

# Scheme of Examination and Syllabus for B.Tech (Civil Engineering)

Harcourt Butler Technological Institute  
Kanpur  
July 2009

Course : B.Tech. Branch : Civil Engineering  
 Year : I Semester : I

S. No.	Course Code	Subject	Periods			Evaluation Scheme			Subject Total	Credit	
			L	T	P	CT	Sessional Exam				ESE
							TA	Total			
<b>Theory</b>											
1.		Physics/ Chemistry	3	1	0	30	20	50	100	150	
2.		Mathematics I	3	1	0	30	20	50	100	150	
3.		Engg. Mechanics/ Concepts of computer & C programming	3	1	0	30	20	50	100	150	
4.		Electrical Engg/ Electronics Engg.	3	1	0	30	20	50	100	150	
5.	CEL 105	Engg. Graphics/ Professional Communication	1/3	3/1	0	30	20	50	100	150	
6.	CEL 106	Remedial English/ Environment & Ecology	2	0	0	-	-	-	50	50	
<b>Practical/ Training/ Project</b>											
1.		Physics/ Chemistry	0	0	3	-	-	25	25	50	
2.		Workshop Practice/ Electrical Engg.	0	1	3	-	-	50	50	100	
3.		Computer lab/ Language Lab	0	0	3	-	-	25	25	50	
4.		G.P.	-	-	-	-	-	50	-	50	
									1000		

Course : B.Tech. Branch : Civil Engineering  
 Year : I Semester : II

S. No.	Course Code	Subject	Periods			CT	Evaluation Scheme			Subject Total	Credit
			L	T	P		Sessional Exam		ESE		
						TA	Total				
<b>Theory</b>											
1.		Chemistry/ Physics	3	1	0	30	20	50	100	150	
2.		Mathematics II	3	1	0	30	20	50	100	150	
3.		Concepts of computer & C programming / Engg. Mechanics	3	1	0	30	20	50	100	150	
4.		Electronics Engg./ Electrical Engg/	3	1	0	30	20	50	100	150	
5.	CEL 205	Professional Communication / Engg. Graphics	3/1	1/3	0	30	20	50	100	150	
6.	CEL 206	Environment & Ecology / Remedial English	2	0	0	–	–	–	50	50	Audit course
<b>Practical/ Training/ Project</b>											
1.		Chemistry / Physics	0	0	3	-	-	25	25	50	
2.		Electrical Engg. / Workshop Practice/	0	1	3	-	-	50	50	100	
3.		Language Lab / Computer lab	0	0	3	-	-	25	25	50	
4.		G.P.	-	-	-	-	-	50	-	50	
									1000		

Course : B.Tech. Branch : Civil Engineering  
 Year : II Semester : III

S. No.	Course Code	Subject	Periods			CT	Evaluation Scheme		ESE	Subject Total	Credit
			L	T	P		Sessional Exam TA	Total			
<b>Theory</b>											
1.	HMA301	Mathematics III	3	1	0	30	20	50	100	150	
2.	HCE 301	Fluid Mechanics	3	1	0	30	20	50	100	150	
3.	HCE 302	Surveying-I	3	1	0	30	20	50	100	150	
4.	HCE 303	Building Materials & Construction	3	1	0	30	20	50	100	150	
5.	HME 301	Strength of Materials	3	1	0	30	20	50	100	150	
<b>Practical/ Training/ Project</b>											
1.	HCE 351	Fluid Mechanics Lab	0	0	3	-	-	25	25	50	
2.	HCE 352	Surveying Lab	0	0	3	-	-	25	25	50	
3.	HCE 353	Building Planning & Drawing	0	0	3	-	-	25	25	50	
4.	HCE 354	Building Materials Lab	0	0	3	-	-	25	25	50	
5.	HGP301	G.P.	-	-	-	-	-	50	-	50	
										1000	

Course : B.Tech.                      Branch : Civil Engineering  
Year : II                                   Semester : IV

S. No.	Course Code	Subject	Periods			CT	Evaluation Scheme		ESE	Subject Total	Credit
			L	T	P		Sessional Exam TA	Total			
<b>Theory</b>											
1.	HCE 401	Hydraulics & Hydraulic Machines	3	1	0	30	20	50	100	150	
2.	HCE 402	Structural Analysis I	3	1	0	30	20	50	100	150	
3.	HCE 403	Surveying-II	3	1	0	30	20	50	100	150	
4.	HCE 404	Engineering Geology	3	1	0	30	20	50	100	150	
5.	HMA401	Computer Oriented Numerical Methods	3	1	0	30	20	50	100	150	
<b>Practical/ Training/ Project</b>											
1.	HCE 451	Hydraulics & Hydraulic Machines Lab	0	0	3	-	-	25	25	50	
2.	HCE 452	Surveying-II Lab	0	0	3	-	-	25	25	50	
3.	HCE 453	Engineering Geology Lab	0	0	3	-	-	25	25	50	
4.	HMA451	Numerical Technique Lab	0	0	3	-	-	25	25	50	
5.	HGP401	G.P.	-	-	-	-	-	50	-	50	
										1000	

Course : B.Tech. Branch : Civil Engineering  
 Year : III Semester : V

S. No.	Course Code	Subject	Periods			Evaluation Scheme			Subject Total	Credit
			L	T	P	Sessional Exam		ESE		
						CT	TA			
<b>Theory</b>										
1.	CEL 501	Hydrology & Irrigation Engineering	3	1	0	30	20	50	100	150
2.	CEL 502	Structural Analysis II	3	1	0	30	20	50	100	150
3.	CEL 503	Design of Concrete Structure I	3	1	0	30	20	50	100	150
4.	CEL 504	Transportation Engineering I	3	1	0	30	20	50	100	150
5.	CEL 505	Geotech. Engineering I	3	1	0	30	20	50	100	150
<b>Practical/ Training/ Project</b>										
1.	CEP 551	Structural Analysis Lab	0	0	3	-	-	25	25	50
2.	CEP 552	Concrete Lab	0	0	3	-	-	25	25	50
3.	CEP 553	Transportation Engineering Lab	0	0	3	-	-	25	25	50
4.	CEP 554	Geotech. Engineering Lab	0	0	3	-	-	25	25	50
5.		G.P.	-	-	-	-	-	50	-	50
									1000	

Course : B.Tech. Branch : Civil Engineering  
 Year : III Semester : VI

S. No.	Course Code	Subject	Periods			Evaluation Scheme			Subject Total	Credit
			L	T	P	Sessional Exam		ESE		
						CT	TA			
<b>Theory</b>										
1.	CEL 601	Environmental Engineering I	3	1	0	30	20	50	100	150
2.	CEL 502	Design of Concrete Structure II	3	1	0	30	20	50	100	150
3.	CEL 503	Geotech. Engineering II	3	1	0	30	20	50	100	150
4.	CEL 504	Transportation Engineering II	3	1	0	30	20	50	100	150
5.	CEL 505	Design of Steel Structure	3	1	0	30	20	50	100	150
<b>Practical/ Training/ Project</b>										
1.	CEP 651	Environmental Engineering I Lab	0	0	3	-	-	25	25	50
2.	CEP 652	Structural Detailing Lab	0	0	3	-	-	25	25	50
3.	CEP 653	CAD Lab	0	0	3	-	-	25	25	50
4.	CEP 654	Colloquium	0	0	3	-	-	50	-	50
5.		G.P.	-	-	-	-	-	50	-	50
									1000	

Course : B.Tech. Branch : Civil Engineering  
 Year : IV Semester : VII

S. No.	Course Code	Subject	Periods			CT	Evaluation Scheme		ESE	Subject Total	Credit
			L	T	P		Sessional Exam TA	Total			
<b>Theory</b>											
1.	CEO 701	Open Elective	3	1	0	30	20	50	100	150	
2.	CEL 701	Earthquake Resistant Design of Buildings	3	1	0	30	20	50	100	150	
3.	CEL 702	Environmental Engineering II	3	1	0	30	20	50	100	150	
4.	CEL 703	Hydraulic Structures	3	1	0	30	20	50	100	150	
5.	CEE 704	Elective I	3	1	0	30	20	50	100	150	
<b>Practical/ Training/ Project</b>											
1.	CEP 751	Environmental Engineering II Lab	0	0	3	-	-	25	25	50	
2.	CEP 752	Practical Training / Educational Tour	0	0	3	-	-	25	25	50	
3.	CEP 753	Project	0	0	6	-	-	25	25	50	
4.		G.P.	0	0	3	-	-	50	50	100	
										1000	



Course : B.Tech.                      Branch : Civil Engineering  
 Year : IV                                   Semester : VIII

S. No.	Course Code	Subject	Periods			Evaluation Scheme				Subject Total	Credit
			L	T	P	Sessional Exam			ESE		
						CT	TA	Total			
<b>Theory</b>											
1.	HU	Industrial Economy & Management	3	1	0	30	20	50	100	150	
2.	CEL 801	Estimation & Construction Management	3	1	0	30	20	50	100	150	
3.	CEE 802	Elective II	3	1	0	30	20	50	100	150	
4.	CEE 808	Elective III	3	1	0	30	20	50	100	150	
5.	CEE 814	Elective IV	3	1	0	30	20	50	100	150	
<b>Practical/ Training/ Project</b>											
1.	CEP 851	Project	0	0	9	-	-	50	100	150	
2.	CEP 852	Comprehensive	-	-	-	-	-	50	-	50	
3.		G.P.	-	-	-	-	-	-	-	50	
										1000	

## **List of Department Electives**

	<b>S.No.</b>	<b>Course code</b>	<b>Name of Subject</b>
<b>Elective I</b>	1.	CEE 704	Pre-stressed concrete design
	2.	CEE 705	Matrix analysis of structures
	3.	CEE 706	Environmental Management
	4.	CEE 707	Transportation system planning
	5.	CEE 708	Water quality modeling
	6.	CEE 708	Soil dynamics
<b>Elective II</b>	1.	CEE 802	Advanced design of steel structures
	2.	CEE 803	Advanced concrete technology
	3.	CEE 804	Remote sensing and GIS applications
	4.	CEE 805	Advanced foundation design
	5.	CEE 806	Water Resources Management
	6.	CEE 807	Design of Wastewater systems
<b>Elective III</b>	1.	CEE 808	Bridge engineering
	2.	CEE 809	Pre-cast and modular construction practices
	3.	CEE 810	Environmental pollution control
	4.	CEE 811	Traffic engineering
	5.	CEE 812	Open channel and river hydraulics
	6.	CEE 813	Planning and management of buildings
<b>Elective IV</b>	1.	CEE 814	Plastic design of structures
	2.	CEE 815	Structural fire engineering
	3.	CEE 816	Advanced hydrology
	4.	CEE 817	Geo-environmental and geo-hazard engg.
	5.	CEE 818	Finite element method
	6.	CEE 819	Construction and Contract management

## **List of Open Electives**

1.	CEO 701	RS and GIS applications
2.	CEO 702	Disaster management
3.	CEO 703	Env. pollution and Management

## **Syllabus for B. Tech 1<sup>st</sup> semester (Civil Engineering)**

### **ENGINEERING GRAPHICS (CEL 105/205)**

**L T P 1 0 3**

Graphics as a tool to communicate ideas, Lettering and dimensioning,  
Plain and Diagonal Scales, Construction of geometrical figures like pentagon and hexagon.  
Principles of orthographic projections, Principal and auxiliary planes, First and Third angle projections, Projection of points. Pictorial view.  
Projection of lines parallel to both the planes. Parallel to one and inclined to other, Inclined to both the planes. Application to practical problems.  
Projection of solid in simple position, Axis or slant edge inclined to one and parallel to other plane, Solids lying on a face or generator on a plane.  
Sectioning of solids lying in various positions, True shape of the section.  
Development of lateral surfaces, sheet metal drawing.  
Principles of isometric projection, Problems using box & offset methods.

### **ENVIRONMENT AND ECOLOGY (CEL 106/206)**

**L T P 2 0 0**

#### **Unit-I**

Definition, Scope and Importance, Need for Public awareness, Environment definition, Ecosystem, Concept of ecosystem, Structure and function of an ecosystem, Energy flow in ecosystem, Ecological succession, Balanced ecosystem, Human activities, Food shelter, Economic and Social Security.

Effects of Human Activities on environment-Agriculture, Housing, Industry, Mining and Transportation Activities, Basic of Environmental Impact Assessment, Sustainable Development.

#### **Unit-II**

Natural Resources: Water Resources – Availability and Quality Aspects, Conservation of water, Water Borne Diseases, Water Induced Diseases, Fluoride Problem in Drinking Water; Mineral Resources, Forest Wealth, Material Cycles-Carbon, Nitrogen and Sulphur Cycles.

Energy-Different Types of Energy, Electro-magnetic Radiation, Conventional and Non-Conventional Sources, Hydro Electric Fossil Fuel Based, Nuclear, Solar, Biomass, Bio-gas, Hydrogen as an Alternative Future Source of energy.

#### **Unit-III**

Environmental Pollution and their Effects, Water Pollution, Land Pollution, Noise Pollution, Public Health aspects, Air Pollution, Solid Waste Management.

Current Environmental Issue of Importance: Population Growth, Climate Change and Global Warming-Effects, Urbanization, Automobile Pollution.  
Acid Rain, Ozone Layer Depletion.

#### **Unit-IV**

Environmental Protection-Role of Government, Legal Aspects, Initiatives by Non-Governmental Organizations (NGO), Environmental Education, Women Education.

Field Work: Visit to local area to document environmental assets-rivers/forest/grassland/hill/mountain, Visit to a local polluted site-Urban/Rural/Industries/Agricultural, Study of common plants, insects, birds, Study of simple ecosystems-ponds, river, hill slopes etc.

## Syllabus for B. Tech 3<sup>rd</sup> semester (Civil Engineering)

### MATHEMATICS-III (AS 301)

To be floated by Mathematics department

### FLUID MECHANICS (CEL 301)

LTP 3 1 0

#### UNIT-I

##### Introduction:

Scope and importance of Fluid Mechanics, Physical Properties of fluids (density, specific weight, specific volume, sp. gravity, viscosity-Newton's law of viscosity, Newtonian and non-Newtonian fluids, Compressibility, Surface tension and Capillarity, vapour pressure), Rheological classification of fluids, Ideal fluid, Real Fluid.

##### Fluid Statics:

Pressure, Pascal's Law, Hydrostatic Law, pressure measurement devices – Piezometer, manometers, Mechanical gauges, Forces on plane and curved surfaces, Centre of pressure and pressure diagram, Buoyancy, Metacentre, Stability of Submerged and floating bodies, Fluid masses subjected to accelerations..

#### UNIT-II

##### Fluid Kinematics:

Concept of control volume, Velocity and acceleration of fluid Particle, Lagrangian and Eulerian approach, Classification of fluid flow ( steady- unsteady, Uniform-Nonuniform, Rotational – Irrotational, turbulent – laminar, 1-D,2-D, 3-D flow, Compressible - incompressible flow), Streamlines, Path lines and Streak lines, Equipotential lines, Stream Function and Velocity Potential, Flow Net, Continuity equation, Rotation, Vorticity and Circulation, Free and Forced vortex motion.

#### UNIT-III

##### Fluid Dynamics:

Concept of control volume and control surface, Forces acting on fluid in motion, Euler's equation, Bernoulli's Theorem and applications – Pitot Tube, Venturimeter, Orificemeter, Orifices and Mouthpieces, Concept of HGL & TEL.

**Dimensional Analysis:** Units and Dimensions, Dimensional analysis, Rayleigh's method, Buckingham's II theorem, Non-dimensional numbers & their significance.

#### UNIT-IV

**Hydraulic Similitude and Model Studies:** Model and prototype; Similitude; Geometric, Kinematic and Dynamic similarity; Model Laws; Un-distorted model studies.

##### Flow in pipes:

Laminar flow: Reynold's Experiment, Couette & Hazen Poiseuille's Equation for viscous flow between parallel plates and circular pipes, Stokes law; Flow through porous media; Darcy's Law; Fluidization; Measurement of viscosity; Transition from laminar to turbulent flow.

Turbulent flow: Velocity distribution and Shear stresses in turbulent flow, Prandtl mixing length theory, Nikuradse's Experiment, Introduction to Moody's Chart.

#### Unit-V

##### Losses in pipes:

Darcy - Wiesbach Equation, factors affecting friction, Minor Losses in pipes, Concept of

equivalent length of pipe for different pipe fittings, Equivalent diameter of pipes, Hydraulic Power, transmission by pipe, Pipes in parallel, Series, Syphon, two reservoir problems, Water hammer in pipes, Surge tanks - function, location and uses.

## References

- 1) Fluid Mechanics – A.K. Jain – Khanna Pub., Delhi
- 2) Fluid Mechanics – Hydraulic & Hydraulic Mechanics -Modi / Seth – Standard Book House, Delhi
- 3) Fluid Mechanics – S. Nagrathanam – Khanna Pub., Delhi
- 4) Fluid Mechanics – Streeter-McGraw-Hill International Book Co., Auckland
- 5) Elementary Fluid Mechanics – H. Rouse – Toppan C. Ltd. Tokyo
- 6) Fluid Mechanics – Garde-Mirajgaonkar – Nemchand & Bros., Roorkee
- 7) Fluid Mechanics – Shames - McGraw-Hill International Book Co., Auckland
- 8) Som and Biswas: Introduction to Fluid Mechanics and Machines, TMH.
- 9) R K Bansal: Fluid Mechanics and Hydraulic Machines
- 10) Fluid Mechanics & Hydraulic Machines – Domkundwar & Domkundwar, Dhanpat Rai & Co.
- 11) Fluid Mechanics & Hydropower Engineering – D. S. Kumar, S.K. Kataria and Sons.

## SURVEYING-I (CEL 302)

LTP 3 1 0

### Unit-I

#### Introduction

Importance of surveying to Engineers —Examples from different fields; Plane and Geodetic Surveying, Classification of surveys, Methods of locating a point, Sources of error, Types of errors, Principle of working from whole to part.

#### Measurement of Distances

Measurement by chain and tape. Sources of errors and precautions, Corrections to tape measurements, Field problems, Introduction of modern trends: EDM and Total Stations.

### Unit-II

#### Measurements of Angles and Directions

**Compass Surveying:** Reference meridians, Bearing and azimuths, Magnetic declination and its variations, Use and adjustment of compass .

**Theodolite Surveying:** Vernier theodolite, micro-optic and electronic theodolites, Temporary and permanent adjustments, Measurement of horizontal and vertical angles Permanent Adjustments .

### Unit-III

#### Traversing

Principles of traversing by compass and theodolite, Field work and checks, Computation of coordinates, Sources of errors, Precision of traversing, Checking and adjusting of traverse, omitted measurements. Gale's traverse Table.

#### Tacheometry

Definitions, Principles of stadia systems, Instrument constants, Subtense and tangential systems, Construction and use of Reduction Tacheometers, Errors and Precision.

### Unit-IV

#### Measurements of Elevation and Contouring

Different methods of determining elevation; Spirit levelling: Definition of terms, principle, Level parts, Temporary and permanent adjustments of levels. Automatic levels, various Levelling staves, Methods of spirit levelling, Booking and reduction of fields notes,

Curvature and refraction, Reciprocal leveling, Construction and field use of altimeter, Trigonometric levelling-simple and reciprocal observations, Sources of errors and precision of levelling procedures. Definition and characteristics of contours, Use of contour maps, Direct and Indirect methods of contouring.

#### **Unit-V**

##### **Plane Table Surveying**

Principle, Advantages and disadvantages, Plane Table equipments, Use of telescopic alidade and self reducing alidades, Different methods of Plane Table Surveying, Resectioning -Two and three point problems, Advantages and disadvantages of Plane Table surveying. (6)

##### **Sheet Numbering System:**

Numbering of topographic maps for India as whole country.

#### **References**

1. Agor, R. "Surveying", Vol. I & II Khanna Publications, Delhi,.
2. Arora, K.R., "Surveying", Vol. I & II Standard Book House, Delhi,
3. Bannister, A. and Baker, R., "Solving Problems in Surveying", Lorigman Scientific Technical, U.K., 1994.
4. Kennie, T.J.M. and Petrie, G., "Engineering Surveying Technology", Blackie & Sons Ltd., London, 1990.
5. Punmia, B.C., "Surveying", Vol. I & II, Laxmi Publications New Delhi,
6. Duggal, S.K., Surveying Vol. I & II TMH
7. Basak, Surveying TMH.
8. Kanetkar, Surveying Vol.1, II.
9. Chandra, A.M. "Plane Surveying", New Age International Publishers, Delhi .
10. Chandra, A.M. "Higher Surveying", New Age International Publishers, Delhi

## **BUILDING MATERIALS & CONSTRUCTION (CEL 303)**

**LTP 3 1 0**

### **Building Material**

#### **Unit-I**

##### **Brick, Stone, Timber, Lime:**

Classification, Properties and selection criteria of Bricks Burning Bricks, tests for bricks, stone Classification, characteristics of good building stone, common building stones in India, lime, IS specifications, Field tests of Building limes, timber, Characteristics of good timber, defects in timber, seasoning of timber, tests on timber, plywood, .

**Mortar:** Types, classification and strength, I.S. specifications.

#### **Unit-II**

##### **Cement & Aggregate**

Cement, Manufacture of cement ,Different types of cement such as slag Cement, Portland Pozzolona Cement and high Alumina cement, their characteristics, composition, use and properties, Tests on Cements , Admixtures, Aggregates and Testing of Aggregates: Classification, source, physical and mechanical properties. Testing of Aggregates, physical and mechanical properties.

#### **Unit-III**

##### **Building, byelaws**

Classification of buildings. Recommendations of NBC, Building byelaws, modular coordination:, orientation of buildings, desirable conditions of comforts, components of building, area considerations. Types of foundations and selection criteria.

## **Masonry**

Brick masonry, stone masonry. Types of walls, partition and cavity walls. Prefabricated construction. Plastering and pointing. Damp proofing materials and techniques, Antitermite treatment. [05]

## **Unit-IV**

### **Floor and Roof**

Types floors, construction details and selection criteria [02]

Types of roofs and roof covering, roof treatment for water proofing. [02]

Stair and staircases : Types, materials, proportions [02]

Doors and windows : types, sizes, purpose of doors and windows. [02]

## **Unit-V**

### **Finishes**

White washing, colour washing, painting, distempering. [02]

Shuttering, scaffolding and centering. Expansion and construction joints [03]

Sound and fire proof construction, L.S. specifications [02]

Lifts & escalators – their utilities & types.

### **References:**

1. Arora, S.P. & Bindra, S. P., 'A text book of Building Construction" Dhanpat Rai & Sons, Delhi.
2. Jha, J. & Sinha, S.K., "Building Construction", Khanna Publishers, Delhi.
3. Kulkarni, C.J., "A text book of Engineering Materials", Ahmedabad book Depot, Ahmedabad.
4. Kulkarni, Ci., "A text book of Engineering Construction", Ahmedabad Book Depot, Ahmedabad.
5. Kurnar Sushil, "Engineering Materials, "Standard Publishers Distributors, Delhi.
6. Kumar Sushil, "Building construction", Standard Publishers, Distributors, Delhi.
7. McKay W.B., "Building Construction, "Vol.1 to 4, Orient Longman Ltd., Hyderabad, Bombay, Madras, Delhi.
8. Punmia, B.C., "A text book of Building Construction "Laxmi Publications, Delhi, Madras.
9. Singh Surendra, "Engineering Materials," Konark Publishers Pvt. Ltd.
10. Civil Engg. Materials, TTTI Chandigarh, Tata McGraw- New Delhi.

## **STRENGTH OF MATERIAL (ME )**

To be floated by Mechanical Engineering department

### **FLUID MECHANICS LAB (CEP 351)**

**LTP 0 0 3**

1. To determine the metacentric height of a ship model experimentally.
2. To study the transition from laminar to turbulent flow and to determine the lower critical Reynolds number.
3. To determine the coefficients of velocity, contraction and discharge of an orifice (or a mouth piece) of a given shape.
4. To find the velocity distribution in a pipe and hence to compute the discharge by integrating the velocity profile obtained.
5. To verify the Bernoulli's theorem.
6. To calibrate an orifice meter and venturimeter and to study the variation of the coefficient of discharge with the Reynolds number.



7. To verify Darcy's law and to find out the coefficient of permeability of the given medium.
8. To study the variation of friction factor, 'f' for turbulent flow in smooth and rough commercial pipes.
9. To determine the loss coefficients for the various pipe fittings.

### **Surveying-I Lab (CEP 352)**

**LTP 003**

1. To study instruments used in chain surveying and to measure distance between two points by ranging.
2. To determine the bearing of sides of a given traverse using Prismatic Compass, and plotting of the traverse.
3. To plot details using radiation and intersection methods in plane tabling.
4. To solve two point and three point problem in plane table.
5. To find out the reduced levels of given points using level. (Reduction by Height of Collimation method and Rise and Fall Method).
6. To determine and draw the longitudinal and cross-section profiles along a given route.
7. Practice for temporary adjustments of a Vernier Theodolite and taking Horizontal and Vertical angular measurements, by Reiteration method.
8. Measurement of horizontal using Theodolite angles by Repetition method.
9. Determination of the Tacheometric constants of a given theodolite.

### **BUILDING PLANNING AND DRAWING (CEP 353)**

**LTP 003**

1. Symbols used in Civil Engineering drawing,
2. Doors, Windows and staircases
3. Foundation types
4. Floor detail
5. Planning (as per design principles) and drawing of Residential building, (Layout, plan, elevation, single and double storeyed both).
6. Wooden roof truss
7. Steel roof truss

### **BUILDING MATERIAL LAB (CEP 354)**

**LTP 003**

1. Cement
  1. Normal consistency of cement
  2. Initial & final setting time of cement
  3. Compressive strength of cement
  4. Fineness of cement
  5. Soundness of cement
2. Coarse Aggregate
  1. Sieve analysis of aggregate
  2. Water absorption of aggregate
  3. Specific gravity and bulk density of aggregate
  4. Crushing value of aggregate
  5. Impact value of aggregate

3. Fine Aggregate
  1. Sieve analysis of sand
  2. Silt content of sand
  3. Bulking of sand
4. Bricks
  1. Water absorption
  2. Dimensional tolerances
  3. Compressive strength
  4. Efflorescence
5. Physical and mechanical properties of reinforcing steel

# Syllabus for B. Tech 4<sup>th</sup> semester (Civil Engineering)

## HYDRAULICS AND HYDRAULIC MACHINES (CEL 401)

L T P 3 1 0

### Unit-I

**Introduction:** Difference between pipe flow and open channel flow. Types of open channels, Types of flows in open channel, Geometric elements, Velocity distribution, Velocity and pressure distribution in an open channel, Continuity equation.

**Uniform Flow:** Chezy's & Manning's formula, Roughosity coefficient, Uniform Flow computations, Hydraulically efficient section (Rectangular, Triangular, Trapezoidal ), compound channel sections.

### Unit-II

#### **Depth energy relationship in open channel flow:**

Specific energy (definition & diagram, Critical, Sub-critical, Super-critical flow), Specific force, Specific discharge, flow through vertical and horizontal contractions.

#### **Gradually varied flow (G.V.F.):**

Definition, Classification of channel Slopes, Dynamic equation of G.V.F.( Assumption and derivation), Classification of G.V.F. profiles-examples, Direct step method of Computation of G.V.F. profiles.

### Unit-III

#### **Rapidly varied flow (R.V.F.):**

Definition, examples, Hydraulic jump- Phenomenon, relation of conjugate depths, Parameters, Uses, Types of Hydraulic jump, Hydraulic jump as an energy dissipater, **Notches & Weirs** : Types, derivation of discharge equation, Sharp, broad & round crested weirs.

### Unit-IV

#### **Impact of jet:**

Impulse momentum principle, Impact of jet on Vanes-flat, curved (stationary and moving), Inlet & outlet velocity triangles, Series of flat, curved vanes mounted on wheel.

#### **Hydraulic turbines:**

Importance of hydro-power, Classification of turbines, description, Typical dimensions and working principle of Pelton, Francis & Kaplan turbine, Unit quantities, Specific speed, Performance Characteristics, Selection of type of turbine, description & function of Draft tube

### Unit-V

#### **Centrifugal pump:**

Classification, Component parts, Working of centrifugal pump, Performance Characteristics, Selection of pump, Common pump troubles & remedies, Introduction to different types of pumps.

#### **Boundary layer theory:**

Concept, Boundary layer along thin plate- Characteristics, Laminar, Turbulent Boundary Layer, laminar sub layer, Various Thicknesses- Nominal, displacement, Momentum, Energy, Hydraulically smooth and Rough boundaries, Separation of Boundary layer, control of Separation.

Introduction to Drag and Lift on submerged bodies ( like Flat plates, Sphere, Cylinder, aerofoil ), stokes law, Drag and Lift coefficients.

#### **References:**

1. Subramanya, K., Flow in Open Channels, Tata McGraw Hill

2. Srivastava R., Flow through open channel, Oxford university press.
2. Henderson, F.M., Open Channel Flow, McGraw Hill International
3. Chow, V.T., Open channel Hydraulics, McGraw Hill International
4. Ranga Raju, K.G., Flow through open channels, T.M.H.
5. French, R.H., Open Channel Hydraulics, McGraw Hill International
6. Graf, W.H., Hydraulics of Sediment Transport, McGraw Hill International
7. Fluid Mechanics – K. Subramanyam – Tata McGraw-Hill Pub. Co., Delhi
8. Fluid Mechanics – Hydraulic & Hydraulic Mechanics -Modi / sesh – Standard Book House, Delhi

## **STRUCTURAL ANALYSIS-I (CEL 402)**

**L T P 3 1 0**

### **Unit-I**

Classification of structures, Stability and Determinacy of structures.  
Classification of pin jointed determinate trusses, Analysis of determinate plane and space trusses.

### **Unit-II**

Rolling loads, influence lines for beams and trusses, Absolute maximum bending moment, Muller-Breslau's principles & its application.

### **Unit-III**

Analysis of Arches, Linear arch, Eddy's theorem, three hinged parabolic arch, two hinged arch, spandrel braced arch, moving load & influence lines.

### **Unit-IV**

Equilibrium of light cable, General Cable theorem, uniformly loaded cable, anchor cables, temperature stresses in suspension cables, three hinged stiffening girder, two hinged stiffening girder, temperature stresses in two hinged girder.

### **Unit-V**

Strain Energy of deformable systems, Maxwell's reciprocal & Betti's theorem, Castigliano's first theorem, unit load & Conjugate beam methods.

### **References**

1. Wilbur and Norris, "Elementary Structural Analysis", Tata McGraw Hill.
2. Reddy, C.S., "Basic Structural Analysis", Tata McGraw Hill.
3. Jain, O.P. and Jain, B.K., "Theory & Analysis of Structures", Vol. I & II Nem Chand.
4. S.P. Gupta & G.S. Pandit., "Theory of structures".
5. S. Ramamrutham., "Theory of structures".
6. Coates, R.C., Coutie, M.G. & Kong, F.K., "Structural Analysis", English Language Book Society & Nelson, 1980.
7. Ghali, A. & Neville, M., "Structural Analysis", Chapman & Hall Publications, 1947.
8. Jain, A.K. "Advanced Structural Analysis", Nem Chand & Bros, Roorkee, India, 1996.
9. Jain, O.P. & Arya A.S., "Theory of structures", Vol. II, Nem Chand Bros., Roorkee, 1976.
10. Kinney, J.S., "Intermediate structural Analysis", McGraw Hill Book Company, 1957.
11. Nautiyal, B.D., "Intermediate structural Analysis", New Age International, 2001.
12. Chu – kia Wang, ph.D., "Statically Indeterminate Structures".

**Unit-1**

**Triangulation and Trilateration**

Reconnaissance

Necessity of Control Surveying, Principle of Triangulation and Trilateration, classification of Triangulation Systems, Station Marks, Towers and Signals, Satellite station, Intersected and Resected points, Inter visibility of stations, Angular Measurement, Base line measurement and its extension (8)

**Unit-II**

**Adjustment Computations**

Treatment of random errors, Normal law of errors, Most Probable Value, Weight of observations, Propagation of errors and variances, Principle of Least Squares, Observations and correlative Normal Equations, Adjustment of triangulation figures and level nets. (8)

**Unit-III**

**Curves**

Classification of curves, Elements of Simple Circular, Transition and Vertical curves, Theory and methods of setting out circular, transition and vertical curves, special field problems. (8)

**Field Astronomy**

Astronomical terms, co-ordinate systems, Spherical trigonometry, Astronomical triangle, Relationship between coordinates. (3)

**Unit-IV**

**Photogrammetry and Remote Sensing**

Photogrammetry -Introduction, Scale of photograph, Tilt and height displacement, Stereoscopic vision and stereoscopes, Techniques of photo-interpretation, Principles of remote sensing, Electro Magnetic Radiation (EMR), energy interaction with atmosphere and earth features, spectral signatures. Remote sensing satellites and their data products, methods of interpretation of remotely sensed data. (5)

**Unit-V**

**GPS and GIS**

Global Positioning System (GPS)-Introduction , principle, and applications GPS indifferent fields of Surveying,

Geographic Information System (GIS)-Introduction, Geographical concepts and terminology, Applications of G IS (3)

**References**

1. Agor, R., ‘Surveying’, Vol. I & II, Khanna Publications. Delhi.
2. Arora, K.R., ‘Suiveying’, Vol 11 & Ill, Standard Book Flouse, Delhi.
3. Bannister, A. and Baker, R., Solvi ng Problems in Surveying, I onggmn Scintific Technical, U.K.
4. Kennie, T.J.M. and Petrie, G., ‘Engineering Surveying Technology’, Blackie & Sons Ltd. London.
5. Punmia, B.C., ‘Surveying’, Vol.11 & Ill Laxmi Puhlications,New Delhi.
6. Duggal S.K., Surveying Vol. 1 & 11 TMH
7. Basak, Surveying TMH.
- 8, Kanetkar & Kulkarni, Surveying Vol. I & II
9. Chandra, A.M.. ‘Plane Surveying’, New Age International Publisher, Delhi.
10. Chandra, A.M. ‘Higher Surveying’, New Age International Publisher, Delhi .
11. Lillesand, T.M. and Kiefer, R.W., ‘Remote Sensing and Image Interpretation’.

## **ENGINEERING GEOLOGY (CEL 404)**

**L T P 3 1 0**

### **Unit-I**

Earth Sciences and its importance in Civil Engg. Minerals and their physical properties. Study of common rock forming minerals. Internal structure of the earth. Suitability of rocks as engineering materials. Building stones occurrences and characteristics, selection

### **Unit-II**

Rocks origin, Characteristics, Texture, structure and classification of igneous, sedimentary and metamorphic rocks. Engineering properties of rocks.

### **Unit-III**

Strike and dip of strata, folds, faults, joints, unconformity and their classification, Causes and relation to engineering behaviour of rock masses. Overlap. Landslides causes, classification and preventive measures.

### **Unit-IV**

Earthquake causes, classification, earthquake waves, intensity and magnitude, Seismic zones for India, Geological consideration for construction of building. Underground water, sources, Aquifer, Aquiclude, Artesian well, Ground water provinces of India and its role as geological hazard.

### **Unit-V**

Geological investigations for site selection of dams & reservoirs, tunnels, bridges and highways. Reservoir induced seismicity. Methods of Geophysical explorations-gravity, electrical and seismic, methods.

## **COMPUTER BASES NUMERICAL METHODS (ASL 401)**

To be obtained floated by Mathematics department

## **HYDRAULICS AND HYDRAULIC MACHINE LAB (CEP 451)**

**L T P 0 0 3**

1. To determine the Manning's coefficient of roughness 'n' for the given channel bed.
2. To study the velocity distribution in an open channel and to find the energy and momentum correction factors.
3. To study the flow characteristics over a hump placed in an open channel.
4. To study the flow through a horizontal contraction in a rectangular channel.
5. To calibrate a broad-crested weir and study the pressure distribution on the upstream face of the weir.
6. To study the characteristics of free hydraulic jump.
7. To study the flow over an abrupt drop and to determine the end (brink) depth for a free over fall in an open channel.

8. To study rotodynamic pumps and their characteristics.
9. To study rotodynamic turbines and their characteristics.
10. To calibrate and to determine the coefficient of discharge for rectangular and triangular notches.
11. To verify the momentum equation.
12. To study the boundary layer velocity profile and to determine boundary layer thickness and displacement thickness. Also to determine the exponent in the power law of velocity distribution.

### **SURVEYING-II (CEP 452)**

**L T P 0 0 3**

1. Study and use of different types of microptic theodolites and total stations.
2. To carry out Triangulation and Trilateration of a given area.
3. To adjust the angular observations taken in triangulation exercise and compute the adjusted coordinates of triangulation, stations.
4. Prepare Gale's traverse Table.
5. To Layout a simple circular curve on the ground using linear methods.
6. To Layout a simple circular curve on the ground using Angular methods
7. To Layout a building and a culvert on the ground.
8. Study of satellite imagery and visual image interpretation.
9. GPS demonstration and coordinate observations.
10. GIS demonstration and study of its applications.

### **ENGINEERING GEOLOGY LAB (CEP 453)**

**L T P 0 0 3**

1. Megascopic study of minerals (physical properties and identification)
2. Determination of Specific gravity of minerals.
3. Megascopic study of the following rocks with special reference to their suitability in Civil Engineering Works:
  - Igneous rocks
  - Sedimentary rocks
  - Metamorphic rocks
4. Determination of strike and dip and completion of out crop.
5. Preparation of geological section and study of geological maps with emphasis on the site selection for dams, tunnels and highways.
6. Application of Seismic Refraction method
7. Application of Electrical resistivity method

### **NUMERICAL TECHNIQUES LAB (ASP 451)**

To be floated by Mathematics department.

## Syllabus for B. Tech 5<sup>th</sup> semester (Civil Engineering)

### HYDROLOGY AND IRRIGATION ENGINEERING (CEL 501)

L T P 3 1 0

#### Unit I

**Hydrologic cycle:** Hydrologic cycle, water budget equation.

**Precipitation:** Forms, measurement, presentation, mean precipitation, missing data, error in estimation, consistency of rainfall records, IDF curve, PMP.

**Abstractions from precipitation:** Factors, measurement and estimation: Infiltration and Evaporation, Evapo-transpiration

#### Unit II

**Streamflow measurement:** Measurement of stage and velocity, Stage discharge relationship

**Runoff:** Components and factors affecting runoff, methods of estimation of runoff volume, Rainfall – runoff relationships.

**Hydrograph analysis:** components, factors affecting hydrographs, base flow separation, Direct Runoff Hydrograph, Unit Hydrograph, Derivation of Unit Hydrograph, Synthetic Unit Hydrograph.

#### Unit III

**Introduction:** Development in India, Necessity and types, advantages and disadvantages, Types and Methods of irrigation.

**Water Requirements of crops:** Quality of irrigation water, Duty and Delta, Irrigation efficiencies, Irrigation water requirements, Irrigation frequency, Intensity of irrigation, Crop seasons, Principal crops, Rotational crops, Crop season.

#### Unit IV

**Canal irrigation:** Classes and alignment, parts of canal system, command area, curves in channels, Silt theories: Design of canal by Kennedy's and Lacey's theories.

**Design procedure for irrigation channel:** use of Garret's diagram in channel design, balance depth.

**Canal Lining:** Advantages, Design of lined canal, economics of canal lining.

**Water logging:** Effects, causes and prevention of water logging, Types of drains- open and closed, Spacing of drains, Layout of canal system.

#### Unit V

**Well irrigation-**types, specific yield of well, relative merits of canal and well irrigation, types of tube wells, well shrouding and development.

**Floods:** Introduction, Rational method, Empirical formulae, Unit hydrograph method, Flood frequency studies, Gumbel's method.

**Flood routing:** Introduction, Basic equations, types-Hydrologic and hydraulic, Channel routing by Muskingum method.

#### Text books

1. Open Channel Hydraulics by Ven Te Chow, McGraw Hill International Book Company
2. Engineering Hydrology by Subramanya, K., 2<sup>nd</sup> edition, Tata McGraw Hill publishing Co.ltd., New Delhi
3. Irrigation Engineering and Hydraulic Structures – P.N Modi
4. Irrigation Engineering and Hydraulic Structures – S.K Garg
5. A text book of Hydrology and Water Resources Engineering by R.K Sharma and T.K. Sharma, Dhanpat Rai publications, New Delhi



6. Irrigation and Water power engineering- B.C. Punmia, Pandey, B.B. Lal, Standard publishers, Delhi.

## **STRUCTURAL ANALYSIS-II (CEL 502)**

**L T P 3 1 0**

### **Unit I**

Analysis of fixed beams, Continuous beams, three moment theorem, simple frames with and without translation of joint, Method of Consistent Deformation, Slope-Deflection method, Moment Distribution method, Strain Energy method.

### **Unit II**

Muller-Breslau's Principle and its applications for drawing influence lines for indeterminate beams, Analysis of two hinged arches, Influence line diagrams for maximum bending moment, Shear force and thrust.

### **Unit III**

Suspension Bridges, Analysis of cables with concentrated and continuous loadings, Basic of two and three hinged stiffening girders, Influence line diagrams for maximum bending moment and shear force for stiffening girders.

### **Unit IV**

Basics of force and Displacement Matrix methods for beams and trusses.

### **Unit V**

Basic of plastic Analysis, Applications of static and Kinematic theorem for Plastic Analysis of Beams and Frames.

### **Text Books**

1. Advanced Structural Analysis by A.K. Jain, Nem Chand & Bros., Roorkee.
2. Structural Analysis by C.S. Reddy, Tata Mc Graw Hill publishing Company limited, New Delhi.

### **References**

1. Theory and Analysis of structures, Vol. I & II by O.P. Jain & B.K. Jain, Nem Chand & Bros., Roorkee.
2. Theory of structures by S.P. Timoshenko and D. Young, McGraw Hill Book publishing Company Ltd., New Delhi.
3. Analysis of Statically Indeterminate Structures by P.Dayaratnam, Affiliated East-West press.
4. Indeterminate Structural Analysis by C.K. Wang.
5. Matrix Analysis of framed Structures by Weaver and Gere.
6. Theory of structures Vol. II by Vazirani & Ratwani.
7. Influence Line Diagram by Dhavilkar.
8. S.P. Gupta & G.S. Pandit., "Theory of structures".
9. S. Ramamurtham., "Theory of structures".

## **DESIGN OF CONCRETE STRUCTURE-I (CEL 503)**

**L T P 3 1 0**

### **Unit I**

Introduction: Structural systems, materials, loadings and structural analysis, introduction to design of concrete structures, design philosophies. Working stress design for flexure – rectangular beams.

### **Unit II**

Limit state design: Assumption, design of rectangular singly and doubly reinforced beams, flanged beams.

### **Unit III**

Design of beams in shear and torsion, development length, bond. Design of curved beams and continuous beams.

### **Unit IV**

Design of one way and two way slabs. Design of staircases. Serviceability limit states.

### **Unit V**

Design of columns: short column under axial compression, short column under axial load and uniaxial bending. Design of columns under biaxial loading by design charts.

Design of building frames

Note: All designs shall be conforming to IS: 456 – 2000.

## **TRANSPORTATION ENGINEERING-I (CEL 504)**

**L T P 3 1 0**

### **Unit I**

Introduction: Role of transportation in society. Modes of transportation. History of road development; Road types and pattern;

Road Geometrics: Road alignment; Controlling factors and surveys for road alignment. Geometric Design: Cross sectional elements, camber, shoulder, sight distance. Horizontal curves: super elevation, extra widening, transition curves, setback distance. Gradient Vertical Curves- Summit and valley curves.

### **Unit II**

Traffic Engineering: Traffic characteristic, volume studies, Speed study, Traffic flow characteristics, capacity, density. Traffic control devices: Signs, signals, island; intersections: at grade and grade separated intersections, rotary intersection, design of signals at intersections.

### **Unit III**

Pavement Materials: Introduction, Road aggregates and their testing, Binders, Bitumen, Emulsion and their testing, I.S. and IRC codes related to testing of materials.

#### **Unit IV**

Pavement Design: Types, Structural and functional failures. Design factors; flexible pavement design by CBR method, Design of rigid pavement, Westerguard theory, load and temperature stress, critical combination of stresses, joints. IRC method of rigid pavement design.

#### **Unit V**

Road Construction Methods: WBM, surface dressing, bituminous carpeting, Bituminous Bound Macadam and Asphaltic Concrete, cement concrete roads, MOST specification for these roads. Pavement failure, evaluation and overlay design.

### **GEOTECHNICAL ENGINEERING (CEL 505)**

**L T P 3 1 0**

#### **Unit I**

##### **Physical properties of soils**

Introduction, Fundamental relationships by volume and weight, Index properties of soils, Sieve analysis, Sedimentation analysis, Atterbergs limits and density index.

#### **Unit II**

##### **Identification of soils and classification of soils**

Tests for identification and classification of soils, Textural classification, Unified soil classification and Indian standard classification systems

##### **Soil water**

Modes of occurrence of water in soils, adsorbed water, capillary water, Stress condition in soil, effective and neutral pressures.

#### **Unit III**

##### **Permeability and seepage**

Permeability of soil, Laboratory and field determination, Seepage analysis, Elementary principles of flow nets, Phreatic line in an earth dam, Seepage through earth dam, Critical hydraulic gradient, Piping

#### **Unit IV**

##### **Consolidation**

Pressure, Void ratio curve, Compression index, Coefficient of compressibility, Modulus of volume change, Consolidation process, Consolidation settlement, Terzaghi's theory of one dimensional consolidation, Coefficient of consolidation, Pre consolidation pressure, Normally consolidated and over consolidated soils.

#### **Unit V**

##### **Shear strength of soils**

Shear strength of soils, Mohr-coulomb failure criteria, Measurement of shear strength, Direct shear, unconfined compression and triaxial compression tests, Shear strength parameters, test conditions, Shear strength of cohesive and cohesion less soils, Drainage conditions, Pore pressure parameters.

#### **Text books**

1. Geotechnical Engineering – C.Venkatramaiah.

2. numerical problems, examples and objective questions in geotechnical engineering – Prof A.V Narasimha Rao and Prof C.Venkatramaiah
3. Soil Mechanics and Foundation Engineering – K.R.Arora
4. Soil Mechanics and Foundation Engineering – B.C.Punmia
5. Fundamentals of Soil Mechanics – D.W.Taylor
6. Soil Mechanics – T.W.Lambe and R.V.Whitman

### **STRUCTURAL ANALYSIS LAB (CEP 551)**

**L T P 0 0 3**

1. To determine the flexural rigidity (EI) of a given beam.
2. To verify Maxwell's reciprocal theorem.
3. To find horizontal thrust in a three hinged arch and to draw influence line diagram for horizontal thrust and bending moment.
4. To find horizontal thrust in a three hinged arch and to draw influence line diagram for horizontal thrust and bending moment.
5. To find deflection of curved members.
6. To find deflection in a fixed beam.
7. To find shear force and bending moment of a simply supported beam.
8. To find critical load in struts with different end conditions.
9. To find forces in elastically coupled beams.
10. To find deflection in beam having unsymmetrical bending.
11. To analyze the portal frame for deflection and horizontal reaction.
12. To verify the cable tension in suspension bridge.

### **CONCRETE TECHNOLOGY LAB (CEP 552)**

**L T P 0 0 3**

1. Workability of concrete by compaction factor, slump test
2. Compressive strength of concrete
3. Flexural strength of concrete
4. Mix design by I.S. code method
5. Concrete permeability test
6. Effect of fire on concrete
7. N.D.T. using Rebound hammer test
8. N.D.T. using ultrasonic pulse velocity test
9. Destructive test on core sample
10. Determination of constituents of hardened mortar

### **TRANSPORTATION ENGINEERING LAB (CEP 553)**

**L T P 0 0 3**

1. Crushing Value Test of Aggregate
2. Impact Value Test of Aggregate
3. Los Angeles Abrasion Value of Aggregate
4. Shape Test (Flakiness Index, Elongation Index) of Aggregate

5. Penetration Test of Bituminous Sample
6. Softening Point Test of Bituminous Sample
7. Stripping Test of Bituminous Sample
8. Ductility Test of Bituminous Sample
9. Flash & Fire Point Test of Bituminous Sample
10. Classified both directional Traffic Volume Study
11. Traffic Speed Study (Using Radar Speedometer)

### **References**

1. Highway Material Testing by S. K. Khanna & C. E. G. Justo
2. Highway Material Testing by A. K. Duggal

### **GEOTECHNICAL ENGINEERING LAB (CEP 554)**

**L T P 0 0 3**

1. Specific Gravity
2. Grain Size Distribution by Sieve Analysis
3. Liquid Limit and Plastic Limit
4. Shrinkage Limit
5. In-Situ Density by Core Cutter Method
6. In-Situ Density by Sand Replacement Method
7. Free Swell Index Test
8. Hydrometer Analysis
9. I S Light Compaction Test
10. California Bearing Test
11. North Dakota Cone Test
12. Direct Shear Test
13. Unconfined Compression Test
14. Coefficient of Permeability by Constant Head Method
15. Coefficient of Permeability by Falling Head Method
16. Triaxial Shear Test (Demonstration Only)
17. Consolidation Test (Demonstration Only)

## Syllabus for B. Tech 6<sup>th</sup> semester (Civil Engineering)

### ENVIRONMENTAL ENGINEERING (CEL 601)

L T P 3 1 0

#### Unit I

##### Introduction

**Water Demands:** Sources, quantity and quality, Types, per capita demand, variation in demand, design period, population forecasting methods

**Water quality:** Characteristics, Water borne diseases, Quality standards

**Development of ground water:** Zones of GW, yield, Wells-Open and Tube wells, Comparison of surface and groundwater

#### Unit II

##### Water collection, conveyance and distribution

##### Types of intakes

**Conduits of transmission of water-**types, hydraulics, forces acting on conduits, material of pressure pipes, layout of water supply pipes, pipe appurtenances, testing of water mains.

**Pumps for lifting water pipe:** types, horsepower and efficiency of pumps, economical diameter of pumping mains, pumping stations.

#### Unit III

##### Purification of water supplies

**Screening:** coarse and fine screens

**Plain sedimentation:** Theory, sedimentation tank, tube settlers

**Sedimentation aided with coagulation:** chemicals used in coagulants,

**Filtration:** Theory, types of filters, design of filters

**Disinfection:** methods, chlorination-Break point chlorination, Calculation of dose of disinfectant.

**Water softening:** methods of removing temporary and permanent hardness

**Miscellaneous:** Removal of colour, dissolved salts, iron, manganese, arsenic, fluoride, packaged natural mineral waters, salinity, adsorption with activated carbon, ion exchange resins, membrane processes, chemical oxidation and softening

#### Unit IV

##### Distribution system

**Distribution system:** Introduction, requirements of good distribution system, layouts, methods of distribution system,

**Distribution reservoirs:** functions, types, stand pipes, storage capacity, location and height.

**Design of distribution network:** Fixing the size of pipes, analysis, Hardy Cross method.

**Appurtenances:** Fire hydrant, Water meters

#### Unit V

**Water supply plumbing in building and houses:** Plumbing system, house water connection, pipe fittings, storage of water in building, design considerations for water piping system in buildings,

**Planning and preparation of water supply projects:** General introduction, data, analysis of data, project drawing.

**Books**

Environmental engineering (Vol I), Water Supply Engineering-I by S.K. Garg, Khanna publishers, Delhi

Water and Wastewater, By Hammer, M.J. and Hammer, M.J. Jr., Prentice Hall of India pvt limited, Delhi.

**DESIGN OF CONCRETE STRUCTURE-II (CEL 602)****L T P 3 1 0****Unit I**

Foundation: structural behaviour of footings, design of shallow foundation - footing for a wall, single column, combined rectangular and trapezoidal footings, concept for design of deep foundations

Design of R.C.C. walls

**Unit II**

Retaining wall: structural behavior, stability, design of cantilever retaining wall, concept of counterfort retaining wall.

Bridges: loads, forces, I.R.C. bridge loadings, design of R.C. slab culvert.

**Unit III**

Design of flat, circular and odd shaped slabs.

**Unit IV**

Design of domes.

Design of tanks: design criteria, material specifications, permissible stresses, design of circular and rectangular tanks situated on the ground / under ground. design of overhead tanks

**Unit V**

Prestressed concrete: advantage, method of prestressing, losses in prestress, analysis of simple prestressed rectangular and flanged sections.

**GEOTECHNICAL ENGINEERING (CEL 603)****L T P 3 1 0****Unit I****Soil compaction**

Compaction of cohesive and cohesion less soils, Standard proctor's test and modified proctor's test, Field compaction, Compaction control, C.B.R test and its use.

**Unit II****Stress distribution in soils**

Boussinesq's equation, Vertical stress due to line load, strip load, and uniformly loaded circular area, Newmark's chart, Westergaard's approach, Pressure bulb concept, approximate methods

### **Unit III**

#### **Stability of slopes**

Stability analysis of infinite slopes – Stability analysis of finite slopes – Swedish circle method – Friction circle method – Taylor's stability number and use of charts – Improving stability of slopes

### **Unit IV**

#### **Earth pressures**

Earth pressure theories of lateral earth pressure – Active and passive earth pressures in cohesion less and cohesive soils (with and without surcharge) – Rankine's and Coulomb's earth pressure theories – Graphical methods due to Rebhann and Culmann.

### **Unit V**

#### **Earth retaining structures**

Types of retaining structures – Stability considerations of gravity and cantilever retaining walls – Drainage in retaining walls – Joints in retaining walls

#### **Text/reference books**

1. Geotechnical Engineering – C. Venkatramaiah
2. Soil Mechanics and Foundation Engineering - K.R Arora
3. Soil Mechanics and Foundations – B.C Punmia
4. Foundation Engineering – Teng
5. Analysis and Design of Foundations and Retaining Structures – Shamsheer Prakash, Gopal Ranjan , and Swamisaran

## **TRANSPORTATION ENGINEERING -II (CEL 604)**

**L T P 3 1 0**

### **Unit I**

Indian Railways, Development and organization of Indian railways. Permanent way, sub grade, formation, embankment and cutting, track drainage. Rail gauges; type of rails, defects in rails, rail features, rail flaw detection, creep of rail. Rail fastenings; fish plates, specks, chairs, keys ,bearing plates; sleepers: function of sleepers timber, steel, cast iron and concrete sleepers , manufacturing of concrete sleepers. sleeper density. Ballast: ballast materials, size of ballast, screening of ballast, specification of ballast ,test of ballast, recommended depth of ballast.

### **Unit II**

Track Geometry, gradients, horizontal curves, super elevation, safe speed on curves, cant deficiency, negative super elevation, compensation for curvatures on gradients, track resistance and tractive power .Point and crossing: elements of a turn, detail of a switch, detail of crossing , numbers and angle of crossing, design of a turnout.

### **Unit III**

Plate laying: Tram line, telescopic and American method. Maintenance of track. Signaling and interlocking: classification of signal, method of train working: absolute block system, mechanical interlocking of a two line railway stations. Yard and stations: site selection for



railway station, layout of different types of stations, classification of stations; Types of yards, functioning of Marshalling yards.

#### **Unit IV**

Air craft characteristic affecting airport planning and design ;runway orientation, wind rose diagram ,estimation of runway length and corrections, taxiways, Runway pavement design, design of overlay; Runway lighting.

#### **Unit V**

Docks and Harbors: Layout and facilities; Inland waterways; inland water operations.

### **DESIGN OF STEEL STRUCTURE (CEL 605)**

**L T P 3 1 0**

#### **Unit I**

Introduction to design: design loads, load combinations, design philosophies, steel rolled sections and steel structures.

Design of structural fasteners: rivets, bolts and welds.

#### **Unit II**

Design of compression members: effective length, slenderness ratio, strength, design of struts, columns, built up columns and eccentrically loaded columns.

#### **Unit III**

Design of tension members: strength and design; Design of column bases: slab and gusset bases

#### **Unit IV**

Design of domes.

Design of beams: laterally unsupported and laterally supported beams, built up sections, design of purlins; Design of gantry girder

#### **Unit V**

Wind design; Design of industrial buildings: detailed design of roof trusses

### **ENVIRONMENTAL ENGINEERING LABORATORY (CEP 651)**

#### **Determination of following physical characteristics:**

1. Turbidity
2. Conductivity
3. Colour
4. Odour

#### **Determination of following chemical characteristics:**

5. Hardness Estimation
6. Fluorides
7. Residual Chlorine

8. Acidity
9. Alkalinity
10. pH
11. Total Solids, Settleable Solids, Suspended solids and Dissolved solids
12. Chlorides
13. Sulphates

**Determination of following bacteriological characteristics:**

14. MPN
15. E-Coli.
16. Field visit to water treatment plant

**References**

1. Standard methods for the examination of water and wastewater, APHA, New york.

**STRUCTURAL DETAILING LAB (CEP 652)**

**L T P 0 0 3**

1. R.C. rectangular beam: simply supported, continuous, cantilever
2. R.C. flanged beams
3. R.C. slab: simply supported, continuous, one way and two way
4. R.C. columns: tied and spirally reinforced
5. Isolated footings for R.C. columns
6. R.C. retaining walls
7. Steel: rolled sections and connections
8. Built up steel columns and beams
9. Gusset bases for steel columns
10. Roof trusses

**COMPUTER APPLICATIONS IN CIVIL ENGINEERING LABORATORY (CEP 653)**

Use of softwares in:

Structures: STAAD.Pro, STRUDS

Geotech: CASTER

Water resources and Environmental Engineering: MODFLOW, QUAL2E, WASP, CALINE

Geoinformatics: Arc view, Arc Info, Map Info, Geomatica

**Books/References**

1. CAD aided design, by Rajiv, S., Narosa publications
2. AI and Expert system, Robert L. Lertner and Lane E. Drang, Mcgraw Hill
3. Neural Computing: Wassermann, Vonnostrand

## Syllabus for B. Tech 7<sup>th</sup> semester (Civil Engineering)

### OPEN ELECTIVE (CE0-701 to 703)

L T P 3 1 0

Any of the following may be floated as an open elective by the department.

1. CEO 701 Remote Sensing and GIS technology
2. CEO 702 Disaster Management
3. CEO 703 Environmental Pollution and Management

The syllabus for above courses under Open Elective is available in Annexure 1

### EARTHQUAKE RESISTANT DESIGN OF BUILDINGS (CEL 701)

L T P 3 1 0

#### Unit I

Introduction: origin of earthquakes, magnitude, intensity, ground motions, sensors, strong motion characteristics.

Concepts of earthquake resistant design of R.C. buildings: earthquake and vibration effects on structure, identification of seismic damages in buildings, effect of structural irregularities on the performance of buildings during earthquakes and seismoresistant building architecture.

#### Unit II

Single degree of freedom systems: equation of motion, free and forced vibrations, damping, response spectrum

#### Unit III

Two degree and multidegree freedom systems.

#### Unit IV

Seismic analysis and modeling of R.C. buildings: codal procedure for design of lateral loads, infill walls, seismic analysis of R.C. building as per IS: 1893 – 2000 (Part 1)

#### Unit V

Earthquake resistant design of buildings: ductility considerations, E.R.D. of R.C. building, design of load bearing buildings, design of shear wall.

### ENVIRONMENTAL ENGINEERING-II (CEL 702)

L T P 3 1 0

#### Unit I

**Introduction:** Physical, chemical and bacteriological characteristics of wastewater, water quality standards, Water borne diseases and their control, Composition of wastewater, Factors affecting the BOD rate of reaction, population equivalent

**Effluent disposal:** Standards for disposal into surface water bodies, Self purification, dissolved oxygen sag curve, Streeter–Phelps equation.

## **Unit II**

### **Wastewater collection**

Systems of sanitation, water carriage system, sewerage, systems of sewerage, sources of wastewater, Estimation of quantity of municipal wastewater, Estimation of quantity of storm water, Different types of sewers, design of flows through sanitary sewers, storm sewers and combined sewers. Hydraulic design of sewers, Sewer appurtenances, House drainage and plumbing systems, House disposal system: Septic tank and soak pit.

## **Unit III**

### **Introduction to Wastewater treatment and Design**

Concept, treatment methods-unit operations and unit processes, treatment systems-preliminary, primary, secondary, tertiary,

Basic design basic considerations: Strength and characteristics of wastewater, flow rates and their function, mass loading, design criteria.

General procedure for design calculation: Objective, types of treatment units sizing of units, calculation procedure,

## **Unit IV**

### **Wastewater Treatment**

**Preliminary and primary sewage treatment:** Principles, functions and Design of approach channel, grit chamber, primary sedimentation tank.

**Secondary treatment of sewage:** Principles, functions and design of secondary treatment units-SST, ASP, TF and oxidation ditch.

**Tertiary treatment:** Introduction to removal of nitrogen, phosphorus, refractory organic, heavy metals, suspended solids and pathogenic bacteria.

**Sludge treatment:** Quantity and characteristics, concept, sludge digestion-aerobic and anaerobic, methods-sludge conditioning, dewatering, composting.

## **Unit V**

**Solid waste management:** Terminology, characteristics, collection and transport, disposal methods

**Air pollution Control:** Types and sources of pollutants, units of measurement, causes and effect of air pollution, air quality monitoring and standards, control measures, brief introduction to control devices for particulate contaminants-gravitational setting chambers, centrifugal collector, electrostatic precipitators, automotive emission control, concept of clean and biofuels.

### **Text books/Reference books**

6. Water Supply Engineering, by S.K Garg
7. Water Treatment: Principles and Design by James M.Montgomery
8. Water Supply and Sewerage, by E.W.Steel
9. Environmental Engineering by H.S.Peavy et al.
10. Sewage Disposal and Air Pollution Engineering, by S.K Garg
11. Wastewater treatment: Concepts and design approach by G.L. Karia and R.A. Christian, Prentice Hall of India private ltd, New Delhi.
12. Environmental Engineering: A Design Approach by A.P. Sincero and G.A. Sincero, Prentice Hall of India private ltd, New Delhi
13. Wastewater Engineering and Treatment, Disposal, and Reuse by Metcalf and Eddy.

**Unit I****Diversion head works**

Location and components of diversion head work, Causes of failures of weirs on permeable foundations, Bligh's and Khosla's theories of design of weirs on permeable foundation, method of independent variable, Exit gradient.

**Canal head works:** Functions, location, layout, weir and barrage, design of vertical drop weir.

**River training work:** Need, Classification and stages of rivers, types of river training works, bank protection.

**Unit II**

**Regulation and control of canal system:** Purpose and their functions- Head and Cross regulator, Falls, Outlets, Canal escape, bed bars, Tail escape, outlets.

**Design of Regulation works:** Principles and design of distributary head regulator and cross regulator, Introduction to design principles of falls, design of sharda falls.

**Irrigation outlets:** Need, types and selection criteria.

**Cross drainage works:** Necessity and types, Aqueduct, Super passage, canal siphon, level crossing, Introduction to design principles of cross drainage works.

**Unit III**

**Flood routing:** Methods of reservoir routing

**Investigation and planning of dams and reservoirs:** Site selection-Engineering and hydrological surveys, estimation of storage capacity, Zones of storage, reservoir losses and sedimentation, life of reservoir.

**Dams:** Classification and selection criteria

**Unit IV**

**Gravity dams:** Forces acting on gravity dams, High and low gravity dams, Elementary and practical profiles, Stability analysis, causes of failure of a gravity dam, galleries, joints and control of cracking.

**Earth dams:** Classification, causes of failure, phreatic line and its determination, stability analysis.

**Unit V**

**Spillways:** Requirements, spillway capacity, components and type of spillways, Design principles of ogee spillway, Methods of dissipation below spillways, Effects of TWC and JHC, Stilling basins and appurtenances.

**Hydropower:** Assessment of potential, classification of plants, important terms, types of turbines and their suitability, layout of power house, components and functions of various components.

**Text books**

1. Irrigation Engineering and Hydraulic Structures – P.N Modi
2. Irrigation Engineering and Hydraulic Structures – S.K Garg
3. A text book of Irrigation Engineering and Hydraulic Structures – R.K Sharma
4. Irrigation and Water power engineering- B.C. Punmia, B.B. Pandey, Lal, Standard publishers.

## **ELECTIVE-I (CEE 704 to 709)**

**L T P 3 1 0**

**Two or more of the following courses shall be floated as Elective-I**

<b>Elective I</b>	<b>Name of Subject</b>
<b>CEE 704</b>	Pre stressed concrete design
<b>CEE 705</b>	Matrix analysis of structures
<b>CEE 706</b>	Environmental Management
<b>CEE 707</b>	Transportation system planning
<b>CEE 708</b>	Water quality modelling
<b>CEE 709</b>	Soil dynamics

**The syllabus for above courses under Elective-I is available in Annexure 2**

## **ENVIRONMENTAL ENGINEERING-II LABORATORY (CEP 751)**

**L T P 0 0 3**

**Bacteriological analysis for the estimation of:**

17. MPN
18. E-Coli.

**Experiments for the estimation of:**

19. Dissolved solids
20. Dissolved oxygen
21. B. O. D
22. C. O. D
23. Total Kjeldahl Nitrogen
24. total suspended solids
25. Rate kinetics constant of aerobic reaction
26. Field visit to wastewater treatment plant

### **References**

1. Standard methods for the examination of water and wastewater, APHA, New york.

## **PRACTICAL TRAINING / EDUCATIONAL TOUR (CEP 752)**

The students shall have to undergo a 4 week practical training (or industrial training) at the end of sixth semester. The evaluation of this would be made in 7<sup>th</sup> semester. This evaluation shall be based on Training report and viva.

## **PROJECT (CEP 753)**

The B.Tech project shall be spread over two semesters (7<sup>th</sup> and 8<sup>th</sup>). The details about group formation, allotment of topics shall be done as per the Institute's guidelines available on the website.

## ANNEXURE 1

### Syllabus for courses under Open Elective

#### REMOTE SENSING AND GIS APPLICATION (CEO 701)

L T P 3 1 0

##### Unit I

**Remote Sensing:** Introduction, sources of energy for remote sensing, active and passive sources, electromagnetic radiation, and their characteristics, thermal emission, Interaction of EMR with atmosphere, atmospheric windows, interaction of EMR with earth surface-spectral reflection curves.

##### Unit II

Multi concept of remote sensing, idealisms and real sequence of remote sensing, sensors and orbital characteristics, various sensing platforms for remote sensing, characteristics of various satellite, remote sensing data products and their uses.

##### Unit III

**Digital image processing:** Introduction, digital image representation, and Characterization, histograms and scatter plot, image enhancement, contrast stretching, Pattern recognition, and feature extraction, image classification: unsupervised and Supervised techniques

##### Unit IV

**Geographic Information system:** Introduction, concept and terminology, components of GIS, raster and Vector formats, scanners and digitizers, methods of digitization, data Preprocessing, form conversion, data reduction, and generalization

##### Unit V

Data merging, edge matching, registration and re-sampling, data manipulation and Analysis representation of real world problems, problem solving and spatial modeling, classification, aggregation, overlay, buffers and indivisibility and its applications in planning of utility lines, flood studies, ground water recharge, erosion modeling, Environment impact assessment

#### DISASTER MANAGEMNT (CEO 702)

L T P 3 1 0

##### Unit I

**Introduction:** Reasons, classifications-natural, based on violence based, based on deterioration of environment and health, based on failures of industrial society; disaster risk, elements of risk

Goals of disaster management, Assessment of disasters magnitude,

##### Unit II

**Natural disasters:** Earthquake, floods, cyclone, landslide, volcano, Tsunami, drought.

##### Unit III

**Man made disasters:** Reasons, types, assessment methodologies, mitigation; community based participation; government intervention.

##### Unit IV

**Phases / Elements of disaster management:** Mitigation, Preparedness, response, recovery Structural and non structural measures for flood disasters, earthquake, cyclone, landslides,

## **Unit V**

Community based disaster preparedness, new paradigm for risk reduction, Government of India's initiatives, International bodies, Case studies of recent major disasters in India and Abroad.

### **Books**

Disaster management by R.B. Singh (Ed.), Rawat publications, New Delhi

## **ENVIRONMENTAL POLLUTION AND MANAGEMENT (CEO 703)**

**L T P 3 1 0**

### **Unit 1**

Impact of man on environment, consequence of population growth, energy problem, pollution of air, water and land, Global environmental issues.

### **Unit 2**

Water pollution: Sources and classification of water pollutants, wastewater treatment, control strategies, Eutrophication of lakes, self purification capacity of streams.  
Thermal pollution: Sources, effects and control measures.

### **Unit 3**

Air pollution: Sources and effects, meteorological aspects, control methods and equipments,  
Land pollution: Types of land pollution, solid waste management-generation, storage, collection, transport, processing and disposal.  
Noise pollution: Sources, effects, preventive and control measures.

### **Unit 4**

**EIA:** Planning and management of environmental impact studies; Impact evaluation methodologies: baseline studies, screening, scoping, checklist, overlays, Environmental impact assessment of water resources and environmental projects, Case study of power plant.  
**EA:** Meaning, audit items, audit procedure, safety audit.

### **Unit 5**

**Contemporary issues:** Emission trading, discharge permits, international resource sharing issues, climate change, international environmental treaties and protocol.  
**Environmental legislation:** Introduction to various legislations related to water, air, biodiversity, ozone depletion etc at National and International level; Institutions for governance.

### **Books**

1. Principles of environmental studies (Ecology, economics, management and law) by C. Manoharachary and P. Jayarama Reddy, B.S. Publications.
2. Text of Environmental Engineering by P.V. Rao, Prentice Hall pvt ltd., Delhi



## ANNEXURE 2

### Syllabus for courses under Elective I

#### PRESTRESSED CONCRETE DESIGN (CEE 704)

L T P 3 1 0

##### Unit I

**Introduction:** basic concepts of prestressing, advantages and applications of prestressed concrete.

Materials for prestressed concrete: high strength concrete, permissible stresses in concrete, high strength steel, permissible stresses in steel

Prestressing systems: prestensioning and post tensioning systems, methods of prestressing

**Losses of Prestress :** Types of losses of prestress, loss due to elastic deformation of concrete, loss due to shrinkage of concrete, loss due to creep of concrete, loss due to relaxation of stress in steel, loss due to friction, loss due to anchorage slip, total loss in pretensioned and post tensioned members.

##### Unit II

**Analysis of prestress and bending stresses:** basic assumptions, resultant stresses at a section, concept of load balancing, cracking moment.

**Deflections:** factors influencing deflections, short term deflections of un-cracked members, deflections of cracked members, prediction of long term deflections.

**Shear and torsional resistance:** ultimate shear resistance of prestressed concrete members, prestressed concrete members in torsion, design of reinforcements for torsion, shear and bending.

##### Unit III

**Design of flexural members:** dimensioning of flexural members, design of pre-tensioned and post tensioned beams, design of partially prestressed members, design of one way and two way slabs, continuous beams.

##### Unit IV

Design for axial tension, compression and bending, bond and bearing.

##### Unit V

**Limit state design:** Review of limit state design concepts, design loads and strengths, crack widths in prestressed members, principles of dimensioning prestressed concrete members.

#### MATRIX ANALYSIS OF STRUCTURES (CEE 705)

L T P 3 1 0

##### Unit I

Introduction of flexibility and stiffness method. Hand computation of problems on beam.

##### Unit II

Hand computation of problems on trusses, frames and grids.

### **Unit III**

Generalised computer oriented treatment of stiffness method. Method of assembling the stiffness matrix, substructure technique for solving very large structures.

### **Unit IV**

Analysis for imposed deformation, temperature, support settlement etc.

### **Unit V**

Transfer matrix method of analysing framed structure

## **ENVIRONMENTAL MANAGEMENT (CEE 706)**

**L T P 3 1 0**

### **Unit I**

**Introduction:** Need for environmental awareness, protection of natural and manmade systems, effect on atmosphere, Impact of man on environment, ecology, quality of life.

**Emerging global environmental issues:** Population growth, climate change and global warming effects, acid rain, ozone layer depletion, urbanization, automobile pollution, case studies

### **Unit II**

**EIA:** Planning and management of environmental impact studies; Impact evaluation methodologies: baseline studies, screening, scoping, checklist, overlays, Environmental impact assessment of water resources and environmental projects, Case study of power plant.

**EA:** Meaning, audit items, audit procedure, safety audit.

### **Unit III**

Sustainable development, Environmental economics, environmental policy in planned, mixed and market economies,

**Contemporary issues:** Emission trading, discharge permits, international resource sharing issues, climate change, international environmental treaties and protocol.

### **Unit IV**

**Emerging technologies for environmental management;** Life cycle analysis-methodology, tools and problems, Concept of ISO and ISO 14000; Environmental cost benefit analysis, Decision methods for evaluation of alternatives, Environment risk assessment, Environmental valuation: Approaches to valuation.

### **Unit V**

**Environmental legislation:** Introduction to various legislations related to water, air, biodiversity, ozone depletion etc at National and International level; Issues involved in the enforcement of environmental legislation, Initiatives by NGO's, Initiatives by Governments, CPCB, Other institutions of governance.

### **Books**

3. Principles of environmental studies (Ecology, economics, management and law) by C. Manoharachary and P. Jayarama Reddy, B.S. Publications.
4. Text of Environmental Engineering by P.V. Rao, Prentice Hall pvt ltd., Delhi

## TRANSPORTATION SYSTEM PLANNING (CEE 707)

L T P 3 1 0

### Unit I

**Introduction:** Overview of transportation system, nature of traffic problems in cities, Present Scenario of road transport and transport assets. Role of transportation: Social, Political, Environmental, Goals and objectives of transportation planning.

### Unit II

**Type of transportation system:** Intermediate Public Transport (IPT), Public Transport, Rapid and mass transport system. Traffic Flow and traffic stream variables.

### Unit III

**Travel demand:** Estimation and forecasting, trip classification, trip generation: factors and methods, multiple regression analysis. Trip distribution methods, modal split, trip assignment.

### Unit IV

**Evaluation of transport planning proposals:** Land Use Transport Planning, Economic Evaluation methods, net-present-Value methods, Benefit Cost method, Internal rate of return method.

### Unit V

**Transportation Facilities:** Pedestrian facilities, Bicycle facilities, parking and terminal facilities. Transport system management. Long term and short term planning, use of IT in transportation.

## WATER QUALITY MODELING (CEE 708)

L T P 3 1 0

### Unit I

**Introduction:** Nature of problem, nature of input, mass loading rates-point and intermittent.

**Overview of modeling:** fundamentals, steps-conceptualization of problem, formulation of equation, coding, calibration, validation, sensitivity analysis, post audit.

### Unit II

**River hydrology and flow:** low flow frequency analysis, Morphometry (hydraulic geometry), travel time, depth and velocity estimates, effect of landuse on river flow.

**Discharge of residual matter into rivers:** Assumptions, mass balance at discharge points, water quality downstream of point source, water quality response to distributed sources, effect of spatial flow variation on water quality, multiple sources-principles of superposition.

**Time variable analysis:** non dispersive streams, effect of dispersion.

**Engineering controls; Derivation of steady state stream equations**

### Unit III

**Estuaries, bays and harbours:** physical aspects of estuaries, distribution of water quality in estuaries-water quality due to point source and distributed source, derivation of estuary equation,

**Lakes: Physical and hydrologic characteristics,**-evaporation, temperature stratification.

**Lake wide water quality response to input-** lakes as completely mixed system, response to an impulse input, lakes in series.

#### **Unit IV**

**Dissolved oxygen:** Introduction, principal components of DO analysis, DO criteria and standards.

**Sources and sinks of dissolved oxygen-**oxygen demanding wastes, atmospheric reaeration, photosynthesis and respiration, sediment oxygen demand, oxidation of CBOD.

**DO analysis in rivers:** single point source, multiple point source, distributed sources of DO and BOD.

#### **Unit V**

**Ground water:** Subsurface processes, unsaturated zone properties, soil moisture level, flow through unsaturated porous media.

**Ground water contamination:** sources and causes, hydrodynamic dispersion, multiphase contamination DNAPL, NAPL, VOC, site specific ground water quality problems in India, numerical models, contaminant transport modeling, application of emerging techniques in groundwater management.

**Introduction to water quality models:** QUAL2E, QUAL2K, WASP4, MODFLOW, GMS

#### **Books**

1. Surface water quality modeling and control by Thomman and Mueller, Harper Collins publishers
2. Chapra, Steven, Surface water quality modeling

### **SOIL DYNAMICS (CEE 709)**

**L T P 3 1 0**

#### **Unit I**

**Theory of vibrations:** Introduction, periodic motion, classical theory, free and forced vibration, energy dissipation mechanism,

#### **Unit II**

**Dynamics of elastic system:** Introduction, Vibrations of two degree and multi degree system, vibration of beams and plates on elastic foundation, dimensional analysis.

#### **Unit III**

**Dynamic soil properties:** Introduction, representation of stress condition by Mohr circle and stress path, dynamic stress-strain relationship, determination of dynamic soil properties, shake table testing, behaviour of soil on pulsating load.

#### **Unit IV**

**Dynamic earth pressure:** Introduction, classical theory for static earth pressure, dynamic earth pressure theory, displacement analysis, recommendation of Indian Standard code of practice

**Strong ground motion:** Introduction, Strong motion observation studies, strong motion measurement, characteristics of strong ground motion.

#### **Unit V**

**Liquefaction of soils:** Introduction, theory of liquefaction, liquefaction analysis, factor of safety against

Liquefaction, factors affecting liquefaction, criteria for assessing liquefaction, laboratory investigations of soil liquefaction, mechanism of dynamic compaction.

#### **Books**

1. Fundamental of Soil dynamics and earthquake engineering, PHI, By Bharat Bhushan Prasad, PHI New Delhi.

# Syllabus for B. Tech 8<sup>th</sup> semester (Civil Engineering)

## INDUSTRIAL ECONOMY & MANAGEMENT

This course shall be floated by Humanities department

## ESTIMATION & CONSTRUCTION MANAGEMENT (CEL 801)

L T P 3 1 0

### Unit I

Purpose of estimate, different types of estimates, approximate estimate, estimate of building, RCC works.

### Unit II

Analysis of rates, estimation of quantity of materials, specifications, method of measurement of works, public works accounts.

### Unit III

Contracts, types of contracts, contract document, conditions of contracts, contract procedure, termination of contracts, and specification important condition of contract, arbitration and tenders.

Valuation, scrap value, salvage value, market value, book value, depreciation, appreciation, mortgage.

### Unit IV

Significance of construction management, objectives and functions of construction management, types of construction, resources for construction industry, stages of construction, construction team, engineering drawings.

Critical path method (CPM), programme evaluation and review technique (PERT) – Network techniques breakdown structures, classification of activities, rules for developing networks, network development, network analysis, critical activities and critical path – Cost optimization.

### Unit V

Equipment requirements in construction industry – Heavy earth moving equipment (bull dozers, scrapers, loaders and excavators); shovels and cranes; compaction equipment; grading equipment; aggregate production equipment; asphalt mixing plant; asphalt laying equipment; hauling equipment; concrete mixing equipment; material handling devices; pneumatic equipment; bridge construction equipment; drilling and blasting equipment; tunneling equipment; pumping and dewatering equipment.

### Text Books

1. Estimating, Costing and Valuation in Civil Engineering by M. Chakraborty.
2. PERT and CPM Principles and Application by L. S. Shrinath.
3. Estimating and Costing by B. N. Dutta.
4. Construction, Planning, Equipment and Methods by R. L. Peurify
5. Network Analysis Techniques by S. K. Bhatnagar.
6. Construction Planning and Management by U. K. Srivastava.

## **Elective II (CEE 802 to 807)**

**Two or more of the following may be floated as the Elective II.**

<b>CEE 802</b>	Advanced design of steel structures
<b>CEE 803</b>	Advanced concrete technology
<b>CEE 804</b>	Remote sensing and GIS applications
<b>CEE 805</b>	Advanced foundation engineering
<b>CEE 806</b>	Water Resources Management
<b>CEE 807</b>	Design of waste water systems

**The syllabus for courses under Elective II is available in Annexure 3**

## **Elective III (CEE 808 to 813)**

**Two or more of the following courses may be floated as Elective III.**

<b>Course code</b>	<b>Name of Elective II</b>
<b>CEE 808</b>	Bridge engineering
<b>CEE 809</b>	Pre-cast and modular construction practices
<b>CEE 810</b>	Environmental Pollution Control
<b>CEE 811</b>	Traffic engineering
<b>CEE 812</b>	Open channel and river hydraulics
<b>CEE 813</b>	Planning and management of building

**The syllabus for courses under Elective III is available in Annexure 4**

## **Elective IV (CEE 814 to 819)**

**Two or more of the following may be floated as the Elective IV.**

<b>Course code</b>	<b>Name of Elective IV</b>
<b>CEE 814</b>	Plastic design of structures
<b>CEE 815</b>	Structural fire engineering
<b>CEE 816</b>	Advanced hydrology
<b>CEE 817</b>	Geo-environmental and geo-hazard engineering
<b>CEE 818</b>	Finite element method
<b>CEE 819</b>	Construction and Contract Management

**The syllabus for courses under Elective IV courses is available in Annexure 5**

## **Project (CEP 851)**

**L T P 0 0 9**

This would be in continuation with 7<sup>th</sup> semester.

## **Comprehensive (CEP 852)**

**L T P 0 0 0**

This shall test the student's ability of comprehensive understanding of all the courses (of all years) of B.Tech (Civil Engineering programme). The evaluation for the same would be based on quiz and viva.

**Elective II (CEE 802 to 807)**

**L T P 3 1 0**

**ADVANCED DESIGN OF STEEL STRUCTURE (CEE 802)**

**L T P 3 1 0**

**Unit I**

Design of tubular structures, Design of beam – columns, Design of eccentric connections

**Unit II**

Design of plate girders: introduction, weight and economical depth, design of plate girders – riveted / bolted and welded.

**Unit III**

Design of steel bridges: introduction of bridges, types of bridges, economical span, loads, permissible stresses, design of steel bridges – plate girder bridges and truss bridges

**Unit IV**

Design of steel towers and masts. Design of hoardings.

**Unit V**

Plastic analysis and design: stress – strain relation for mild steel, scope of plastic analysis, shape factor, plastic hinge, load factor, basic theorems of plastic analysis, collapse load for beams and portal frames, design considerations

**ADVANCED CONCRETE TECHNOLOGY (CEE 803)**

**L T P 3 1 0**

**Unit I**

Fundamental concrete technology: mixing, transportation, placing and curing of concrete, properties of fresh and hardened concrete, use of chemical and mineral admixtures.

**Unit II**

Durability of concrete: effect of chemically and physically aggressive environments on concrete and methods of their control.

**Unit III**

Special concrete: mass concrete, hot and weather concrete, self compacting concrete, fibre reinforced concrete, high strength concrete and high performance concrete.

**Unit IV**

Special construction methods: mechanical construction, roller compaction and shotcreting, preplaced aggregate and antiwashout concrete.

Special concrete: ready mixed concrete, grouting, sprayed concrete, under water concrete

**Unit V**

Repair, rehabilitation and enhancement of concrete: degradation of concrete in structures, assessment and repair techniques, rehabilitation and enhancement of existing structures.

## **REMOTE SENSING AND GIS APPLICATION IN CIVIL ENGINEERING (CEE 804)**

**L T P 3 1 0**

### **Unit I**

**Remote Sensing:** Introduction, sources of energy for remote sensing, active and passive sources, electromagnetic radiation, and their characteristics, thermal emission, Interaction of EMR with atmosphere, spectral reflection curves.

### **Unit II**

Multi concept of remote sensing, sensors and orbital characteristics, various sensing platforms for remote sensing, characteristics of various satellite, remote sensing data products and their uses.

Data capture for simulation of land surface, geomorphology, landuse classification, flood plain mapping, application to snow cover studies,

### **Unit III**

**Geographic Information system:** Introduction, concept and terminology, components of GIS, Raster and Vector formats, scanners and digitizers, methods of digitization, data Preprocessing, form conversion, data reduction, and generalization.

Data bases and DBMS, Spatial databases, co-ordinate systems and geo-referencing.

### **Unit IV**

Data merging, edge matching, registration and re-sampling, data manipulation and analysis representation of real world problems, problem solving and spatial modeling, classification, aggregation, overlay, buffers, Digital elevation models.

### **Unit V**

Applications in planning of utility lines, flood studies, ground water recharge, erosion modeling, case studies on use of GIS related to landuse, water, environment and transportation.

Integrated use of Remote sensing and GIS, Introduction to Arc view, Arc info, Map Info, MODFLOW softwares.

## **ADVANCED FOUNDATION ENGINEERING (CEE 805)**

**L T P 3 1 0**

### **Unit I**

Site investigation and sub soil exploration: Site reconnaissance, Depth of exploration, Lateral extent of exploration, Test pits, Auger borings, Wash borings, Soil sampling: Split, Spoon sampler; Penetration tests, Geophysical methods: Seismic refraction and Electrical resistivity methods, Sub soil investigation reports.

### **Unit II**

#### **Bearing capacity of shallow foundations**

Types of foundations, Depth of foundation, Terzaghi's bearing capacity equation, Bearing capacity of Square, Rectangular, Circular and Continuous footings, Meyerhof's theory, Skempton's method Brinch Hansen's method, Effect of ground water table on bearing capacity, Bearing capacity from building codes, Tolerable settlements, Settlement analysis.

### **Unit III**

#### **Pile foundations**

Classification of piles, Pile driving, Load carrying capacity of piles, Dynamic formulae, Static formulae, Pile load tests, In-situ penetration tests, Group action of piles, Negative skin friction.



#### **Unit IV**

##### **Caisson foundations**

Types of caissons, Bearing capacity, Construction of caissons, Advantages and disadvantages of caisson foundations, Shape and lateral size, Comparison of caisson types, Lateral stability of caisson foundations, Terzaghi's analysis.

#### **Unit V**

##### **Machine foundations**

Types of machine foundations: Basic definition-Degrees of freedom of a block foundation, General criteria for design of machine foundations, Free vibration, Forced vibration, Damping Vibration analysis of a machine foundation, Determination of natural frequency, Weight of foundation, Vibration isolation and control

##### **Text books**

1. Geotechnical engineering by C.Venkatramaiah
2. Soil Mechanics and Foundation Engineering - K.R Arora
3. Soil Mechanics and Foundations – B.C Punmia
4. Foundation Engineering – Teng
5. Analysis and Design of Foundations and Retaining Structures – Shamsheer Prakash, Gopal Ranjan , and Swamisaran

### **WATER RESOURCES MANAGEMENT (CEE 806)**

**L T P 3 1 0**

#### **Unit I**

**Water harvesting:** Types of storage structures, water yield from catchments, run off diversion, ponds and reservoirs, earth embankments, Augmentation of water resources  
Water resources of India and their management, Government's intervention

#### **Unit II**

**Watershed management:** Watershed programmes, mass soil movement, forest plantation, management of saline and alkaline soils, planning of watershed unit  
Land management, Controlling soil erosion, people participation, socio-economic analysis, role of NGO

#### **Unit III**

Systems concept/Optimization and its application in irrigation flood control, hydropower, water supply and water quality.

Introduction of artificial intelligence tools such as neural networks, fuzzy sets, genetic algorithms, simulated annealing, kriging to water resources problems, hybrid models for water resources management.

#### **Unit IV**

##### **Water quality and pollution control**

Surface water pollution: sources, control, emerging techniques for control, wasteload allocation, case studies in India

Groundwater pollution, salt water intrusion, groundwater quality management, contaminated aquifers in India.

Government of India's intervention for water pollution control.

#### **Unit V**

##### **Economics of water resources planning:**

General, mathematics, discounting techniques, conditions of project optimality, the institutional framework, benefit-cost analysis, Project formulation: A social benefit-cost

approach, profitability analysis, flood control, drainage, hydroelectric power, water quality control

### **Books**

1. Water resources management by VVN Murthy, Kalyanipublsihers
2. Irrigation and WM by DK Majumdar
3. Water Resources Systems: Planning and Economics by R.S. Varshney, Nem chand and brothers, Roorkee.
4. Water resources systems, Douglas Haith, TMH, New York.
5. Environmental systems optimization Wills and Yeh

## **DESIGN OF WASTE WATER SYSTEMS (CEE 807)**

**L T P 3 1 0**

### **Unit I**

**Introduction:** Physical, chemical and bacteriological characteristics of wastewater, water quality standards, Water borne diseases and their control, Composition of wastewater, Factors affecting the BOD rate of reaction, population equivalent

### **Unit II**

#### **Introduction to Wastewater treatment and Design**

**Concept, treatment methods**-unit operations and unit processes, treatment systems-preliminary, primary, secondary, tertiary,

**Basic design basic considerations:** Strength and characteristics of wastewater, flow rates and their function, mass loading, design criteria.

**General procedure for design calculation:** Objective, types of treatment units sizing of units, calculation procedure,

### **Unit III**

#### **Wastewater Treatment**

**Preliminary and primary sewage treatment: Concept,** functions and Design of approach channel, equalization basin, screen chamber, grit chamber, primary sedimentation tank.

**Secondary treatment of sewage:** Principles, functions and design of secondary treatment units-SST, ASP, TF, RBC, Extended aeration-oxidation ditch, aerated lagoon, waste stabilization pond.

### **Unit IV**

**Tertiary treatment:** Introduction to removal of nitrogen, phosphorus, refractory organic, heavy metals, suspended solids and pathogenic bacteria.

**Sludge treatment:** Quantity and characteristics, concept, sludge digestion-aerobic and anaerobic, methods-sludge conditioning, dewatering, composting.

**Design of sludge treatment units:** Introduction, Treatment concept, Design essentials, Sludge digestion,

### **Unit V**

Disposal of wastewater on land and water bodies

Introduction to Duckweed pond, vermiculture and root zone technologies and other emerging technologies such as UASB, Final polishing unit, River bank filtration, Zero valent iron, Phytoremediation, bioremediation, Sludge drying beds.

Sewage treatment plant layout, concept of sustainable wastewater treatment.

**Text books**

1. Water Supply Engineering, by S.K Garg
2. Water Treatment: Principles and Design by James M.Montgomery
3. Water Supply and Sewerage, by E.W.Steel
4. Environmental Engineering by H.S. Peavy, Rowe and Tchobanoglous.
5. Sewage Disposal and Air Pollution Engineering, by S.K Garg
6. Wastewater treatment: Concepts and design approach by G.L. Karia and R.A. Christian, Prentice Hall of India private ltd, New Delhi.
7. Environmental Engineering: A Design Approach by A.P. Sincero and G.A. Sincero, Prentice Hall of India private ltd, New Delhi
8. Wastewater Engineering and Treatment, Disposal, and Reuse by Metcalf and Eddy

**Elective III (CEE 808 to 813)****L T P 3 1 0****BRIDGE ENGINEERING (CEE 808)****L T P 3 1 0****Unit I**

Introduction: definition, components of a bridge, classifications, importance of bridges.  
Investigation of bridges: need for investigations, selection of bridge site, preliminary data to be collected, design discharge and its determination, linear waterway, economical span, vertical clearance above H.F.L., scour depth, choice of bridge type.

**Unit II**

Standard specifications for road and railway bridges.  
R.C.C. bridges: slab culvert, skew slab culvert, T – beam bridge, Courbon’s theory for load distribution

**Unit III**

Balanced cantilever bridges, prestressed concrete bridges

**Unit IV**

Steel bridges: plate girder and truss bridges  
Introduction to suspension bridges, cantilever bridges, cable – stayed bridges.

**Unit V**

Sub-structure: types of piers and abutments, design forces, design of piers and abutments.  
Bearing and joints, construction, inspection and maintenance of bridges.

**PRECAST AND MODULAR CONSTRUCTION PRACTICES (CEE 809)****L T P 3 1 0****Unit I**

Overview of reinforced and prestressed concrete construction Design and detailing of precast/prefabricated building components.

**Unit II**

Structural design and detailing of joints in prefabricated structures.

### **Unit III**

Production of ready mixed concrete, quality assurance. Use of equipments in precast prefabricated structure. Productivity analysis, economics of form work, design of Formwork and their reusability.

### **Unit IV**

Modular construction Practices, Fibonacci series, its handling and other reliable proportioning concepts.

### **Unit V**

Modular coordination, standardisation, system building. Lamination and advantages of modular construction.

## **ENVIRONMENTAL POLLUTION CONTROL (CEE 810)**

**L T P 3 1 0**

### **Unit I**

Impact of man on environment: The biosphere, hydrological cycle, nutrient cycles, consequence of population growth, energy problem, pollution of air, water and land. Global environmental issues.

### **Unit II**

Air pollution: Sources and effects, meteorological aspects, air pollution sampling and measurement, control methods and equipments, control of specific air pollutants, air quality standards, statistical analysis of air quality data

### **Unit III**

Water pollution: Sources and classification of water pollutants, water quality standards, wastewater sampling and analysis, control strategies, Eutrophication of lakes, self purification capacity of streams, recent treatment technologies-phyto-remediation, bio-remediation, river bank filtration, zero valent iron etc, waste load allocation..

### **Unit IV**

Land pollution: Types of land pollution, solid waste management-generation, storage, collection, transport, processing and disposal, municipal landfills-design criteria, leachate transfer through landfills

### **Unit V**

Noise pollution: Sources, effects, preventive and control measures, standards/limits.

Thermal pollution: Sources, effects and control measures.

Environmental legislation at National and international level.

### **Books**

5. Principles of environmental studies (Ecology, economics, management and law) by C. Manoharachary and P. Jayarama Reddy, B.S. Publications.
6. Text of Environmental Engineering by P.V. Rao, Prentice Hall pvt ltd., Delhi

## **TRAFFIC ENGINEERING (CEE 811)**

**L T P 3 1 0**

### **Unit I**

**Introduction:** Role of traffic Engineer, Vehicle, highway and traffic factors. Traffic characteristics, Vehicular Road users, Introduction to Traffic Noise and Air Pollution and remedial measures.

### **Unit II**

**Traffic flow:** Interrupted and Un-interrupted Traffic Flow, Highway capacity: Urban, rural and intersection, Capacity of transit system, Traffic flow theory: Car Following and Queuing Theory.

### **Unit III**

**Traffic Studies:** Traffic volume studies, speeds studies, Speed and Delay Studies, Origin and Destination studies, Accident studies, capacity studies, parking studies.

### **Unit IV**

**Traffic Control:** regulations and other operational controls, Traffic Signal and marking, street lighting, Traffic Safety: Barricades, delineators.

### **Unit V**

**Design of Intersections:** Canalizing islands, Design of Rotaries, Intersection and terminal design, Parking facilities.

## **OPEN CHANNEL AND RIVER HYDRAULICS (CEE 812)**

**L T P 3 1 0**

### **Unit I**

Basic fluid flow concepts, Classification of open channel flow, Velocity and pressure distribution. Energy and Momentum Equation applied to open channel flow, Energy and momentum coefficients, Channel Geometry and geometrical elements. Uniform and critical flow computations: Energy depth relationships, Resistance formulae, Concept of First and Second hydraulic exponent, Determination of critical and normal depth, Hydraulically most efficient channel sections, Channel transitions.

### **Unit II**

Gradually varied flow: Differential equation governing GVF, Classification analysis and control sections of flow profiles, Computation of GVF profiles by different methods. Rapidly varied flow: Types, Analysis and characteristics of Hydraulic jump in rectangular and non rectangular channels, Location of jump, Introduction to jump in non-rectangular channels and on sloping floor, Use of jump as Energy dissipater.

### **Unit III**

Flow measurement : Weirs, spillways, critical depth flumes.  
River gauging: Dominant discharge, Methods of gauging, current meter rating curve, automatic water level recorder, stage discharge relationship for a river.

### **Unit IV**

Flow in channels of non-linear alignment: Nature of flow, spiral flow, design considerations for sub- critical and super-critical flow in curvilinear channels.  
Fluvial Hydraulics: Sediment transport, Mode of sediment motion and bed formation, Threshold movement, Total sediment load, Suspended and bed load Theories, Reservoir Sedimentation.

### **Unit V**

River Management and Training: Types of rivers, river morphology, meandering and braiding of river.

River training works: Classification, Types- Guide banks, Groynes, Deflectors, Embankments, Cut-offs, Bank Protection Stable channel natural river training works, river morphology,.

### **Reference Books:**

- i) Open Channel Hydraulics – Ven Te Chow, McGraw hill book co. Newyark
- ii) Open channel Flow – F. M. Henderson
- iii) Mechanics of Sediment transport and alluvial river problems : R. J. Garde. New Age Publications, New Delhi
- iv) River Mechanics: Vol. I & II, Hsieh Wen Shen
- v) River Gauging – Chitale and Hiranandani
- vi) Flow through Open Channel – Ranga Raju
- vii) Flow in Open Channel – K. Subramanya (Tata McGraw Hill)

## **PLANNING AND MANAGEMENT OF BUILDING (CEE 813)**

**L T P 3 1 0**

### **Unit I**

Components of urban forms and their planning, Concept of neighbourhood unit, Street system and layout in neighbourhood.

### **Unit II**

Functional planning of building: Principles of planning, Factors: Aspect, prospect, privacy, grouping, roominess, water supply and sanitation, flexibility, circulation

### **Unit III**

Planning and design of public buildings such as residential, offices, schools, hospitals, theatres, and industrial buildings, preliminaries of vastu.

### **Unit IV**

Standard fire, fire list, fire resistance, classification of buildings, means of escape, alarms.

Fire hydrants, design criteria of fire hydrant system,

### **Unit V**

Engineering services in a building as a system: lifts, escalators, cold and hot water systems, water supply system, wastewater collection systems, electrical system

### **TEXT BOOKS**

1. Building Planning and Drawing by Dr.N.Kumara Swamy and A. Kameswara Rao, charotar publishers, Anand.
2. Building Drawing by Shah, Kale and Patki
3. Instructional Sketches for Civil Engineering Drawing – A series & B series.
4. Building Planning and Design and Scheduling by Gurucharan Singh & Jagadish Singh.

**Elective IV (CEE 814 to 819)**

**L T P 3 1 0**

**PLASTIC DESIGN OF STRUCTURES (CEE 814)**

**L T P 3 1 0**

**Unit I**

Introduction: basic hypothesis, stress – strain relation for mild steel, scope of plastic analysis, concept of shape factor, basic theorem of plastic collapse.

**Unit II**

Methods for plastic design: introduction, trial and error method, method of combining mechanisms, plastic moment distribution method.

**Unit III**

Factors affecting fully plastic moments: Introduction, variations of lower yield stress, effect of normal force, effect of shear force.

**Unit IV**

Plastic design: design of simple, fixed and continuous beams, analysis and design of portal and gable frames, design of two bay and two storey frames.

**Unit V**

Minimum weight design: assumptions, geometrical analogue and minimum weight theorem, applications, methods for solution.

**STRUCTURAL FIRE ENGINEERING (CEE 815)**

**L T P 3 1 0**

**Unit I**

Introduction to structural fire engineering: fire loads, ventilation effects, compartment geometry

**Unit II**

Fire safety and fire resistant tests

**Unit III**

Elements of construction for fire safety, protection for openings, selection of materials, site planning

**Unit IV**

Fire protection of tall buildings

**Unit – 5**

Architectural fire safety measures.

Repair and rehabilitation of fire damaged structures

## **ADVANCE HYDROLOGY(CEE 816)**

**L T P 3 1 0**

### **Unit I**

Introduction: history, meteorology, hydrologic cycle, importance and application of hydrology.

Statistics and probability: parameters, probability distribution, frequency analysis, regression and correlation.

### **Unit II**

Precipitation: forms, types of precipitation, rainfall in India, network design, data presentation, depth – area – duration curve.

Losses from precipitation: evaporation and its estimation, evapotranspiration, storages, infiltration and its estimation.

### **Unit III**

Groundwater: zoning of subsurfaces, aquifer properties, flow equations, well hydraulics, methods of groundwater investigations.

Stream flow: runoff, stage measurement, stage discharge relationship, runoff computations.

### **Unit IV**

Hydrograph: components, unit hydrograph, S- hydrograph, Instantaneous unit hydrograph, synthetic unit hydrograph, dimensionless unit hydrograph.

Design flood: flood estimation, flood frequency analysis, partial duration series.

### **Unit V**

Flood routing: hydrologic and hydraulic channel routing, reservoir routing, flood forecasting.

Reservoir and sedimentation: reservoir capacity, reservoir sedimentation and control, reservoir economics.

### **Reference Books:**

1. V.T. Chow, D.R. Maidment, L.W. Mays, “Applied Hydrology”, McGraw Hill, 1998.
2. V.P. Singh, “Elementary Hydrology”, Prentice Hall, 1993.
3. H.M. Raghunath, “Hydrology – Principles, Analysis and Design”, Wiley Eastern Ltd., 1986.
4. A.M. Michael, “Irrigation – Theory and Practice”, Vikas Publishing House, 1987.
5. D.K. Todd, “Groundwater Hydrology”, John Wiley & Sons, 1993.
6. K. Linsley, “Water Resources Engineering”, McGraw Hill, 1995.
7. K.C. Patra, “Hydrology and water resources engineering”, Narosa publishers

## **GEO-ENVIRONMENTAL AND GEO HAZARD ENGINEERING (CEE 817)**

**L T P 3 1 0**

### **Unit I**

Geo-environmental engineering, waste generation, subsurface contamination, waste containment, sub surface contamination control and remediation.

### **Unit II**

Landfills: types of landfills, design of landfills-siting criteria, waste containment principles, types of barrier material, operation of landfills.

Engineering properties and geotechnical reuse of waste material such as coal ash, mining waste, and demolition waste, Ash ponds. Reclamation of old waste dumps



### **Unit III**

Geotechnical earthquake engineering: Engineering seismology, strong ground motion, seismic hazard analysis, local site effects and design of ground motions, liquefaction hazard evaluation and remedial measures

### **Unit IV**

**Landslides:** Causes and phenomenon associated with liquefaction, effect of rainfall on slope stability, earthquake triggered landslides, landslide prevention, control and remedial measures-soil nailing, gabions, drainage

### **Unit V**

**Other hazards:** Ground subsidence, ground heave, erosion, unstable slopes

**Ground improvement:** Shallow stabilization with additives, Deep stabilization and column, vibro-floatation, dynamic compaction.

## **FINITE ELEMENT METHOD (CEE 818)**

**L T P 3 1 0**

### **Unit I**

Derivation of backward, forward and central difference, relations and estimate of error in use of these relations.

### **Unit II**

Extension of central difference relations in solution of partial differential equations, application of laplace equation and torsion problems.

### **Unit III**

Introduction to finite element method and its uses in analysis of Civil Engineering structures. Derivation of the element characteristics and condensation technique.

### **Unit IV**

Application of the method in treatment of plane stress and plane strain problems using triangular, 4 – nodal & 8 – nodal quadrilateral elements. Organisation of the finite element program and data presentation.

### **Unit V**

Efficient solution technique for simultaneous linear algebraic equations obtained in finite element formulation.

### **Books**

1. Introduction to Finite elements in engineering by T.R Chnadrupatla and Ashok D. Belegundu, PHI Delhi
2. Finite element in Engineering Design by S. Rajasekaran, S.Chand an company, Delhi
3. Finite Elements Analysis, S.S. Bhavikati, New Age International Publishers, Delhi

## **CONSTRUCTION AND CONTRACT MANAGEMENT (CEE 819)**

**L T P 3 1 0**

### **Unit I**

Tendering and contractual procedures, Claims, compensation and disputes, dispute resolution techniques, Arbitration and Conciliation Act 1996, Introduction to value Engineering.

**Unit II**

Material management: purchases management and inventory control, ABC analysis  
Human resource management, Statistical quality control at site, Management Information System

**Unit III**

**Quantitative methods in construction:** Linear programming, transportation and assignment problems, Queuing theory, decision theory, game theory.

**Unit IV**

**Quality in construction:** Quality assurance and quality control at site, quantitative techniques in quality control, Introduction to quality, Quality standards/codes in design and construction, Concept and philosophy of total quality management

**Unit V****Safety in construction:**

Concept of safety, factors affecting safety, structural safety, safety consideration during construction, demolition and during use of equipment, safety manuals, safety legislation, standards/codes.