cost-benefit analysis and prevailing legal provisions in industries
CO-4: Can manage small scale industries through entrepreneurship firm with strong marketing management and industrial inputs

- **INTRODUCTION : (08 Hours)**
  Objectives, Entrepreneurship terminology, Historical development and principles, Need & Scope in changing economy, Risks factors, Characteristics of an entrepreneur, Relevance and benefits of Small Scale Industry.

- **HUMAN ENGINEERING : (06 Hours)**
  Entrepreneur and Society, Attitude towards work; Self –assessment and goal setting, Leadership, Resource mobilization, Motivation, Understanding Human behaviour, social aspects of production process

- **SETTING UP AN INDUSTRY : (10 Hours)**
  Forms of business organization/ ownership , merits and demerits, Formation of a Company, procedures and formalities , Sources of information, Govt. polices, Incentives, Subsidies , Industrial development agencies and their functions, State & National level institutions for Small Scale Industry ,case studies.

- **PROJECT PLANNING : (10 Hours)**
  Identification of opportunities and constraints Market survey; Techno - Economic feasibility studies and economic analysis ,Pay-back period, Return on Investment, Cost-benefit analysis and Break-even analysis , Financial viability, sources of Finance for Industry, Assessment of fixed and working capital requirements, Financial Ratios, Project Scheduling.

- **MARKETING : (06 Hours)**
  Components of Marketing Management, Market survey and analysis, arrangements, strategies and assistance to small industry, Consumer behaviour, Market feedback; Projections, Predictions and Forecasts.

- **LEGAL ASPECTS**: **(05 Hours)**
  Industrial legal provisions, industrial aspects of Indian penal code

BOOKS RECOMMENDED:

1. "Hand book for New Entrepreneurs "– EDII, Ahmedabad. (1998)
2. P. Saravanavel, "Entrepreneurial Development ". (1994)
3. T.R. Banga ,"Project Planning and Entrepreneurship Development ". (1991)

B.TECH. IV (CIVIL) SEMESTER –	L	T	P	C
CE 428: CONSTRUCTION OF BRIDGES AND TUNNELS (ES-II)	3	0	0	3

COURSE OBJECTIVES:

CO-1: Analyze the site based on history, components and classification of bridges and tunnels
CO-2: Planning of bridges and tunnels with references to site hydrological and geological investigations for bridges and tunnels
CO-3: Setting out alignment on sites, curves
CO-4: Soil strata investigation as per blasting and drilling pattern data
CO-5: Analysis of safety measures like ventilation, water control and lining activities for tunnel

- **INTRODUCTION** **(06 Hours)**
  History of bridge development – Components & classification of bridges – Bridge loadings – History of tunneling - Classification of tunnels

- **SITE INVESTIGATION & PLANNING** **(08 Hours)**
  Location of bridges and tunnels, Criteria for selection of site – Alignment – Hydrological, geological & geotechnical investigations – Economic span of bridge

- **TUNNEL SURVEYING** **(06 Hours)**
  Preliminary surveys – Setting out – Transfer of alignment – Curves – Adjustment at tunnel meeting points

- **TUNNELING METHODS** **(12 Hours)**
  Classification of soil strata – Sequence of operations – Tunneling in soft strata – Driving tunnels in rocky strata - Blasting – Drilling patterns – shafts

- **VENTILATION & SAFETY** **(08 Hours)**
  Natural and mechanical ventilation – Dust prevention & control – ventilation shafts and equipments – Safety Programmes – Scaling & mucking

- **TUNNEL LINING** **(03 Hours)**
  Necessity – Lining materials – Design of lining – Types of lining – Ground support

- **TUNNEL DRAINAGE** **(02 Hours)**
  Control of ground water, Pre-drainage – Dewatering – Permanent drainage

(Total Contact Time: 45 Hours)

BOOKS RECOMMENDED:

1. Peurifoy R.L., “Construction Planning, Equipment and Methods”, Tata McGraw Hill Publication, New Delhi, 2003.
2. Vazirani V.N. and Chandola S.P., “Transportation Engineering” Vol. III, Khanna Publishers, New Delhi, 1987.
3. Srinivasan R., “Harbour, Dock and Tunnel Engineering”, Charotar Publishing House, Anand, 2006.
4. Ahuja T.D. and Birdi G.S., “Roads, Railways, Bridges and Tunnels Engineering”, Standard Book House, Delhi, 2004.
5. Ponnuswamy S., “Bridge Engineering”, Tata McGraw Hill Publication, New Delhi, 2001.

B. Tech. IV (Civil), Semester-VIII	L	T	P	C
CE 432: COASTAL ENGG. AND MARINE STRUCTIRES (ES-II)	3	-	-	3

- **INTRODUCTION (04Hours)**

Man-ocean interaction, effects of ocean on ecology and climate, ocean as a source of food and means of communication, minerals in ocean, ocean for disposal of wastes.

- **THEORY OF OCEAN WAVES (05 Hours)**

Formulation of wave motion problem, assumption made in two dimensional cases, small amplitude wave theory, orbital motion and pressure, wave energy, finite amplitude wave theory, Stocke's wave theory (third order), mass transport, Gerstner theory, solitary wave theory, generation of waves, wave forecasting, decay of waves.

- **GENERATION OF WAVES (06 Hours)**

Relationship among wave dimensions, wind and fetches, generation of waves, wind waves in shallow water, limited width of wine field, decay of swell, wave forecasting procedures and their reliability, surface wind velocity and fetch determination, S.M.B and P.N.J methods.

- **REFLECTION, REFRACTION AND DIFFRACTION OF WAVES (08 Hours)**

Reflection of waves, clapotis or standing waves, superposition of waves, refraction, refraction diagrams, wave fronts and orthogonal methods, diffraction of waves around semi infinite break waters, detached break water of finite length, diffraction through openings.

- **WAVE FORCES ON STRUCTURES (07 Hours)**

Forces on vertical walls due to non- breaking waves, breaking waves and broken waves base on linear theory, forces on circular cylinders.

- **SHORES AND SHORE PROCESSES (06 Hours)**

Long term and short term changes of shores, factors influencing beach characteristics , beach wave interaction, beach profile modification , littoral drift, stability of shores, shore erosion due to sea level, on shore and off shore transport, long shore transport, interaction of shore structures, shore erosion in kerala, mud banks.

- **SHORE PROTECTION WORKS (05 Hours)**

Description and effects of break waters, sea walls, groynes of various types, beach nourishment, design of sea walls, break waters, tetra pod, tribar etc.

- **PORT PLANNING AND MARINE STRUCTURES (04 Hours)**

Harbour types and features, ship Features related to port planning, site investigation & selection, port layout, on-shore and offshore structures, cargo handling equipments, Navigational aids.

BOOKS RECOMMENDED

1. Robert, L. Weigel, “Oceanographical Engineering”, Prentice Hall Inc.(1964)
2. Arthar, T.I., “Estuary and coastline hydrodynamics ”, McGraw Hill Book Co.(1964)
3. Robert M.Sorensen, “Basic Coastal Engineering” , Springer, (2006)
4. Alonzo Def. Quinn, “Design and Construction of Ports and Marine Structures”, McGraw Hill Book Company.(1972).

6 Henry F. Cornik, “Dock and Harbour Engineering Vol.–I to IV”, Charles Griffin & Company Ltd., London.(1988)

B. Tech. – IV (Civil), Semester - VIII	L	T	P	C
AM 434: DESIGN OF BRIDGE STRUCUTRES (ES –II)	**3**	**-**	**-**	**3**

COURSE OBJECTIVES:

CO-1: Know types of bridges and bridge components
CO-2: Identify the types of IRC loading and impact factors
CO-3: Design of RCC and TEE beam deck Slab Bridge
CO-4: Detailed design of pre-stressed concrete beams
CO-5: Conceptual design of balance cantilever bridge and composite bridge

- **INTRODUCTION** **(Hours -08)**
  Different types of bridges – Impact factor – Indian Road Congress Loads – Wind Load – Centrifugal forces – Economic span length – Foundation for bridges - Abutments

- **SOLID SLAB BRIDGES** **(Hours -06)**
  Slabs spanning in one direction – Slabs spanning two directions- Check for shear stresses

- **TEE BEAM AND DECK SLAB BRIDGES** **(Hours -07)**
  General features – Courbon's Method – Guyon – Massonet Method – Hendry Jaegar Method – Eccentric and Multiple concentric loads.

- **PRESTRESSED CONCRETE BRIDGES** **(Hours -08)**
  Pre-tensioned and post-tensioned prestressed concrete bridges – Concordant cable profile – Design of End Block.

- **BALANCED CANTILEVER BRIDGES** **(Hours -08)**
  Segmental construction – Cast in place and precast balanced cantilever – Box section – Hinged or continuous beam system – Deck cabling arrangement.

- **STEEL BRIDGES** **(Hours -05)**
  Plate girder bridge – Steel Trussed bridges – Composite bridges, Design of foundation, caisons & pile.

RECOMMENDED BOOKS

1. Krishna Raju N. "Design of Bridges" – Oxford IBH Publication House, New Delhi, 2006
2. Rakshit K. S. "Design and Construction of Highway Bridges". New Central Book Agency – Pune, 2004.

3. Raina V. K “Concrete Bridge Practice – Analysis, Design and Economics”. Tata McGraw Hill Publication Co. Ltd., New Delhi, 2004.
4. Heins C.P. and Lawrie R.A. “Design of Modern Concrete Highway Bridges”, John Wiley & Sons., New York, USA, 2000.
5. Victor D J, “Essentials of Bridge Engineering” Oxford IBH Publication – New Delhi, 2000.

***B*. Tech. – IV (Civil), Semester – VIII**	**L**	**T**	**P**	**C**
AM 436: Computer Aided Design of Structures (ES-II)	**3**	**-**	**-**	**3**

COURSE OBJECTIVES:

CO-1: Competence in softwares such as MATLAB applicable to engineering problems
CO-2: Conceptual knowledge of structural design process and advantages of computer aided design
CO-3: Development of models for structural elements like truss, beam, frame and grid using softwares
CO-4: Exposure to computational tools like spread sheet, excel/VBA for structural elements

- **COMPUTER BASED STRUCTURAL ANALYSIS AND DESIGN : AN OVERVIEW (Hours – 02)**

  Concept of Structural design process – Role of Computers in Structural Design process – Advantages of Computer Aided Design (CAD)

- **COMPUTER PROGRAMMING FOR STRUCTURAL ENGINEERS (Hours – 08)**
  Introduction to MATLAB for engineers – Development of Computer Programmes for solving set of simultaneous equations – Development of Computer programmes for analysis of simply supported beam element – Determination of beam fixed end moments – Beam flexural and shear stresses etc.

- **COMPUTER ASSISTED STRUCTURAL ANALYSIS AND MODELLING (Hours-12)**
  Modelling of Structural elements like truss – beam – frame and grid using structural design software – Developing structural models using Graphical User Interphase (GUI) – Understanding preprocessing and post processing phases for solving analysis problem – Solution errors and model correctness.

- **INTRODUCTION TO COMPUTATIONAL TOOLS FOR STRUCTURAL ENGINEERS (Hours-10)**
  Spreadsheet tool for engineers – Programming with Excel / VBA – Developing Spreadsheets for the design of structural elements

- **COMPUTER ASSISTED DESIGN OF STRUCTURES (Hours-10)**
  Introduction to integrated analysis and design process using structural design software packages – Modelling building structures – Analysis and design of building structures for gravity and lateral loads.

BOOKS RECOMMENDED:.

1. Balfour, J A D (1992) “Computer Analysis of Structural Frameworks”, 2nd Edition, Blackwell Scientific Publication, Oxford, UK.
2. Shah, V L (1998) “Computer Aided Design in Reinforced Concrete” 3rd Edition, Structures Publishers, Pune.
3. Davies, S. R. (1995) “Spreadsheets in Structural Design”, Longman Scientific and Technical, UK.
4. Liengme, B. V. (2000) “A Guide to Microsoft excel for scientist and engineers”, 2nd edition, Butterworth Heinemann, NY, USA.
5. Pratap Rudra (2006) “Getting started with MATLAB 7: A quick introduction for scientist and Engineers”, Indian Edition, Oxford University Press, New Delhi

B. Tech. – IV (Civil), Semester – VIII	L	T	P	C
AM438: REHABILITATION AND STRENGTHENING OF STRUCTURES (ES-II)	3	-	-	3

COURSE OBJECTIVES:

CO-1: Diagnose the causes of deterioration and distress of concrete structures
CO-2: Offer methodology/materials to repair and maintenance of structures
CO-3: Provide appropriate technology/ solutions to retrofit the existing concrete structure
CO-4: Write technical report for executing field problem and tender

- **CAUSES FOR DISTRESS IN STRUCTURE**
  Effect of sulphate & chlorides on concrete & steel components - Effect of salty environment on masonry components - Effect of chemical & industrial fumes on superstructures - Effect of Sea water and water vapour on underground & on ground structures - Frost damages - Effect of moisture movement and leakage on concrete components - Effect of temperature & other environmental factors

- **MAINTENANCE & REPAIR OF STRUCTURES**
  Need for maintenance and repairs - Inspection of Structures for repairs and maintenance - Methods for repairs - Materials and methodology for repairs - Use of high performance materials - Cost of repairs and maintenance - Implementation and Documentation for maintenance and repair.

- **REHABILITATION OF DISTRESSED STRUCTURES**
  Inspection and testing of distressed structures - Cracks in concrete members - Corrosion of reinforcement Techniques for rehabilitation of concrete structures - Use of polymer and epoxy based materials - Fibre reinforced composite for repairs - Use of steel plates and angles - Encasing of columns by other materials - Sprayed concrete crack filling protective coatings - Anticorrosive paints.

- **PREVENTIVE MEASURES FOR DURABILITY OF STRUCTURES**
  Measures to be taken into consideration during construction and while designing a structure - Proper selection and specification for materials - Use of high performance materials and modern techniques for making structure durable.

BOOKS RECOMMENDED

1. Ted Kay (1992) "Assessment and Renovation of Concrete Structure" ed. John Wiley & Sons, Inc. New York.
2. Mallett G.P. (1994) "Repair of Concrete Bridges" Pub – Thomas Telford Services Ltd., Quay, London E 144 JD.
3. Rakshit K.S. (1994) "Construction Maintenance & Repair of Highway Bridges".
4. Naville A. M. (1973) "Properties of Concrete" 2nd edition, Pitman Publishing Company, Bath, U.K.

B. Tech. – IV (Civil), Semester - VIII	L	T	P	C
AM 442: ADVANCED STRUCTURAL ANALYSIS (ES-II)	3	-	-	3

COURSE OBJECTIVES:

CO-1: Analysis of fixed arches in all aspects
CO-2: Analysis of beam incurred plan and beam of elastic foundations
CO-3: Apply the computation method like Finite Difference, Finite element
CO-4: Provide solutions for 3D structures

- **FIXED ARCHES**
  Analysis of fixed arches using elastic centre method - Effect of yielding of support - Change in temperature and rib shortening - Influence lines

- **BEAMS CURVED IN PLAN**
  Statically indeterminate cases, bow girder, circular and semicircular beams supported symmetrically.

- **BEAMS ON ELASTIC FOUNDATION**

- **STIFFNESS AND FLEXIBILITY METHOD**
  Introduction to flexibility method - Comparison of stiffness and flexibility method, choice of method

- **3 – DIMENSIONAL STRUCTURES**
  Stiffness method of analysis for 3 – D truss and frames

- **APPLICATIONS OF FINITE DIFFERENCE METHOD**
  Deflections for determinate and indeterminate beams using finite difference method for various load cases.

- **INTRODUCTION ON TO FINITE ELEMENT METHOD**

TUTORIALS

1. Fixed Arch
2. Beams curved inplan
3. Beam on Elastic Foundation
4. Stiffness Method
5. Flexibility Method
6. Finite Different Method
7. Finite Element Methods.

BOOKS RECOMMEND :

1. S. Utkn, C.H. Norris & J.B. Wilbur, "Elementary Structured Analysis" – McGraw Hill, N.J. 1991.
2. Reddy C. S. "Basic Structural Analysis", Tata McGraw Hill, New Delhi, 1983.
3. Beanfait F.W. "Computer Methods of Structural Analysis" etal. Prentice Hall, N.J. 1970.
4. Krishna Raju N. & Gururaja D.R. "Advanced Mechanics of Solids & Structures", Narosa Put House, New Delhi, 1997.
5. Cook R.D. "Finite Element Modelling for Stress Analysis", John Wiley & Sons, 1995.

B. Tech. – IV (Civil), Semester – VIII	L	T	P	C
AM 444: GROUND IMPROVEMENT TECHNIQUES (ES-II)	3	-	-	3

- Introduction, Role of ground improvement in foundation engineering, Drainage techniques, Well point, Suitability of methods of stabilization
- In-situ densification of granular and consolidation of cohesive soils, Dynamic compaction, Compaction by sand piles, Blasting, Dynamic consolidation, Pre loading with sand drains.
- Stone columns, Methods of installation, Stabilisation of Soft clays with lime piles.
- Earth reinforcement, Geo-synthetics, Geo-textile Applications of reinforced earth.
- Grouting and stabilisation, Suspension and solution grout, Injection methods, Electro-chemical stabilisation, Stabilisation with cement, lime and chemicals, stabilisation of expansive clays.

BOOKS RECOMMENDED

1. Hausmann M.R. 'Engineering Principles of Ground Modification' McGraw Hill Publishing Company, New York - 1990
2. Rolt Hammond – 'Modern Foundation Methods' Oxford & IBH Publishing Co.
3. Gullhati S K & Datta M (2005) "Geotechnical Engineering", Tata McGraw Hill Publishers Co. Ltd, New
4. Jones JFP Colin – 'Earth Reinforcement & Soil Structures' Butter worths, London.
5. Mandal J. N. – 'Geo-synthetics World' Wiley Eastern Limited.

B. Tech. – IV (Civil), Semester – VIII	L	T	P	C
AM 446: ROCK MECHANICS (ES-II)	**3**	**-**	**-**	**3**

- Scope of rock mechanics, Object of rock exploration, Methods of rock exploration, Rock quality designation, Geophysical prospecting, Problems of rock mechanics, Rock classification.
- Defects in rock mass – Joints, Faults and Folds.
- Rock properties – Physical and Mechanical properties of rock, Factors influencing wave velocity, In-situ determination of elastic properties of rocks by dynamic method, Creep and its measurement, Rheology and rheological models
- Improvement in properties of Rock mass – Necessity, Grouting, Rock bolting, Cable anchorage.
- In-situ tests – Necessity, Requirements of in-situ tests, Plate load test, Pressure tunnel test, Bore hole test.
- Strength test - Compressive strength test, Tensile strength test, Test for internal stress in rock, Indirect methods, Flexural strength of rock

BOOKS RECOMMENDED

1. Jumikis A. R. – Rock Mechanics, Trans Tech. Publication, Rock Part – 1979.
2. Ziemkiewcz & Stag – Rock Mechanics in Engineering Practice, London, Jhon Willy & Sons.
3. Goodman R. E., Introduction to Rock Mechanics – Jhon Wiley, London, 1989.
4. Arogyaswamy R. N. P. – Geo-technical Application in Civil Engineering – Oxford & IBH, London, 1991.
5. Brady and Brown " Rock Mechanics for under mining "" Third edition Springer

B. Tech. – IV (Civil), Semester – VIII	L	T	P	C
CE 412: Project	**-**	**-**	**8**	**4**

- The Project topic is covered in two parts. Project Preliminaries will be covered during seventy semester. The work is assigned to the batch of students immediately after the six semester examination. Thus, the candidate starts working on the given problem during the summer vacation prior to commencement of seventh semester.
- The preliminary work involved is related to state-of-art literature review, identification of area and finalization of the specific problem, with clearly defined title. The presentation of the preliminaries is address as the 1st stage seminar of the proposed project work. The group of students is expected to present the plan of action and review of the published work related to the area.
- After obtaining the approval along with necessary notification form the jury, the (candidates group) proceeds for the second stage of the project work.
- The second stage of project work, which can be termed as the core part can be carried out at any of laboratories of the Institute OR any industry, Centre of excellence Places with whom prior permission is obtained through MOU.