

**ANNA UNIVERSITY TIRUCHIRAPPALLI****Tiruchirappalli – 620 024****Regulations 2008****Curriculum****B.E. CIVIL ENGINEERING****SEMESTER III**

S. No.	Subject Code	Subject	L	T	P	C
<b>Theory</b>						
1	MA1201	Transforms and Partial Differential Equations	3	1	0	4
2	HS1201	Environmental Science and Engineering	3	0	0	3
3	CE1201	Applied Geology	3	0	0	3
4	CE1202	Mechanics of Solids	3	1	0	4
5	CE1203	Mechanics of Fluids	3	1	0	4
6	CE1204	Construction Techniques, Equipments and Practice	4	0	0	4
7	CE1205	Surveying I	3	0	0	3
<b>Practical</b>						
8	CE1206	Surveying Practical I	0	0	4	2
9	CE1207	Computer Aided Building Drawing	0	0	4	2
<b>Total</b>						<b>29</b>

**SEMESTER IV**

S. No.	Subject Code	Subject	L	T	P	C
<b>Theory</b>						
1	MA1251	Numerical Methods	3	1	0	4
2	CE1251	Soil Mechanics	3	0	0	3
3	CE1252	Strength of Materials	3	1	0	4
4	CE1253	Applied Hydraulic Engineering	3	1	0	4
5	CE1254	Surveying II	3	0	0	3
6	CE1255	Highway Engineering	3	0	0	3
<b>Practical</b>						
7	CE1256	Strength of Material Laboratory	0	0	3	2
8	CE1257	Hydraulic Engineering Laboratory	0	0	3	2
9	CE1258	Surveying Practical II	0	0	4	2
<b>Total</b>						<b>27</b>

## SEMESTER V

S. No.	Subject Code	Subject	L	T	P	C
<b>Theory</b>						
1	<b>CE1301</b>	Building Technology	3	0	0	3
2	<b>CE1302</b>	Design of Reinforced Concrete Elements	4	0	0	4
3	<b>CE1303</b>	Structural Analysis I	3	1	0	4
4	<b>CE1304</b>	Fundamentals of Remote Sensing and GIS	3	0	0	3
5	<b>CE1305</b>	Environmental Engineering	3	0	0	3
6	<b>CE1306</b>	Foundation Engineering	3	0	0	3
<b>Practical</b>						
7	<b>CE1307</b>	Environmental Engineering Laboratory	0	0	3	2
8	<b>CE1308</b>	Soil Mechanics Laboratory	0	0	3	2
9	<b>CE1309</b>	Field Survey - Survey Camp	0	0	3	2
<b>Total</b>						<b>26</b>

## SEMESTER VI

S. No.	Subject Code	Subject	L	T	P	C
<b>Theory</b>						
1	<b>CE1351</b>	Design of Reinforced Concrete and Masonry Structures	4	0	0	4
2	<b>CE1352</b>	Structural Analysis II	3	1	0	4
3	<b>CE1353</b>	Irrigation Engineering	3	0	0	3
4	<b>CE1354</b>	Design of Steel Structures	4	0	0	4
5	<b>CE1355</b>	Concrete Technology	3	0	0	3
6	<b>CE1356</b>	Railway Engineering	3	0	0	3
<b>Practical</b>						
7	<b>CE1357</b>	Irrigation Engineering and Environmental Engineering Design and Drawing	0	0	3	3
8	<b>CE1358</b>	Transportation Engineering Laboratory	0	0	3	2
9	<b>HS1301</b>	Communication and Soft Skills Laboratory	0	0	3	2
<b>Total</b>						<b>28</b>

## SEMESTER VII

S. No.	Subject Code	Subject	L	T	P	C
<b>Theory</b>						
1	<b>MG1301</b>	Total Quality Management	3	0	0	3
2	<b>CE1401</b>	Estimation and Quantity Surveying	3	1	0	4
3	<b>CE1402</b>	Pre Stressed Concrete Structures	3	0	0	3
4	<b>CE1403</b>	Hydrology	4	0	0	4
5	<b>E1****</b>	Elective I	3	0	0	3
6	<b>E2****</b>	Elective II	3	0	0	3
<b>Practical</b>						
7	<b>CE1405</b>	Computer Aided Design and Drawing	1	0	3	3
8	<b>CE1406</b>	Concrete Laboratory	0	0	3	2
<b>Total</b>						<b>25</b>

## SEMESTER VIII

S. No.	Subject Code	Subject	L	T	P	C
<b>Theory</b>						
1	<b>GE1451</b>	Engineering Economics and Cost Analysis	3	0	0	3
2	<b>CE1451</b>	Construction Project Management	3	0	0	3
3	<b>E3****</b>	Elective III	3	0	0	3
4	<b>E4****</b>	Elective IV	3	0	0	3
<b>Practical</b>						
5	<b>CE1455</b>	Project Work	0	0	12	6
<b>Total</b>						<b>18</b>

## LIST OF ELECTIVES

### ELECTIVES FOR SEMESTER VII

S. No.	Subject Code	Subject	L	T	P	C
<b>Theory</b>						
1	<b>CE1001</b>	Airports and Harbours	3	0	0	3
2	<b>CE1002</b>	Electronic Surveying	3	0	0	3
3	<b>CE1003</b>	Cartography	3	0	0	3
4	<b>CE1004</b>	Bridge Structures	3	0	0	3
5	<b>CE1005</b>	Storage Structures	3	0	0	3
6	<b>CE1006</b>	Tall Buildings	3	0	0	3
7	<b>CE1007</b>	Prefabricated Structures	3	0	0	3
8	<b>CE1008</b>	Wind Engineering	3	0	0	3
9	<b>CE1009</b>	Smart Structures and Smart Materials	3	0	0	3
10	<b>CE1010</b>	Advanced Structural analysis	3	0	0	3

### ELECTIVES FOR SEMESTER VIII

S. No.	Subject Code	Subject	L	T	P	C
<b>Theory</b>						
1	<b>CE1011</b>	Housing Planning and Management	3	0	0	3
2	<b>CE1012</b>	Ground Water Engineering	3	0	0	3
3	<b>CE1013</b>	Water Resources Engineering	3	0	0	3
4	<b>CE1014</b>	Introduction to Soil Dynamics and Machine Foundation	3	0	0	3
5	<b>CE1015</b>	Air Pollution Management	3	0	0	3
6	<b>CE1016</b>	Computer Aided Design of Structures	3	0	0	3
7	<b>CE1017</b>	Industrial Structures	3	0	0	3
8	<b>CE1018</b>	Finite Elements Technique	3	0	0	3
9	<b>CE1019</b>	Repair and Rehabilitation of Structures	3	0	0	3
10	<b>CE1020</b>	Experimental Techniques and Instrumentation	3	0	0	3

# **ANNA UNIVERSITY TIRUCHIRAPPALLI**

**Tiruchirappalli – 620 024**

**Regulations 2008**

**Syllabus**

**B.E. CIVIL ENGINEERING**

**SEMESTER III**

## **MA1201 – TRANSFORMS AND PARTIAL DIFFERENTIAL EQUATIONS**

(Common to all branches)

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>3</b>	<b>1</b>	<b>0</b>	<b>4</b>

### **UNIT I      FOURIER SERIES      9**

Dirichlet's conditions – General Fourier series – Odd and even functions – Half range sine series – Half range cosine series – Complex form of Fourier Series – Parseval's identity – Harmonic Analysis.

### **UNIT II      FOURIER TRANSFORMS      9**

Fourier integral theorem (without proof) – Fourier transform pair – Sine and Cosine transforms – Properties – Transforms of simple functions – Convolution theorem – Parseval's identity.

### **UNIT III      PARTIAL DIFFERENTIAL EQUATIONS      9**

Formation of partial differential equations – Lagrange's linear equation – Solutions of standard types of first order partial differential equations - Linear partial differential equations of second and higher order with constant coefficients.

### **UNIT IV      APPLICATIONS OF PARTIAL DIFFERENTIAL EQUATIONS      9**

Solutions of one dimensional wave equation – One dimensional equation of heat conduction – Steady state solution of two-dimensional equation of heat conduction (Insulated edges excluded) – Fourier series solutions in cartesian coordinates.

### **UNIT V      Z -TRANSFORMS AND DIFFERENCE EQUATIONS      9**

Z-transforms - Elementary properties – Inverse Z-transform – Convolution theorem - Formation of difference equations – Solution of difference equations using Z-transform.

**L: 45   T: 15   Total: 60**

### **TEXTBOOKS**

1. Grewal, B.S., “Higher Engineering Mathematics”, 39th Edition, Khanna Publishers, 2007.
2. Bali, N.P. and Manish Goyal, “A Textbook of Engineering Mathematics”, 7th Edition, Laxmi Publications (P) Ltd, 2008.

### **REFERENCES**

1. Ramana, B.V., “Higher Engineering Mathematics”, 2nd Edition, Tata McGraw Hill, 2008.
2. Glyn James, “Advanced Modern Engineering Mathematics”, 3rd Edition, Pearson Education, 2007.
3. Erwin Kreyszig, “Advanced Engineering Mathematics” 8th Edition, Wiley India, 2007.

## HS1201 – ENVIRONMENTAL SCIENCE AND ENGINEERING

**L T P C**  
**3 0 0 3**

### **UNIT I INTRODUCTION TO ENVIRONMENTAL STUDIES AND NATURAL RESOURCES 9**

Definition – Scope and importance – Need for public awareness – Forest resources – Use and over – Exploitation – Deforestation – Case studies – Timber extraction – Mining – Dams and their ground water – Floods – Drought – Conflicts over water – Dams – Benefits and problems – Mineral resources – Use effects on forests and tribal people – Water resources – Use and over-utilization of surface and exploitation – Environmental effects of extracting and using mineral resources – Case studies – Food resources – World food problems – Changes caused by agriculture and overgrazing – Effects of modern agriculture – Fertilizer – Pesticide problems – Water logging, salinity – Case studies – Energy resources – Growing energy needs – Renewable and non renewable energy sources – Use of alternate energy sources – Case studies – Land resources – Land as a resource – Land degradation – Man induced landslides – Soil erosion and desertification – Role of an individual in conservation of natural resources – Equitable use of resources for sustainable lifestyles.

### **UNIT II ECOSYSTEMS AND BIODIVERSITY 9**

Concepts of an ecosystem – Structure and function of an ecosystem – Producers, consumers and decomposers – Energy flow in the ecosystem – Ecological succession – Food chains, food webs and ecological pyramids – Introduction, types, characteristic features, structure and function of the (A) forest ecosystem (B) grassland ecosystem (C) desert ecosystem (D) aquatic ecosystems (Ponds, Streams, Lakes, Rivers, Oceans, Estuaries) – Introduction to biodiversity – Definition genetic, species and ecosystem diversity – Biogeographical classification of India – Value of biodiversity – Consumptive use, productive use, social, ethical, aesthetic and option values – Biodiversity at global, national and local levels – India as a mega-diversity nation – Hot-Spots of biodiversity – Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts – Endangered and endemic species of India – Conservation of biodiversity: In-situ and ex-situ conservation of biodiversity.

### **UNIT III ENVIRONMENTAL POLLUTION 9**

Definition – Causes, Effects and Control Measures of:- (A) Air Pollution (B) Water Pollution (C) Soil Pollution (D) Marine Pollution (E) Noise Pollution (F) Thermal Pollution (G) Nuclear Hazards – Solid Waste Management:- Causes, Effects and Control Measures of Urban and Industrial Wastes – Role of an Individual in Prevention of Pollution – Pollution Case Studies – disaster Management:- Floods, Earthquake, Cyclone and Landslides

#### **UNIT IV SOCIAL ISSUES AND THE ENVIRONMENT**

**9**

From unsustainable to sustainable development – Urban problems related to energy – Water conservation, rain water harvesting, watershed management – Resettlement and rehabilitation of people, its problems and concerns, case studies – Environmental ethics:- issues and possible solutions – Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust, case studies – Wasteland reclamation – Consumerism and waste products – Environment production act – Air (Prevention and control of pollution) act – Water (Prevention and control of pollution) act – Wildlife protection act – Forest conservation act – Issues involved in enforcement of environmental legislation – Public awareness.

#### **UNIT V HUMAN POPULATION AND THE ENVIRONMENT**

**9**

Population growth, variation among nations – Population explosion – Family welfare programme – Environment and human health – Human rights – Value education – HIV /AIDS – Women and child welfare – Role of information technology in environment and human health – Case studies.

Field study of local area to document environmental assets – River/forest/grassland/hill/mountain.

Field study of common plants, insects and birds – Field study of simple ecosystems – Pond, river, hill slopes, etc.

Field study of local polluted site – Urban/rural/industrial/agricultural.

**Total: 45**

#### **TEXT BOOKS**

1. Masters, G.M., “Introduction to Environmental Engineering and Science”, 2nd Edition, Pearson Education, 2007.
2. Townsend, C., Harper, J. and Begon, M., “Essentials of Ecology”, Blackwell Science, 2003.

#### **REFERENCES**

1. Cunningham, Cooper, W.P. and Gorhani, T.H., “Environmental Encyclopedia”, Jaico Publishing House, 2001.
2. Erach, B., “The Biodiversity of India”, Mapin Publishing Pvt. Ltd., 2006
3. Wages, K.D., “Environmental Management”, W.B. Saunders Co., 1998

## CE1201 – APPLIED GEOLOGY

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

### **UNIT I GENERAL GEOLOGY 9**

Geology in civil Engineering – Branches of geology – Earth Structures and composition – Elementary knowledge on continental drift and plate tectonics – Earth processes – Weathering – Work of rivers, wind and sea and their engineering importance – Earthquake belts in India – Groundwater – Mode of occurrence – Prospecting – importance in civil engineering

### **UNIT II MINERALOGY 9**

Elementary knowledge on symmetry elements of important crystallographic systems – Physical properties of minerals – Study of the following rock forming minerals – Quartz family – Feldspar family – Augite, hornblende, biotite, muscovite, calcite, garnet – properties – behaviour and engineering significance of clay minerals – Fundamentals of process of formation of ore minerals – Coal and petroleum – Their origin and occurrence in India.

### **UNIT III PETROLOGY 9**

Classification of rocks – Distinction between igneous, sedimentary and metamorphic rocks – Description occurrence, engineering properties and distribution of following rocks – Igneous rocks – Granite, syenite, diorite, gabbro, pegmatite, dolerite and basalt sedimentary rocks sandstone – Limestone, shale conglom, conglomerate and breccia. Metamorphic rocks – Quartzite, marble, slate, phyllite, gneiss and schist.

### **UNIT IV STRUCTURAL GEOLOGY AND GEOPHYSICAL METHOD 9**

Attitude of beds – Outcrops – Introduction to geological maps Study of structures – Folds, faults and joints – Their bearing on engineering construction – Seismic and electrical methods for civil engineering investigations.

### **UNIT V GEOLOGICAL INVESTIGATIONS IN CIVIL ENGINEERING 9**

Remote sensing techniques – Study of air photos and satellite images – Interpretation for civil Engineering projects – Geological conditions necessary for construction of dams – Tunnels – Buildings – Road cuttings – Land slides – Causes and preventions – Sea erosion and coastal protection.

**Total: 45**

#### **TEXT BOOKS**

1. Parbin Singh, “Engineering and General Geology”, Katson Publication House, 1987.
2. Krynine and Judd, “Engineering Geology and Geotechniques”, McGraw-Hill Book Company, 1990

#### **REFERENCES**

1. Legeet, “Geology and Engineering”, McGraw-Hill Book Company 1998
2. Blyth, “Geology for Engineers”, ELBS, 1995.

## CE1202 – MECHANICS OF SOLIDS

L T P C  
3 1 0 4

### UNIT I STRESS STRAIN AND DEFORMATION OF SOLIDS, STATES OF STRESS 9

Rigid bodies and deformable solids – Stability – Strength – Stiffness – Tension, Compression and shear stresses – Strain – Elasticity – Hooke's law – Limit of proportionately, modulus of elasticity – stress-strain curve – lateral strain – temperature stresses – deformation of simple and compound bars – shear modulus – bulk modulus – relationship between elastic constants – biaxial state of stress – stress at a point – stress on inclined plane – principal stresses and principal planes – Mohr's circle of stresses.

### UNIT II ANALYSIS OF PLANE TRUSS, THIN CYLINDERS / SHELLS 9

Stability and equilibrium of plane frames – Types of trusses – Analysis of forces in truss members – Method of joints – Method of sections – Method of tension coefficients – Thin cylinders and shells – Under internal pressure – Deformation of thin cylinders and shells.

### UNIT III TRANSVERSE LOADING ON BEAMS 9

Beams statically determinate and indeterminate beams – Types of supports – Simple and fixed, types of loads – Concentrated – Uniformly distributed – Varying distributed load – Combination of above loading – Relationship between bending moment and shear force – Bending moment and shear force diagram for simply supported, cantilever and over hanging beams – Theory of simple bending – Analysis of stresses – Load carrying capacity of beams – Proportioning of sections

### UNIT IV DEFLECTION OF BEAMS AND SHEAR STRESSES 9

Deflection of beams – Double integration method – Macaulay's method – Slope and deflection using moment area method – Conjugate Beam method – Variation of shear stress – Shear stress distribution in rectangular – Various sections.

### UNIT V TORSION AND SPRINGS 9

Stresses and deformation in circular (solid and hollow shafts) – Stepped shafts – Shafts fixed at both ends – Leaf springs – Stresses in helical springs – Deflection of springs.

**L: 45 T: 15 Total: 60**

#### TEXT BOOKS

1. Egor P. Popov, "Engineering Mechanics of Solids", Prentice Hall of India, 2003.
2. Bansal, R.K., "Strength of Materials", Laxmi Publications, 2007.

#### REFERENCES

1. Subramanian, R., "Strength of Materials", Oxford university Press, 2005.
2. William A. Nash, "Theory and Problems of Strength of Materials, Schaum's Outline Series", Tata McGraw-Hill Publishing Co., 2007.
3. Srinath, L.S., "Advanced Mechanics of Solids", Tata McGraw-Hill Publishing Co., 2003.

## CE1203 – MECHANICS OF FLUIDS

**L T P C**  
**3 1 0 4**

### **UNIT I DEFINITIONS AND FLUID PROPERTIES 5**

Definitions – Fluid and fluid mechanics – Dimensions and units – Fluid properties – Continuum Concept of system and control volume

### **UNIT II FLUID STATICS and KINEMATICS 10**

Pascal's Law and Hydrostatic equation – Forces on plane and curved surfaces – Buoyancy – Meta centre – Pressure measurement – Fluid mass under relative equilibrium  
Fluid Kinematics – Stream, streak and path lines – Classification of flows – Continuity equation (one, two and three dimensional forms) – Stream and potential functions – flow nets – Velocity measurement (Pitot tube, current meter, Hot wire and hot film anemometer, float technique, Laser Doppler velocimetry)

### **UNIT III FLUID DYNAMICS 10**

Euler and Bernoulli's equations – Application of Bernoulli's equation – Discharge measurement – Laminar flows through pipes and between plates – Hagen Poiseuille equation – Turbulent flow – Darcy-Weisbach formula – Moody diagram – Momentum Principle

### **UNIT IV BOUNDARY LAYER AND FLOW THROUGH PIPES 10**

Definition of boundary layer – Thickness and classification – Displacement and momentum thickness – Development of laminar and turbulent flows in circular pipes – Major and minor losses of flow in pipes – Pipes in series and in parallel – Pipe network

### **UNIT V SIMILITUDE AND MODEL STUDY 10**

Dimensional Analysis – Rayleigh's method – Buckingham's Pi-theorem – Similitude and models – Scale effect and distorted models.

**L: 45 T: 15 Total: 60**

### **TEXT BOOKS**

1. Kumar, K.L., "Engineering Fluid Mechanics", Eurasia Publishing House (P) Ltd., New Delhi, 1995.
2. Rajput, R.K., "A text book of Fluid Mechanics", S.Chand and Co.,2007.

### **REFERENCES**

1. John Finnemore, E. and Joseph B. Franzini, "Fluid Mechanics with Engineering Applications", McGraw-Hill International Edition, 2001
2. Pernard Messay, "Mechanics of Fluids" 7th Edition, Nelson Thornes Ltd. U. K. 1998.
3. Modi, P.N. and Seth, S.M ., "Hydraulics and fluid Mechanics", Standard book house , 2005.

## **CE1204 – CONSTRUCTION TECHNIQUES, EQUIPMENTS AND PRACTICE**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>4</b>	<b>0</b>	<b>0</b>	<b>4</b>

### **UNIT I CONCRETE TECHNOLOGY 12**

Cements – Grade of cements – Manufactures of cement – Concrete chemicals and applications – Mix design concept – Mix design as per BIS and ACI methods – Manufacturing of concrete – Batching – Mixing – Transporting – Placing – Compaction of concrete – Curing and finishing – Testing of fresh and hardened concrete – Quality of concrete – Non-destructive testing.

### **UNIT II CONSTRUCTION PRACTICES 13**

Specifications, details and sequence of activities and construction co-ordination – Site clearance – Marking – Earthwork – Masonry – Stone masonry – Bond in masonry – Concrete hollow block masonry – Flooring – Damp proof courses – Construction joints – Movement and expansion joints – Pre cast pavements – Building foundations – basements – Temporary shed – Centering and shuttering sheet piles – Slip forms – scaffoldings – De-shuttering forms – Fabrication and erection of steel trusses – Frames – Braced domes – Laying brick – Weather and water proof – Roof finishes – Air conditioning – Acoustic and fire protection.

### **UNIT III SUB STRUCTURE CONSTRUCTION 13**

Techniques of Box jacking – Pipe Jacking – under water construction of diaphragm walls and basement – Tunneling techniques – Piling techniques – Driving well and caisson – Sinking cofferdam – Cable anchoring and grouting – Driving diaphragm walls – Sheet piles – Shoring for deep cutting – Large reservoir construction with membranes and Earth system – Well points – Dewatering and stand by plant equipment for underground open excavation.

### **UNIT IV SUPER STRUCTURE CONSTRUCTION 12**

Launching girders – Bridge decks – Off shore platforms – Special forms for shells – Techniques for heavy decks – In-situ pre-stressing in high rise structures – Material handling – Erecting light weight components on tall structures – Support structure for heavy Equipment and conveyors – Erection of articulated structures – Braced domes and space decks.

### **UNIT V CONSTRUCTION EQUIPMENTS 10**

Selection of equipment for earth work – Earth moving operations – Types of earthwork equipment – Tractors – Motor graders – Scrapers – Front end waders – Earth movers – Equipment for foundation and pile driving. Equipment for compaction – Batching and mixing and concreting – Equipment for material handling and erection of structures – Equipment for dredging, trenching, tunneling,

**Total: 60**

### **TEXT BOOKS**

1. Arora S.P. and Bindra S.P., “Building Construction, Planning Techniques and Method of Construction”, Dhanpat Rai and Sons, 1997.
2. Sharma, S.C., “Construction Equipment and Management”, Khanna Publishers, 1988.

### **REFERENCES**

1. Jha, J. and Sinha, S.K., “Construction and Foundation Engineering”, Khanna Publishers, 1993.
2. Deodhar, S.V., “Construction Equipment and Job Planning”, Khanna Publishers, 1988.
3. Peurifoy, R.L., Ledbetter, W.B. and Schexnayder, C., "Construction Planning, Equipment and Methods", 5th Edition, McGraw Hill, 1995.

## CE1205 – SURVEYING I

**L T P C**  
**3 0 0 3**

### **UNIT I INTRODUCTION AND CHAIN SURVEYING 8**

Definition – Principles – Classification – Field and office work – Scales – Conventional signs – Survey instruments – their care and adjustment – Ranging and chaining – Reciprocal ranging – Setting perpendiculars -well – conditioned triangles – Traversing – Plotting – Enlarging and reducing figures.

### **UNIT II COMPASS SURVEYING AND PLANE TABLE SURVEYING 7**

Prismatic compass – Surveyor’s compass – Bearing – Systems and conversions – Local attraction – Magnetic declination – Dip – Traversing – Plotting – Adjustment of errors – Plane table instruments and accessories – Merits and demerits – Methods – Radiation – Intersection – Resection – Traversing.

### **UNIT III LEVELLING AND APPLICATIONS 12**

Level line – Horizontal line – Levels and staves – Spirit level – Sensitiveness – Bench marks – Temporary and permanent adjustments – Fly and check levelling – Booking – Reduction – Curvature and refraction – Reciprocal levelling – Longitudinal and cross sections – Plotting – Calculation of areas and volumes – Contouring – Methods – Characteristics and uses of contours – Plotting – Earth work volume – Capacity of reservoirs.

### **UNIT IV THEODOLITE SURVEYING 8**

Theodolite – Vernier and microptic – Description and uses – Temporary and permanent adjustments of vernier transit – Horizontal angles – Vertical angles – Heights and distances – Traversing – Closing error and distribution – Gale’s tables – Omitted measurements.

### **UNIT V ENGINEERING SURVEYS 10**

Reconnaissance – preliminary and location surveys for engineering projects – Lay out – Setting out works – Route Surveys for highways – Railways and waterways – Curve ranging – Horizontal and vertical curves – Simple curves – Setting with chain and tapes – tangential angles by theodolite – Double theodolite – Basic concept of Compound and reverse curves – Transition curves – Functions and requirements – Setting out by offsets and angles – Vertical curves – Sight distances.

**Total: 45**

### **TEXT BOOKS**

1. Bannister A. and Raymond S., “Surveying”, ELBS, 6th Edition, 1992.
2. Kanetkar T.P., “Surveying and Levelling”, Vol. I and II, United Book Corporation, Pune, 1994.

### **REFERENCES**

1. Heribert Kahmen and Wolfgang Faig, “Surveying”, Walter de Gruyter, 1995.
2. James M. Anderson and Edward M. Mikhail, “Introduction to Surveying”, McGraw-Hill Book Company, 1985.
3. Punmia B.C., “Surveying”, Vol. I, II and III, Laxmi Publications, 2007

## CE1206 – SURVEYING PRACTICAL I

**L T P C**  
**0 0 4 2**

1. Study of chains and its accessories
2. Aligning, Ranging and Chaining
3. Chain Traversing
4. Compass Traversing
5. Plane table surveying: Radiation
6. Plane table surveying: Intersection
7. Plane table surveying: Traversing
8. Plane table surveying: Resection –Three point problem
9. Plane table surveying: Resection – Two point problem
10. Study of levels and levelling staff
11. Fly levelling using Dumpy level
12. Fly levelling using tilting level
13. Check levelling
14. LS and CS
15. Contouring
16. Study of Theodolite

**Total: 60**

### SURVEYING PRACTICAL I AND SURVEYING PRACTICAL II

#### LIST OF EQUIPMENTS

(For a batch of 30 students)

Sl. No.	Description of Equipments	Quantity
1.	Total Station	3 Nos
2.	Theodolites	Atleast 1 for every 10 students
3.	Dumpy level	Atleast 1 for every 10 students
4.	Plain table	Atleast 1 for every 10 students
5.	Pocket stereoscope	1
6.	Ranging rods	3 for a set of 5 students
7.	Leveling staff	1 for a set of 5 students
8.	Cross staff	
9.	Chains	
10.	Tapes	
11.	Arrows	5 for a set of 5 students

## CE1207 – COMPUTER AIDED BUILDING DRAWING

**L T P C**  
**0 0 4 2**

- |    |  |    |
|----|--|----|
| 1. | Buildings with load bearing walls (Flat and pitched roof) – Including details of doors and windows | 15 |
| 2. | RCC framed structures  | 15 |
| 3. | Industrial buildings – North light roof structures – Trusses                                       | 15 |
| 4. | Perspective view of one and two storey buildings   | 15 |

**Total: 60**

### TEXT BOOKS

1. Civil Engg. Drawing and House Planning – Varma B.P., Khanna publishers, Delhi
2. Building drawing and detailing – Balagopal and T.S. Prabhu, Spades Publishers, Calicut.

### REFERENCES

1. Building drawing – Shah.M.G., Tata McGraw-Hill,1992
2. Building planning and Drawing –Kumaraswamy N., Kameswara Rao A., Charotar Publishing
3. Shah, Kale and Patki, Building Drawing with integrated approach to built environment, Tata McGraw-Hill.

### Examination Guideline

30% of the end semester examination paper shall deal with planning, while the rest 70% shall be based on the drafting skill.

### LIST OF EQUIPMENTS

(For a batch of 30 students)

Sl. No.	Description of Equipments	Quantity
1.	Computer system of Pentium IV or equivalent	1 for each student
2.	Licensed version of any reputed Analysis, Design and Drafting software	1 copy for a set of 3 students

## SEMESTER IV

### MA1251 – NUMERICAL METHODS

**L T P C**  
**3 1 0 4**

#### **UNIT I SOLUTION OF EQUATIONS AND EIGENVALUE PROBLEMS 9**

Solution of equation – Fixed point iteration:  $x=g(x)$  method – Newton's method – Solution of linear system by Gaussian elimination and Gauss-Jordan method – Iterative method – Gauss-Seidel method – Inverse of a matrix by Gauss Jordan method – Eigen value of a matrix by power method and by Jacobi method for symmetric matrix.

#### **UNIT II INTERPOLATION AND APPROXIMATION 9**

Lagrangian Polynomials – Divided differences – Interpolating with a cubic spline – Newton's forward and backward difference formulas.

#### **UNIT III NUMERICAL DIFFERENTIATION AND INTEGRATION 9**

Differentiation using interpolation formulae – Numerical integration by trapezoidal and Simpson's 1/3 and 3/8 rules – Romberg's method – Two and Three point Gaussian quadrature formulae – Double integrals using trapezoidal and Simpson's rules.

#### **UNIT IV INITIAL VALUE PROBLEMS FOR ORDINARY DIFFERENTIAL EQUATIONS 9**

Single step methods – Taylor series method – Euler method for first order equation – Fourth order Runge – Kutta method for solving first and second order equations – Multistep methods – Milne's and Adam's predictor and corrector methods.

#### **UNIT V BOUNDARY VALUE PROBLEMS IN ORDINARY AND PARTIAL DIFFERENTIAL EQUATIONS 9**

Finite difference solution of second order ordinary differential equation – Finite difference solution of one dimensional heat equation by explicit and implicit methods – One dimensional wave equation and two dimensional Laplace and Poisson equations.

**L: 45 T: 15 Total: 60**

#### **TEXT BOOKS**

1. Veerarjan, T and Ramachandran, T., "Numerical Methods with Programming in C", 2nd Edition, Tata McGraw-Hill Publishing Co.Ltd, 2007.
2. Sankara Rao, K, "Numerical Methods for Scientists and Engineers", 3rd Edition, Printice Hall of India, 2007.

#### **REFERENCES**

1. Chapra, S. C. and Canale, R. P., "Numerical Methods for Engineers", 5th Edition, Tata McGraw-Hill, 2007.
2. Gerald, C.F. and Wheatley, P.O., "Applied Numerical Analysis", 6th Edition, Pearson Education, 2006.
3. Grewal, B.S. and Grewal, J.S., "Numerical methods in Engineering and Science", 6th Edition, Khanna Publishers, 2004.

## CE1251 – SOIL MECHANICS

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

### **UNIT I SOIL INTER RELATIONS 8**

Nature of Soil – Problems with soil – Phase relation – Sieve analysis – Sedimentation analysis – Atterberg limits – Classification for engineering purposes – BIS Classification system – Soil compaction – Factors affecting compaction – Field compaction methods and monitoring.

### **UNIT II SOIL WATER AND WATER FLOW 8**

Soil water – Various forms – Influence of clay minerals – Capillary rise – Suction – Effective stress concepts in soil – Total, neutral and effective stress distribution in soil – Permeability – Darcy's law – Permeability measurement in the laboratory – Quick sand condition – Seepage – Laplace equation – Introduction to flow nets – Properties and uses – Application to simple problems.

### **UNIT III STRESS DISTRIBUTION, COMPRESSIBILITY AND SETTLEMENT 10**

Stress distribution in soil media – Boussinesque formula – Stress due to line load and Circular and rectangular loaded area – Approximate methods – Use of influence charts – Westergaard equation for point load – Components of settlement – Immediate and consolidation settlement – Terzaghi's one dimensional consolidation theory – Governing differential equation – Laboratory consolidation test – Field consolidation curve – NC and OC clays – Problems on final and time rate of consolidation

### **UNIT IV SHEAR STRENGTH 9**

Shear strength of cohesive and cohesionless soils – Mohr – Coulomb failure theory – Saturated soil and unsaturated soil (basics only) – Strength parameters – Measurement of shear strength, direct shear, triaxial compression, unconfined compressive strength and vane shear tests – Types of shear tests based on drainage and their applicability – Drained and undrained behaviour of clay and sand – Stress path for conventional triaxial test.

### **UNIT V SLOPE STABILITY 10**

Slope failure mechanisms – Modes – Infinite slopes – Finite slopes – Total and effective stress analysis – Stability analysis for purely cohesive and  $c-\phi$  soils – Method of slices – Modified Bishop's method – Friction circle method – Stability number – Problems – Slope protection measures.

**Total: 45**

### **TEXT BOOKS**

1. Gopal Ranjan and Rao A.S.R., “Basic and Applied Soil Mechanics”, New Age International Publishers, 2000.
2. Khan, I.H., “A Text Book of Geotechnical Engineering”, Prentice Hall of India, 1999.

### **REFERENCES**

1. Coduto, D.P., “Geotechnical Engineering Principles and Practices”, Prentice Hall of India, 2002.
2. McCarthy, D.F., “Essentials of Soil Mechanics and Foundations Basic Geotechniques”, 6th Edition, Prentice Hall of India, 2002.
3. Das, B.M., “Principles of Geotechnical Engineering”, 5th Edition, Thomas Books/ Cole, 2002.

## CE1252 – STRENGTH OF MATERIALS

**L T P C**  
**3 1 0 4**

### **UNIT I ENERGY PRINCIPLES 9**

Strain energy and strain energy density – Strain energy in traction, shear in flexure and torsion – Castigliano’s theorems – Principle of virtual work – Application of energy theorems for computing deflections in beams and trusses – Maxwell’s reciprocal theorems.

### **UNIT II INDETERMINATE BEAMS 9**

Propped cantilever and fixed beams-fixed end moments and reactions for concentrated load (central, non central), uniformly distributed load, triangular load (maximum at centre and maximum at end) – Theorem of three moments – Analysis of continuous beams – shear force and bending moment diagrams for continuous beams – Slope deflections in continuous beams (qualitative study only)..

### **UNIT III COLUMNS 9**

Eccentrically loaded short columns – Middle third rule – Core section – Columns of unsymmetrical sections – (angle channel sections) – Euler’s theory of long columns – critical loads for prismatic columns with different end conditions – Rankine-Gordon formula for eccentrically loaded columns – Thick cylinders – Compound cylinders.

### **UNIT IV STATE OF STRESS IN THREE DIMENSIONS 9**

Spherical and deviatoric components of stress tensor – Determination of principal stresses and principal planes – Volumetric strain – Dilatation and distortion – Theories of failure – Principal stress dilatation – Principal strain – Shear stress – Strain energy and distortion energy theories – Application in analysis of stress, load carrying capacity and design of members – Residual stresses.

### **UNIT V ADVANCED TOPICS IN BENDING OF BEAMS 9**

Unsymmetrical bending of beams of symmetrical and unsymmetrical sections – Curved beams – Winkler Bach formula – Stress concentration – Shear flow – Center.

**L: 45 T: 15 Total: 60**

### **TEXT BOOKS**

1. Popov, E.P., “Engineering Mechanics of Solids”, Prentice Hall of India, 2003.
2. Rajput, R.K., “Strength of Materials”, S. Chand and Company Ltd., 2006.

### **REFERENCES**

1. Srinath, L.S., “Advanced Mechanics and Solids”, Tata-McGraw Hill Publishing Company Ltd, 2005.
2. Punmia, B.C., “Theory of Structures (SMTS) Vol I and II”, Laxmi Publishing Pvt Ltd, 2004.
3. Kazimi, S.M.A., “Solid Mechanics”, Tata McGraw-Hill Publishing Co., 2003.

## CE1253 – APPLIED HYDRAULIC ENGINEERING

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>3</b>	<b>1</b>	<b>0</b>	<b>4</b>

### **UNIT I OPEN CHANNEL FLOW 9**

Open channel flow – Types and regimes of flow – Velocity distribution in open channel – Wide open channel – Specific energy – Critical flow and its computation – Channel transition.

### **UNIT II UNIFORM FLOW 9**

Uniform flow – Velocity measurement – Manning's and Chezy's formula – Determination of roughness coefficients – Determination of normal depth and velocity – Most economical sections – Non-erodible channels.

### **UNIT III VARIED FLOW 9**

Dynamic equations of gradually varied flow – Assumptions – Characteristics of flow profiles – Draw down and back water curves – Profile determination – Graphical integration, direct step and standard step method – Flow through transitions – Hydraulic jump – Types – Energy dissipation – Surges.

### **UNIT IV PUMPS 9**

Centrifugal pump – Minimum speed to start the pump – Multistage Pumps – Jet and submersible pumps – Positive displacement pumps – Reciprocating pump – Negative slip – Flow separation conditions – Air vessels – Indicator diagram and its variation – Savings in work done – Rotary pumps.

### **UNIT V TURBINES 9**

Turbines – Draft tube and cavitations – Application of momentum principle – Impact of jets on plane and curved plates – Turbines – Classification – Radial flow turbines – Axial flow turbines – Impulse and Reaction.

**L: 45 T: 15 Total: 60**

### **TEXT BOOKS**

1. Bansal, R.K., "Fluid Mechanics and Hydraulic Machines", Laxmi Publishing Pvt Ltd, 2007.
2. Subramanya, K., "Flow in Open Channels", Tata McGraw-Hill Publishing Company, 1994.

### **REFERENCES**

1. Jain, A.K., "Fluid Mechanics (including Hydraulic Machines)", 8th Edition, Khanna Publishers, 1995.
2. Ranga Raju, K.G., "Flow Through Open Channels", Tata McGraw-Hill, 1985.
3. Modi, P.N. and Seth, S.M., "Hydraulic and Fluid Mechanics", Standard Book House, 2000

## CE1254 – SURVEYING II

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

### **UNIT I TACHEOMETRIC SURVEYING 6**

Tachometric systems – Tangential, stadia and subtense methods – Stadia systems – Horizontal and inclined sights – Vertical and normal staffing – Fixed and movable hairs – Stadia constants – Anallactic lens – Subtense bar.

### **UNIT II CONTROL SURVEYING 8**

Working from whole to part – Horizontal and vertical control methods – Triangulation – Signals – Base line – Instruments and accessories – Corrections – Satellite station – Reduction to centre – Trigonometric leveling – Single and reciprocal observations – Modern trends – Bench marking

### **UNIT III SURVEY ADJUSTMENTS 8**

Errors – Sources, precautions and corrections – Classification of errors – True and most probable values – weighted observations – Method of equal shifts – Principle of least squares – Normal equation – Correlates – Level nets – Adjustment of simple triangulation networks.

### **UNIT IV ASTRONOMICAL SURVEYING 11**

Celestial sphere – Astronomical terms and definitions – Motion of sun and stars – Apparent altitude and corrections – Celestial co-ordinate systems – Different time systems – Nautical almanac – Star constellations – calculations for azimuth of a line.

### **UNIT V ADVANCES IN SURVEYING 12**

Basic concept of hydrographic surveying – Tides – MSL – Sounding methods – Location of soundings and methods – Three point problem – Strength of fix – Sextants and station pointer – River surveys – Measurement of current and discharge – Photogrammetry – Introduction only – Basic concept of terrestrial and aerial photographs – Stereoscopy – Definition of parallax – Electromagnetic distance measurement – Basic principles – Instruments – Trilateration – basic concept of Cartography and Cadastral surveying.

**Total: 45**

### **TEXT BOOKS**

1. Punmia, B.C., “Surveying”, Vol. I, II and III, Laxmi Publications, 1989.
2. Kanetkar ,T.P., “Surveying and Leveling”, Vols. I and II, United Book Corporation, 1994.

### **REFERENCES**

1. Clark D., “Plane and Geodetic Surveying”, Vol. I and II, C.B.S. Publishers and Distributors, 6th Edition, 1971.
2. Anderson, J.M. and Mikhail, E.M., “Introduction to Surveying”, McGraw-Hill Book Company, 1985.
3. Heribert Kahmen and Wolfgang Faig, “Surveying”, Walter de Gruyter, 1995.

## CE1255 – HIGHWAY ENGINEERING

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

### **UNIT I HIGHWAY PLANNING AND ALIGNMENT 9**

History of road construction – Highway development in India – Jayakar committee Recommendations and realisations – Twenty year road development plans – Concepts of on-going highways development programmes at national level – Institutions for highway development at national level – India road congress – Highway research board, national highway authority of India – Ministry of Road Transport and Highway (MORTH) Central road research institute – Requirements of ideal alignment – Factors controlling highway alignment engineering surveys for alignment – Conventional methods and modern methods (Remote sensing, GIS and GPS techniques) – Classification and cross section of urban and rural roads – Highway cross sectional elements – Right of way, carriage way, camber, kerbs, shoulders and footpaths (IRC Standards) – Cross sections of different class of roads – Principles of highway financing.

### **UNIT II GEOMETRIC DESIGN OF HIGHWAYS 9**

Design of horizontal alignment – Horizontal curves super elevation – Widening of pavements on horizontal curves and transition curves design of vertical alignments – Rolling, limiting, exceptional and minimum gradients, summit and valley curves – Sight distances – Factors affecting sight distances – PIEV theory, stopping sight distance (SSD) – Overtaking sight distance – Sight distance at intersections – Intermediate sight distance and illumination sight distance [Derivations and problems in SSD and OSD] – Geometric design of hill roads [IRC Standards Only].

### **UNIT III FLEXIBLE AND RIGID PAVEMENTS 9**

Rigid and flexible pavements – Components and their functions – Design principles of flexible and rigid pavements – Factors affecting the design of pavements – ESWL, climate, sub-grade soil and traffic – Design practice for flexible pavements (CBR method, IRC Method and Recommendations – Problems) – Design practice for rigid pavements – IRC Recommendations (concept only).

### **UNIT IV HIGHWAY MATERIALS AND CONSTRUCTION PRACTICE 9**

Desirable properties and testing of highway materials– Soil – California bearing ratio test – Field density test – Aggregate, crushing, abrasion, impact tests, water absorption – Flakiness and elongation indices and stone polishing value test – Bitumen – Penetration, ductility, viscosity, binder content and softening point tests – Construction practice – water bound macadam road – Bituminous road and cement concrete road (As per IRC and MORTH specification) – Highway drainage (IRC Recommendations).

### **UNIT V HIGHWAY MAINTENANCE 9**

Types of defects in Flexible pavements – Surface defects – Cracks, deformation, disintegration – Symptoms – Causes and treatments – Types of pavement – Failures in rigid pavements – Scaling, shrinkage, warping, structural cracks spalling of joints and mud pumping – Special repairs – Pavement evaluation – Pavement surface conditions and structural evaluation – Evaluation of pavement Failure and strengthening – Overlay design by Benkelman Beam method (Procedure only).

**Total: 45**

### **TEXT BOOKS**

1. Khanna, K. and Justo, C.E.G., “Highway Engineering”, Khanna Publishers, 2001.
2. Kadiyali, L.R., “Principles and Practice of Highway Engineering”, Khanna Technical Publications, 2000.

### **REFERENCES**

1. Papacostas, C.S. and Prevedouros P.D., “Transportation Engineering and Planning”, Prentice Hall of India, 2006.
2. IRC Standards (IRC 37 – 2001 and IRC 58 – 1998).
3. Bureau of Indian Standards (BIS) Publications on Highway Materials.
4. Specifications for Road and Bridges, MORTH (India).

## CE1256 – STRENGTH OF MATERIALS LABORATORY

**L T P C**  
**0 0 3 2**

### LIST OF EXPERIMENTS

1. Test involving axial compression to obtain the stress – strain curve
  2. Test involving axial tension to obtain the stress – strain curve and the strength
  3. Test involving torsion to obtain the torque vs. angle of twist and hence the stiffness
  4. Test involving flexure to obtain the load deflection curve and hence the stiffness
  5. Tests on springs
  6. Hardness tests
  7. Shear test
  8. Test for impact resistance
  9. Tests on Cement
- Total :45**

The student should learn the use of deflectometer, extensometer, compressometer and strain gauges.

### LIST OF EQUIPMENTS

(For a batch of 30 students)

Sl. No.	Description of Equipments	Quantity
1.	UTM of minimum 400 KN capacity	1 No.
2.	Torsion testing machine for steel rods	1 No
3.	Izod impact testing machine	1 No
	Hardness testing machine	
4.	Rockwell } Vicker's } (any 2) Brinell }	1 each
5.	Beam deflection test apparatus	1 No
6.	Extensometer	1 No
7.	Compressometer	1 No
8.	Dial gauges	Few
9.	Le Chatelier's apparatus	2 Nos.
10.	Vicat's apparatus	2 Nos.
11.	Mortar cube moulds	10 Nos.

## CE1257 – HYDRAULIC ENGINEERING LABORATORY

**L T P C**  
**0 0 3 2**

### LIST OF EXPERIMENTS

1. Determination of co-efficient of discharge for orifice
2. Determination of co-efficient of discharge for notches
3. Determination of co-efficient of discharge for venturimeter
4. Determination of co-efficient of discharge for orifice meter
5. Study of impact of jet on flat plate (normal / inclined)
6. Study of friction losses in pipes
7. Study of minor losses in pipes
8. Study on performance characteristics of Pelton turbine.
9. Study on performance characteristics of Francis turbine
10. Study on performance characteristics of Kaplan turbine
11. Study on performance characteristics of Centrifugal pumps (Constant speed / variable speed)
12. Study on performance characteristics of reciprocating pump.

**Total :45**

### LIST OF EQUIPMENTS

- |    |  |   |        |
|----|--|---|--------|
| 1. | Bernoulli's theorem – Verification Apparatus   | - | 1 No.  |
| 2. | Calculation of Metacentric height  |   |        |
|    | Water tank   | - | 1 No.  |
|    | Ship model with accessories  | - | 1 No.  |
| 3. | Measurement of velocity  |   |        |
|    | Pitot tube assembly  | - | 1 No.  |
| 4. | Flow measurement   |   |        |
|    | Open channel flow  |   |        |
|    | (i) Channel with provision for fixing notches<br>(rectangular, triangular and trapezoidal forms)                   | - | 1 Unit |
|    | (ii) Flume assembly with provisions for conducting<br>experiments on Hydraulic jumps, generation of<br>surges etc. | - | 1 Unit |

5.	Flow measurement in pipes		
(i)	Venturimeter, U tube manometer fixtures like Valves, collecting tank	-	1 Unit
(ii)	Orifice meter, with all necessary fittings in pipe lines of different diameters	-	1 Unit
(iii)	Calibration of flow through orifice tank with Provisions for fixing orifices of different shapes, collecting tank	-	1 Unit
(iv)	Calibration of flow through mouth piece Tank with provisions for fixing mouth pieces Viz external mouth pieces and internal mouth piece Borda's mouth piece	-	1 Unit
6.	Losses in Pipes		
	Major loss – Friction loss		
	Pipe lengths (min. 3m) of different diameters with Valves and pressure rapping and collecting tank	-	1 Unit
	Minor Losses		
	Pipe line assembly with provisions for having Sudden contractions in diameter, expansions Bends, elbow fitting, etc.	-	1 Unit
7.	Pumps		
(i)	Centrifugal pump assembly with accessories (single stage)	-	1 Unit
(ii)	Centrifugal pump assembly with accessories (multi stage)	-	1 Unit
(iii)	Reciprocating pump assembly with accessories	-	1 Unit
(iv)	Deep well pump assembly set with accessories	-	1 Unit
8.	Turbine		
(i)	Impulse turbine assembly with fittings and accessories	-	1 Unit
(ii)	Francis turbine assembly with fittings and accessories	-	1 Unit
(iii)	Kaplan turbine assembly with fittings and accessories	-	1 Unit

## CE1258 – SURVEYING PRACTICAL II

**L T P C**  
**0 0 4 2**

### LIST OF EXPERIMENTS

1. Study of theodolite
2. Measurement of horizontal angles by reiteration and repetition and vertical angles
3. Theodolite survey traverse
4. Heights and distances - Triangulation - Single plane method.
5. Tacheometry - Tangential system - Stadia system - Subtense system.
6. Setting out works - Foundation marking - Simple curve (right/left-handed) - Transition curve.
7. Field observation for and Calculation of azimuth
8. Field work using Total Station

**Total: 60**

### LIST OF EQUIPMENTS

(For a batch of 30 students)

S. No.	Description of Equipments	Quantity
1.	Total Station	3 Nos
2.	Theodolites	Atleast 1 for every 10 students
3.	Dumpy level	Atleast 1 for every 10 students
4.	Plain table	Atleast 1 for every 10 students
5.	Pocket stereoscope	1
6.	Ranging rods	1 for a set of 5 students
7.	Leveling staff	
8.	Cross staff	
9.	Chains	
10.	Tapes	
11.	Arrows	

## SEMESTER V

### CE1301 – BUILDING TECHNOLOGY

L	T	P	C
3	0	0	3

#### UNIT I PRELIMINARY INVESTIGATION 9

Principles of planning – Planning regulations and bye-laws-site works and setting out – Excavations and timbering – Sub soil drainage – Electricity lighting on building sites – Winter building – Preparation of layout – Site plan – Orientation of buildings.

#### UNIT II SITE SELECTION AND SUB STRUCTURES 9

Site selection – Types of building as per NBC – Types of foundations – Shallow – Deep foundations – Machine foundation

#### UNIT III SUPER STRUCTURE 9

Stone and brick masonry – Composite masonry – Load bearing walls – Cavity walls – Partition walls – Reinforced brick masonry.

#### UNIT IV FLOORING AND ROOFING 9

Ground floors – Components – Types – Suspended flooring – Upper floors – Types – Methods of laying – Type of roofs – Types of pitched roof – Shell roofs – Folded plate roofs – Constructional practices – Roof covering details.

#### UNIT V STAIRCASE AND SERVICES 9

Requirement of a good staircase – Type of staircase calculation for geometry – Ramps – Escalators lifts – Types – Handling capacity.

**Total: 45**

#### TEXT BOOKS

1. Arora, S.P. and Bindra, S.P., “Building construction Planning Techniques and Methods of Construction”, Dhanpat Rai and Sons, 1997.
2. Punmia, B.C., Ashok Kumar Jain and Arun Kumar Jain, “Building Construction”, Laxmi Publications Pvt., Ltd., 1997.

#### REFERENCES

1. Chudley, “Construction Technology” Vol.1, 2, 3 and 4 ELBS Publisher, 1997.
2. National Building Code of India, Parts III, IV, VII and IX 1983.

## CE1302 – DESIGN OF REINFORCED CONCRETE ELEMENTS

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>4</b>	<b>0</b>	<b>0</b>	<b>4</b>

### **UNIT I            METHODS OF DESIGN OF CONCRETE STRUCTURES            12**

Concept of elastic method, ultimate load method and limit state method – Advantages of limit state method over other methods – Design codes and specification – Limit state philosophy as detailed in IS code – Design of flexural members and slabs by working stress method – Principles of design of liquid retaining structures – Properties of uncracked section – Calculation of thickness and reinforcement for liquid retaining structure.

### **UNIT II            LIMIT STATE DESIGN FOR FLEXURE            12**

Analysis and design of one way and two way rectangular slab subjected to uniformly distributed load for various boundary conditions and corner effects – Analysis and design of singly and doubly reinforced rectangular and flanged beams.

### **UNIT III            LIMIT STATE DESIGN FOR BOND, ANCHORAGE SHEAR AND TORSION            12**

Behaviour of RC members in bond and anchorage – Design requirements as per current code – Behaviour of RC beams in shear and torsion – Design of RC members for combined bending shear and torsion.

### **UNIT IV            LIMIT STATE DESIGN OF COLUMNS            12**

Types of columns – Braced and unbraced columns – Design of short column for axial, uniaxial and biaxial bending – Design of long columns.

### **UNIT V            LIMIT STATE DESIGN OF FOOTING AND DETAILING            12**

Design of wall footing – Design of axially and eccentrically loaded rectangular footing – Design of combined rectangular footing for two columns only – Standard method of detailing RC beams, slabs and columns – Special requirements of detailing with reference to erection process.

**Total: 60**

#### **TEXT BOOKS**

1. Varghese, P.C., “Limit State Design of Reinforced Concrete”, Prentice Hall of India, Pvt. Ltd., 2007.
2. Krishna Raju, N., “Design of Reinforced Concrete Structures”, CBS Publishers and Distributors, 2003.

#### **REFERENCES**

1. Jain, A.K., “Limit State Design of RC Structures”, Nemchand Publications, 2002.
2. Sinha, S.N., “Reinforced Concrete Design”, Tata McGraw-Hill Publishing Company Ltd., 2002.
3. Unnikrishna Pillai, S. and Devadas Menon, “Reinforced Concrete Design”, Tata McGraw-Hill Publishing Company Ltd., 2003.

## CE1303 – STRUCTURAL ANALYSIS I

**L T P C**  
**3 1 0 4**

### **UNIT I DEFLECTION OF DETERMINATE STRUCTURES 9**

Principles of virtual work for deflections – Deflections of pin-jointed plane frames and rigid plane frames – Willot diagram – Mohr’s correction.

### **UNIT II MOVING LOADS AND INFLUENCE LINES 9**

(DETERMINATE AND INDETERMINATE STRUCTURES)

Influence lines for reactions in statically determinate structures – Influence lines for members forces in pin-jointed frames – Influence lines for shear force and bending moment in beam sections – Calculation of critical stress resultants due to concentrated and distributed moving loads – Muller Breslau’s principle – Influence lines for continuous beams and single storey rigid frames – Indirect model analysis for influence lines of indeterminate structures – Beggs deformer.

### **UNIT III ARCHES 9**

Arches as structural forms – Examples of arch structures – Types of arches – Analysis of three hinged, two hinged and fixed arches, parabolic and circular arches – Settlement and temperature effects.

### **UNIT IV SLOPE DEFLECTION METHOD 9**

Continuous beams – Settlement rigid frames (without sway) – Principles of symmetry and anti symmetry.

### **UNIT V MOMENT DISTRIBUTION METHOD 9**

Analysis of continuous beams – Settlement – Plane rigid frames with and without sway – Naylor’s simplification.

**L: 45 T: 15 Total: 60**

#### **TEXT BOOKS**

1. Vaidyanadhan, R. and Perumal, P., “Comprehensive Structural Analysis – Vol. 1 and Vol. 2”, Laxmi Publications, 2003.
2. Harrison H.B., “Structural Analysis and Design”, Part I and II Pergamon Press, 1990.

#### **REFERENCES**

1. Wang, C.K., “Analysis of Indeterminate Structures”, Tata McGraw-Hill, 1983.
2. Negi, L.S. and Jangid, R.S., “Structural Analysis”, 6th Edition, Tata McGraw-Hill Publications, 2003.

# CE1304 – FUNDAMENTALS OF REMOTE SENSING AND GIS

**L T P C**  
**3 0 0 3**

## **UNIT I EMR AND ITS INTERACTION WITH ATMOSPHERE AND EARTH MATERIAL 9**

Definition of remote sensing and its components – Electromagnetic spectrum – Wavelength regions important for remote sensing – Wave theory, particle theory, Stefan-Boltzmann and Wien's displacement law atmospheric scattering, absorption – Atmospheric windows – Spectral signature concepts – Typical spectral reflective characteristics of water, vegetation, soil.

## **UNIT II PLATFORMS AND SENSORS 9**

Types of platforms – Orbit types, sun synchronous and geosynchronous – Passive and active sensors – Resolution concepts – Payload description of important earth resources and meteorological satellites – Airborne and space borne TIR and microwave sensors – Types of data products.

## **UNIT III IMAGE INTERPRETATION AND ANALYSIS 9**

Types of image interpretation – Visual interpretation keys – Basic elements of image interpretation – Digital image processing – Pre-processing – Image enhancement techniques – Multispectral image classification – Supervised and unsupervised.

## **UNIT IV GEOGRAPHIC INFORMATION SYSTEM 9**

Introduction – Maps – Definitions – Map projections – Types of projections – Map analysis – GIS definition – Basic components of GIS – Standard GIS soft wares – Data type – Spatial and non spatial (attribute data) – Measurement scales – Data Base Management Systems (DBMS).

## **UNIT V DATA-ENTRY, STORAGE AND ANALYSIS 9**

Data models: vector and raster – Data compression – Data input by digitization and scanning – Attribute data analysis and integrated data analysis – Modeling in GIS – Highway alignment studies – Land information system.

**Total: 45**

### **TEXT BOOKS**

1. Thomas, L.M. and Ralph, K.W., “Remote Sensing and Image Interpretation ”, John Wiley and Sons, 2002.
2. Anji Reddy, M., “Text Book of Remote Sensing and Geographical information Systems”, 3rd Edition, BS Publications, 2006.

### **REFERENCES**

1. Lo, C.P. and Yeung, A.K.W., “Concepts and Techniques of GIS”, Prentice Hall of India Pvt. Ltd., 2002.
2. Burrough, P.A. and Rachael A.Mc. Donnell “Principles of GIS”, Oxford University Press, 2006.
3. Lan Heywood, “An Introduction to GIS”, Pearson Education Asia, 2000.

## CE1305 – ENVIRONMENTAL ENGINEERING

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

### **UNIT I WATER SUPPLY SYSTEMS – SOURCE AND CONVEYANCE 9**

Objectives – Population forecasting – Design period – Water demand characteristics – Sources of water – Source selection – Water quality parameters and significance – Standards – Intake structures – Conveyance – Hydraulics – Laying, jointing and testing of pipes – Pump selection – Appurtenances.

### **UNIT II DESIGN PRINCIPLES OF WATER TREATMENT 9**

Objectives – Selection of unit operations and processes – Principles of flocculation, sedimentation, filtration, disinfection – Design principles of flash mixer, flocculator, clarifiers, filters – Disinfection devices – Softening – Demineralisation – Aeration – Iron removal – Defluoridation – Operation and maintenance aspects – Residue management.

### **DISTRIBUTION**

Requirements – Components – Service reservoir design – Analysis of distribution network – Hardy cross method – Equivalent pipe method – Computer application – Leak detection.

### **UNIT III SEWERAGE SYSTEM, COLLECTION AND TRANSMISSION 9**

Sources of wastewater – Quantity of sanitary sewage – Storm run off estimation – Wastewater characteristics and significance – Effluent disposal stand over – Design of sewers – Computer applications – Laying, jointing and testing of sewers – Sewer appurtenances – Pump selection.

### **UNIT IV SEWAGE TREATMENT AND DESIGN PRINCIPLES 9**

Objectives – Selection of unit operation and process – Design principles of primary and secondary treatment, screen chamber, grit chamber, primary sedimentation tanks, activated sludge process – Aeration tank and oxidation ditch – Trickling filter – Stabilisation ponds – Septic tanks with soak pits – Sludge: treatment and disposal – Biogas recovery – Sewage farming.

### **UNIT V DISPOSAL OF SEWAGE 9**

Disposal on land – Disposal into water bodies – Oxygen sag curve – Streeter Phelp's model – Wastewater reclamation techniques.

**Total: 45**

### **TEXT BOOKS**

1. Garg, S.K., “Environmental Engineering I and II”, Khanna Publishers, 2007.
2. Modi, P.N., “Environmental Engineering I and II”, Standard Book House, 1999.

### **REFERENCES**

1. “Manual on Water Supply and Treatment”, CPHEEO, Government of India, 1999.
2. “Manual on Sewerage and Sewage Treatment”, CPHEEO, Government of India, 1993.
3. “Handbook on Water Supply and Drainage”, SP35, B.I.S., 1987.
4. Metcalf, and Eddy, M.C., “Wastewater Engineering Treatment and Reuse”, Tata McGraw-Hill Publications, 2003.

## CE1306 – FOUNDATION ENGINEERING

L	T	P	C
3	0	0	3

### **UNIT I SITE INVESTIGATION AND SELECTION OF FOUNDATION 9**

Scope and objectives – Methods of exploration-averaging and boring – Water boring and rotatory drilling – Depth of boring – Spacing of bore hole - Sampling – Representative and undisturbed sampling – Sampling techniques – Split spoon sampler, thin tube sampler, stationary piston sampler – Bore log report – Penetration tests (SPT and SCPT) – Data interpretation (Strength parameters and Liquefaction potential) – Selection of foundation based on soil condition.

### **UNIT II SHALLOW FOUNDATION 9**

Introduction–Location and depth of foundation – Codal provisions – Bearing capacity of shallow foundation on homogeneous deposits – Terzaghi’s formula and BIS formula – Factors affecting bearing capacity – Problems-bearing Capacity from insitu tests (SPT, SCPT and plate load) – Allowable bearing pressure, settlement – Components of settlement – Determination of settlement of foundations on granular and clay deposits – Allowable settlements – Codal provision – Methods of minimizing settlement – Differential settlement.

### **UNIT III FOOTINGS AND RAFTS 9**

Types of foundation – Contact pressure distribution below footings and raft – Isolated and combined footings – Types – Proportioning – Mat foundation – Types – Use – Proportioning – Floating foundation.

### **UNIT IV PILES 9**

Types of piles and their function – Factors influencing the selection of pile – Carrying capacity of single pile in granular and cohesive soil – Static formula – Dynamic formulae (Engineering news and Hiley’s) – Capacity from insitu tests (SPT and SCPT) – Negative skin friction – Uplift capacity – Group capacity by different methods (Feld’s rule, Converse Labarra formula and block failure criterion) – Settlement of pile groups – Interpretation of pile load test – Forces on pile caps – Under reamed piles – Capacity under compression and uplift.

### **UNIT V RETAINING WALLS 9**

Plastic equilibrium in soils – Active and passive states – Rankine’s theory – Cohesionless and cohesive soil – Coloumb’s wedge theory – Condition for critical failure plane – Earth pressure on retaining walls of simple configurations – Graphical methods (Rebhann and Culmann) – Pressure on the wall due to line load – Stability of retaining walls.

**Total: 45**

### **TEXT BOOKS**

1. Murthy, V.N.S., "Soil Mechanics and Foundation Engineering", UBS Publishers Distribution Ltd, 1999.
2. Gopal Ranjan Rao, A.S.R., "Basic and Applied Soil Mechanics", Wiley Eastern Ltd., 2003.

### **REFERENCES**

1. Das, B.M., "Principles of Foundation Engineering, 5th Edition, Thomson Books, 2003.
2. Kaniraj, S.R., "Design Aids in Soil Mechanics and Foundation Engineering", Tata McGraw Hill Publishing Company Ltd., 2002.
3. Bowles, J.E., "Foundation Analysis and Design", McGraw-Hill, 1994

## CE1307 – ENVIRONMENTAL ENGINEERING LABORATORY

L	T	P	C
0	0	3	2

### LIST OF EXPERIMENTS

1. Sampling and preservation methods and significance of characterization of water and wastewater.
2. Determination of
  - i)  $P^H$  and turbidity
  - ii) Hardness
3. Determination of iron and fluoride
4. Determination of residual chlorine
5. Determination of Chlorides
6. Determination of Ammonia Nitrogen
7. Determination of Sulphate
8. Determination of Optimum Coagulant Dosage
9. Determination of available Chlorine in Bleaching powder
10. Determination of dissolved oxygen
11. Determination of suspended, volatile and fixed solids
12. B.O.D. test
13. C.O.D. test
14. Introduction to Bacteriological Analysis (Demonstration only)

**Total: 45**

### REFERENCES

1. Standard Methods for the Examination of Water and Wastewater, APHA, 20th Edition, Washington, 1998.
2. Garg, S.K., "Environmental Engineering Vol. I and II", Khanna Publishers, 2007.
3. Modi, P.N., "Environmental Engineering Vol. I and II", Standard Book House, 1999.

**LIST OF EQUIPMENTS**  
**(for a batch of 30 students)**

1.	P <sup>H</sup> meter		
2.	Turbidity meter	-	1 no.
3.	Conductivity meter	-	1 No.
4.	Refrigerator	-	1 No.
5.	BOD incubator	-	1 No.
6.	Muffle furnace	-	1 No.
7.	Hot air oven	-	1 No.
8.	Magnetic stirrer with hot plates	-	5 Nos.
9.	Desicator	-	1 No.
10.	Jar test apparatus	-	1 No.
11.	Water bath	-	1 No.
12.	Furniture	-	1 lot
13.	Glass waves / Crucibles	-	1 lot
14.	Chemicals	-	1 lot
15.	COD apparatus	-	1 No.
16.	Kjeldane apparatus	-	1 No.
17.	Heating mantles	-	5 Nos.
18.	Calorimeter	-	1 No.
19.	Chlorine comparator	-	1 No.
20.	Furniture: Work table	-	10 Nos.
21.	Beaker	-	30 Nos.
22.	Standard flask	-	30 Nos.
23.	Burette with stand	-	15 Nos.
24.	Pipette	-	15 Nos.
25.	Crucible	-	15 Nos.
26.	Filtration assembly	-	1 No.
27.	Chemicals	-	Lot

## CE1308 – SOIL MECHANICS LABORATORY

**L T P C**  
**0 0 3 2**

### LIST OF EXPERIMENTS

1. Grain size distributions – Sieve analysis
2. Grains size distribution – Hydrometer analysis
3. Specific gravity of soil grains
4. Relative density of sands
5. Atterberg limits test
6. Determination of moisture – Density relationship using standard Proctor test.
7. Permeability determination (constant head and falling head methods)
8. Determination of shear strength parameters.
  - i) Direct shear test on cohesionless soil
  - ii) Unconfined compression test on cohesive soil
  - iii) Triaxial compression test
9. One dimensional consolidation test (determination of coefficient of consolidation only)
10. field density test (Core cutter and sand replacement methods)

**Total: 45**

### LIST OF EQUIPMENTS (for a batch of 30 students)

Sl.No	Equipments	Qty
1.	Electrical Oven	1 No
2.	Direct Shear test apparatus	1 No
3.	Liquid limit Apparatus	2 Nos
4.	Sieve Shaker	1 No
5.	Sieves ( Fine and Coarse Aggregates)	1 Set in each
6.	Soil Permeability Apparatus	1 No
7.	Standard Proctor compaction mould and hammer	1 No
8.	Soil Hydrometer	1 No
9.	Core Cutter	1 No
10.	CBR Apparatus	1 No
11.	Consolidation Apparatus	1 No
12.	Pycnometer	3 Nos
13.	Hydrometer jar	1 No
14.	Triaxial setup	1 No
15.	Compression Proving Ring	3 Nos
16.	Direct Shear test apparatus	1 No
17.	Liquid Limit Apparatus	2 No

## CE1309 – FIELD SURVEY - SURVEY CAMP

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>0</b>	<b>0</b>	<b>3</b>	<b>2</b>

Ten days survey camp using theodolite, cross staff, levelling staff, tapes, plane table and total station. The camp must involve work on a large area of not less than 400 hectares. At the end of the camp, each student shall have mapped and contoured the area. The camp record shall include all original field observations, calculations and plots.

- i) Triangulation
- ii) Trilateration
- iii) Sun / Star observation to determine azimuth
- iv) Use of GTS to determine latitude and longitude

**Total: 45**

### **EVALUATION PROCEDURE**

- 1. Internal Marks : 20 marks  
(Decided by the staff in-charge appointed by the Institution)
- 2. Evaluation of Survey Camp Report : 30 marks  
(Evaluated by the external examiner appointed the University)
- 3. Viva voce examination : 50 marks  
(Evaluated by the internal examiner appointed by the HOD  
with the approval of HOD and external examiner appointed by  
the University – with equal Weightage)

**Total: 100 marks**

## **SEMESTER VI**

### **CE1351 – DESIGN OF REINFORCED CONCRETE AND MASONRY STRUCTURES**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>4</b>	<b>0</b>	<b>0</b>	<b>4</b>

**UNIT I      RETAINING WALLS      12**

Design of cantilever and counter fort retaining walls.

**UNIT II      WATER TANKS      12**

Underground rectangular tanks – Domes – Overhead circular and rectangular tanks – Design of staging and foundations.

**UNIT III      SELECTED TOPICS      12**

Design of staircases (ordinary and doglegged) – Design of flat slabs – Design of reinforced concrete walls – Principles of design of mat foundation, box culvert and road bridges

**UNIT IV      YIELD LINE THEORY      12**

Application of virtual work method – Square, rectangular, circular and triangular slabs.

**UNIT V      BRICK MASONRY      12**

Introduction, classification of walls – Lateral supports and stability – Effective height of wall and columns – Effective length of walls, design loads, load dispersion, permissible stresses and design of axially and eccentrically loaded brick walls

**Total: 60**

#### **TEXT BOOKS**

1. Krishna Raju, N., “Design of RC Structures”, CBS Publishers and Distributors, 1998.
2. Dayaratnam, P., “Brick and Reinforced Brick Structures”, Oxford and IBH Publishing House, 1997.

#### **REFERENCES**

1. Mallick, D.K. and Gupta A.P., “Reinforced Concrete”, Oxford and IBH Publishing Company, 1999.
2. Syal, I.C. and Goel, A.K., “Reinforced Concrete Structures”, A.H. Wheelers and Co. Pvt. Ltd., 1994.
3. Varghese, P.C., “Limit State Design of Reinforced Concrete Structures”, 2nd Edition, Prentice-Hall of India Pvt. Ltd., 2002.

## CE1352 – STRUCTURAL ANALYSIS II

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>3</b>	<b>1</b>	<b>0</b>	<b>4</b>

### **UNIT I FLEXIBILITY METHOD FOR INDETERMINATE FRAMES 9**

Equilibrium and compatibility – Determinate Vs Indeterminate structures – Indeterminacy – Primary structure – Compatibility conditions – Analysis of indeterminate pin-jointed plane frames, continuous beams, rigid jointed plane frames (with redundancy restricted to two).

### **UNIT II MATRIX STIFFNESS METHOD 9**

Element and global stiffness matrices – Analysis of continuous beams – Co-ordinate transformations – Rotation matrix – Transformations of stiffness matrices, load vectors and displacements vectors – Analysis of pin-jointed plane frames and rigid frames.

### **UNIT III FINITE ELEMENT METHOD 9**

Introduction – Discretisation of a structure – Displacement functions – Truss element – Beam element – Plane stress and plane strain Triangular elements

### **UNIT IV PLASTIC ANALYSIS OF STRUCTURES 9**

Statically indeterminate axial problems – Beams in pure bending – Plastic moment of resistance – Plastic modulus – Shape factor – Load factor – Plastic hinge and mechanism – Plastic analysis of indeterminate beams and frames – Upper and lower bound theorems

### **UNIT V SPACE AND CABLE STRUCTURES 9**

Analysis of Space trusses using method of tension coefficients – Beams curved in plan Suspension cables – Cables with two and three hinged stiffening girders.

**L: 45 T: 15 Total: 60**

### **TEXT BOOKS**

1. Coates R.C., Coutie M.G. and Kong F.K., “Structural Analysis”, ELBS and Nelson, 1990.
2. Negi, L.S. and Jangid, R.S., “Structural Analysis”, Tata McGraw-Hill Publications, 2003.

### **REFERENCES**

1. Ghali, A., Nebille, A.M. and Brown, T.G., “Structural Analysis” A Unified Classical and Matrix approach”, 5th Edition, Spon Press, 2003.
2. Vazirani Vaidyanathan, R. and Perumail, P., “Comprehensive Structural Analysis – Vol. I and II”, Laxmi Publications, 2003.

## CE1353 – IRRIGATION ENGINEERING

L	T	P	C
3	0	0	3

### UNIT I INTRODUCTION 9

Irrigation – Need and mode of irrigation – Merits and demerits of irrigation – Crop and crop seasons – Consumptive use of water – Duty – Factors affecting duty – Irrigation efficiencies – Planning and development of irrigation projects.

### UNIT II IRRIGATION METHODS 9

Canal irrigation – Lift irrigation – Tank irrigation – Flooding methods – Merits and demerits – Sprinkler irrigation – Drip irrigation.

### UNIT III DIVERSION AND IMPOUNDING STRUCTURES 9

Weirs – Elementary profile of a weir – Weirs on pervious foundations – Types of impounding structures – Tanks, sluices and weirs – Gravity dams – Earth dams – Arch dams – Spillways – Factors affecting location and type of dams – Forces on a dam – Hydraulic design of dams.

### UNIT IV CANAL IRRIGATION 9

Alignment of canals – Classification of canals – Canal drops – Hydraulic design of drops – Cross drainage works – Hydraulic design of cross drainage works – Canal Head works – Canal regulators – River Training works.

### UNIT V IRRIGATION WATER MANAGEMENT 9

Need for optimisation of water use – Minimising irrigation water losses – On farm development works – Percolation ponds – Participatory irrigation management – Water users associations – Changing paradigms in water management – Performance evaluation.

**Total: 45**

### TEXT BOOKS

1. Asawa, G.L., “Irrigation Engineering”, New Age International Publishers 2005.
2. Gupta, B.L. and Amir Gupta, “Irrigation Engineering”, Satya Praheshan, 2000.

### REFERENCES

1. Dilip Kumar Majumdar, “Irrigation Water Management – Principles and Practices”, Prentice Hall of India (P), Ltd. 2004
2. Basak, N.N., “Irrigation Engineering”, Tata McGraw-Hill Publishing Co, 2006.
3. Garg, S.K., “Irrigation Engineering”1985.

## CE1354 – DESIGN OF STEEL STRUCTURES

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>4</b>	<b>0</b>	<b>0</b>	<b>4</b>

### **UNIT I INTRODUCTION 12**

Properties of steel – Structural steel sections – Limit state design concepts – Loads on structures – Metal joining methods using rivets, welding, bolting – Design of bolted, riveted and welded joints – Eccentric connections – Efficiency of joints – High tension bolts.

### **UNIT II TENSION MEMBERS 12**

Types of sections – Net area – Net effective sections for angles and tee in tension – Design of connections in tension members – Use of lug angles – Design of tension splice – Concept of shear lag.

### **UNIT III COMPRESSION MEMBERS 12**

Types of compression members – Theory of columns – Basis of current codal provision for compression member design – Slenderness ratio – Design of single section and compound section compression members – Design of lacing and battening type columns – Design of column bases – Gusseted base.

### **UNIT IV BEAMS 12**

Design of laterally supported and unsupported beams – Built up beams – Beams subjected to biaxial bending – Design of plate girders riveted and welded – Intermediate and bearing stiffeners – Web splices – Design of beam columns.

### **UNIT V ROOF TRUSSES AND INDUSTRIAL STRUCTURES 12**

Roof trusses – Roof and side coverings – Design loads, design of purlin and elements of truss, end bearing – Design of gantry girder.

**Total: 60**

### **TEXT BOOKS**

1. Dayaratnam, P., “Design of Steel Structures”, 2nd Edition, S. Chand and Company, 2008.
2. Subramanian, N., “Design of Steel Structures”, Oxford University Press, 2008.

### **REFERENCES**

1. Ramachandra, S., “Design of Steel Structures – Vol. I and II”, Standard Publication, 2007.
2. Gaylord, E.H., Gaylord, N.C. and Stallmeyer, J.E., “Design of Steel Structures”, 3rd Edition, McGraw-Hill Publications, 1992.

## CE1355 – CONCRETE TECHNOLOGY

**L T P C**  
**3 0 0 3**

### **UNIT I CONCRETE MAKING MATERIALS 9**

Aggregates classification – IS Specifications – Properties – Grading – Methods of combining aggregates – Specified gradings – Testing of aggregates – Cement– Grade of cement– Chemical composition – Testing of concrete – Hydration of cement– Structure of hydrated cement – Special cements – Water chemical admixtures– Mineral admixture.

### **UNIT II CONCRETE 9**

Properties of fresh concrete – Hardened concrete – Strength – Elastic properties – Creep and shrinkage– Variability of concrete strength.

### **UNIT III MIX DESIGN 9**

Principles of concrete mix design – Methods of concrete mix design – Testing of concrete.

### **UNIT IV SPECIAL CONCRETE 9**

Light weight concrete – Fly ash concrete – Fibre reinforced concrete – Polymer concrete –Super plasticized concrete – Epoxy resins and screeds for rehabilitation – Properties and applications – High performance concrete.

### **UNIT V CONCRETING METHODS 9**

Process of manufacturing of concrete – Methods of transportation, placing and curing– Extreme weather concreting – Special concreting methods –Vaccum dewatering – Underwater concrete – Special form work.

**Total: 45**

### **TEXT BOOKS**

1. Neville, A.M., “Properties of Concrete”, Pitman Publishing Limited, 1987.
2. Shetty, M.S., “Concrete Technology”, S. Chand and Company Ltd., 2002.

### **REFERENCES**

1. Rudhani, G., “Light Weight Concrete”, Academic Kiado, Publishing Home of Hungarian Academy of Sciences, 1963.
2. Gambhir, M.L., “Concrete Technology” Tata Mc.Graw Hill Publishers, 2008.

## CE1356 – RAILWAY ENGINEERING

L	T	P	C
3	0	0	3

### **UNIT I INTRODUCTION 9**

Role of Indian railways in national development – Permanent way its components and their functions – Types of rails – Rail fastenings – Sleepers – Ballasts – Ballast less tracks.

### **UNIT II TRACK ALIGNMENT 9**

Engineering surveys for track alignment – Obligatory points – Conventional methods – Modern methods – EDM – Remote sensing – GIS – GPS – Track in cutting – Track on embankments.

### **UNIT III GEOMETRIC DESIGN OF TRACKS 9**

Gradients – Grade compensation – Super-elevation – Widening of gauges in curves – Transition curves – Vertical curves.

### **UNIT IV TRACK CONSTRUCTION 9**

Points and crossings – Turnouts – Signalling – Interlocking and track circuiting – Construction – Conventional and modern methods – Materials used.

### **UNIT V MAINTENANCE AND OPERATION 9**

Track drainage – Track modernization – Automated maintenance and upgrading – Lay outs of railway stations and yards – Rolling stock – Tractive power – Track resistance – Level crossings.

**Total: 45**

### **TEXT BOOK**

1. Saxena Subhash, C. and Satyapal Arora, A., “Course in Railway Engineering”, Dhanpat Rai and Sons, 2003.
2. Agarwal, M..M ,and Chandra.S., “Railway Engineering”, Oxford University Press,2008.

### **REFERENCES**

1. Rangwala, “Railway Engineering”, Charotar Publishing House, 2007.
2. Gupta, B.L. and Amit Gupta, , “Railway Engineering”, Standard Publishers Distributors,2005

**CE1357 – IRRIGATION ENGINEERING AND ENVIRONMENTAL  
ENGINEERING DESIGN AND DRAWING**

**L T P C**  
**0 0 3 3**

**UNIT I IMPOUNDING STRUCTURES 12**

Gravity dams – Earth dams – Arch dams – Spill ways – Energy dissipation devices – Drawing showing plan, elevation, half sections including foundation.

**UNIT II CANAL TRANSMISSION STRUCTURES 12**

Aqueducts – Syphon aqueducts – Super passage – Canal syphon – Canal drops – Notch type – Rapid type fall – Syphon well drops – Drawing showing plan, elevation and foundation details.

**UNIT III TANK IRRIGATION STRUCTURES 12**

Tank bunds – Tank surplus weirs – Tank sluices weirs on pervious foundations – Percolation ponds – Detailed drawings showing foundation details, plan and elevation.

**UNIT IV WATER TREATMENT PLANT 12**

Design and drawing of intake towers – Acrators – Chemical feeding facility – Flocculator – Clarifier – Settling tanks – Slow sand filter – Rapid sand filter – Pressure filter.

**UNIT V SEWAGE TREATMENT PLANTS 12**

Design and drawing of screen chamber – Grit channel – Primary clarifier – Activated sludge process – Aeration tank and oxidation ditch – Trickling filters – Secondary clarifiers – Upflow anaerobic sludge blanket reactors – Upflow anaerobic filter – Sludge digester – Sludge drying beds – Stabilisation ponds – Septic tanks.

**Total: 60**

**Note:**

The examination will be a three hour one carrying 100 marks. Part – A shall carry one either or question carrying 50 marks. Part – B shall carry one either or question carrying 50 marks. Part – A and B together will form part of the question paper.

**TEXT BOOKS**

1. Garg, S.K., “Irrigation Engineering and Design of Structures” Kanna Publishers, 2000.
2. Satyanarayana Murthy Challa, “Water Resources Engineering Principles and Practice”, 2nd Edition, New Age International (P) Ltd., 2002.

**REFERENCES**

1. Sharma, R.K., “Irrigation Engineering and Hydraulic Structures”, Oxford and IBH Publishing Co., 2002.
2. “Manual on Water Supply and Treatment”, CPHEEO, Govt. of India, 2002.
3. “Manual on Sewage and Sewage Treatment”, CPHEEO, Govt. of India, 2003.

## CE1358 – TRANSPORTATION ENGINEERING LABORATORY

L	T	P	C
0	0	3	2

### LIST OF EXPERIMENTS

#### I Testing On Aggregate

1. Presence of deleterious materials - IS 2386 - Part 2
2. Water absorption and Bulk Specific gravity - IS 2386 - Part -3
3. Partial size distribution - IS 2386 - Part -1
4. Flakiness and Elongation Index tests - IS 2386 - Part -1
5. Mechanical properties - IS 2386 - Part - 4
  - a. Aggregate crushing Value
  - b. Impact Value
  - c. Abrasion test Value and
  - d. Polished store Value
6. Soundness Test - IS 2386 - Part -5

#### II. CBR Test – Studies and Experimentation

#### III. Bituminous Materials

1. Bituminous coating and Stripping test – IS 6241
2. Viscosity of bituminous
3. Penetration test
4. Softening point – test
5. Heat stability test

**Total: 45**

### LIST OF EQUIPMENTS (for a batch of 30 students)

- |  |                  |
|--|------------------|
| 1. Universal Testing Machine                               | -1               |
| 2. Abrasion test   | -1               |
| 3. Visco meter   | - 2              |
| 4. Impact test equipments                                  | - 1              |
| 5. Measuring jars with Burners                             | - 2 sets         |
| 6. Standard needle for penetration test                    | - 2              |
| 7. Thermo meter  | - 2              |
| 8. Flakiness and elongation test Equipment and accessories | - 2 sets in each |
| 9. CBR test with accessories with loading arrangements     | -1 set           |

## HS1301 – COMMUNICATION AND SOFT SKILLS LABORATORY

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>0</b>	<b>0</b>	<b>3</b>	<b>2</b>

(Common to All Branches of III Year B.E./ B.Tech students of Anna University  
Tiruchirappalli and affiliated colleges)

The aim of the course is two-fold: to enable the students to develop communication skills in the language laboratory and to arrange discussions for developing soft skills in the lab and/or the classroom. Each lab session shall last for three periods.

### **List of activities that are to be carried out: (15 sessions x 3 periods = 45)**

Lab session # 1: Listening and speaking practice exercises with communicative functions. Learning material: the ACD of Spoken English: A Foundation Course for Speakers of Indian Languages (Orient Longman, 2008)

Lab session # 2: Practice with more advanced communicative functions. Learning material: the ACD of Spoken English: A Foundation Course for Speakers of Indian Languages (Orient Longman, 2008)

Lab session # 3: Pronunciation exercises with Oxford Advanced Learners' Dictionary of Current English or any other standard Dictionary

Lab session # 4: Making an oral presentation in English. Learning Material: Professional Presentations VCD (Cambridge University Press)

Lab session # 5: Listening to telephone conversations in English and completing the tasks. Learning material: Essential Telephoning in English ACD (Cambridge University Press)

Lab session # 6: Giving an exposure to and practice with model group discussion and interviews. Learning material: How to Prepare for Group Discussion and Interview Audio Cassette (McGraw-Hill)

Lab session # 7: Giving insights into the format and the task types in the IELTS (International English Language Testing System). Learning Material: Objective IELTS, Intermediate Level (CUP)

Lab session # 8: Understanding the format and the task types in the TOEFL (Test of English as a Foreign Language). Learning Material: Understanding the TOEFL (Educational Testing Services, Princeton)

Lab session # 9: Administering the BEC (Business English Certificate) Diagnostic Test. Learning Material: BEC Practice Materials (British Council, Chennai)

Lab session # 10: Completing the steps involved in Career, Life Planning and Change Management. Learning Material: Developing Soft Skills (Pearson Education)

Lab session # 11: Setting goals and objectives exercises. Learning Material: Developing Soft Skills (Pearson Education)

Lab session # 12: Prioritizing and time planning exercises. Learning Material: Managing Time Multimedia Program CD

Lab session # 13: Taking a Personality Typing/ Psychometric Test Learning Material: 200 Psychometric Test prepared by the CUIC, Anna University Chennai

Lab session # 14: Critical and creative thinking exercises.

Lab session # 15: Improving body language and cross-cultural communication with pictures. Learning material: Body Language (S. Chand and Co.)

For a detailed plan, refer to the topics given below;

### **UNIT I LISTENING AND SPEAKING PRACTICE IN COMMUNICATIVE FUNCTIONS**

Introductions and Meetings – Talking about Studies and/or Job – Expressing Likes and Dislikes – Describing Daily Routines and Current Activities – Talking about Past States and Events – Talking about Future Plans and Intentions – Expressing Preferences – Giving Reasons – Expressing Opinions, agreement and Disagreement – Seeking and Giving Advice – Making Suggestions.

### **UNIT II SPEAKING APPLICATIONS**

Making an Oral Presentation – Preparing the Presentation – Performing the Presentation – Beginning – Language – Visual Aids and Body Language – Voice – Ending – Questions – Telephone Conversations – Group Discussion and Interview.

### **UNIT III UNDERSTANDING AND PREPARING FOR INTERNATIONAL ENGLISH LANGUAGE EXAMINATIONS**

International English Language Testing System (IELTS) – Test of English as a Foreign Language (TOEFL) – Business English Certificate (BEC)

### **UNIT IV SOFT SKILLS (1)**

Preparing for and Dealing With Change – Motivation, Goal-Setting and Self-Esteem – Managing Time and Stress – Career and Life Planning – Team Work – Leadership Traits.

### **UNIT V SOFT SKILLS (2)**

Multiple Intelligences – Learning Styles and Personality Typing – Critical and Creative Thinking – People, Cultures and Self – Intercultural Communication.

## **RESOURCES**

1. Kamalesh Sadanand and Susheela Punitha, “Spoken English: A Foundation Course” for Speakers of Indian Languages, Part 2 Audio CD, Hyderabad: Orient Longman, 2008
2. Malcome Goodale, “Professional Presentations”, (VCD) New Delhi: Cambridge University Press, 2005
3. Barbara Garside and Tony Garside, Essential Telephoning in English (Audio CD), Cambridge: Cambridge University Press, 2002
4. Hari Mohan Prasad and Rajnish Mohan, “How to Prepare for Group Discussion and Interview (Audio Cassette)”, Tata McGraw-Hill Publishing
5. International English Language Testing System Practice Tests, CUP
6. Business English Certificate Materials, Cambridge University Press
7. Understanding the TOEFL. Educational Testing Services, Princeton, US
8. Interactive Multimedia Programs on Managing Time and Stress
9. Robert M. Sherfield and et al “Developing Soft Skills”, 4th Edition, New Delhi, Pearson Education, 2009.

**Total: 60**

**SEMESTER VII**  
**MG1301 – TOTAL QUALITY MANAGEMENT**  
(Common to all branches)

**L T P C**  
**3 0 0 3**

**UNIT I INTRODUCTION 9**

Definition of quality – Dimensions of quality – Quality planning – Quality costs – Analysis techniques for quality costs – Basic concepts of total quality management – Historical review– Principles of TQM, leadership – Concepts – Role of senior management – Quality council – Quality statements – Strategic planning – Deming philosophy – Barriers to TQM implementation.

**UNIT II TQM PRINCIPLES 9**

Customer satisfaction – Customer perception of quality – Customer complaints – Service quality – Customer retention – Employee involvement – Motivation – Empowerment – Teams – Recognition and reward – Performance appraisal – Benefits – Continuous process improvement – Juran trilogy – PDSA cycle – 5S, Kaizen, supplier partnership – Partnering, sourcing – Supplier selection – Supplier rating – Relationship development – Performance measures – Basic concepts – Strategy – Performance measure.

**UNIT III STATISTICAL PROCESS CONTROL (SPC) 9**

The seven tools of quality – Statistical fundamentals – Measures of central tendency and dispersion – Population and sample – Normal curve – Control charts for variables and attributes – Process capability – Concept of six sigma – New seven management tools.

**UNIT IV TQM TOOLS 9**

Benchmarking – Reasons to benchmark – Benchmarking process – Quality function deployment (QFD) – House of quality – QFD Process – Benefits – Taguchi quality loss function – Total Productive Maintenance (TPM) – Concept – Improvement needs – FMEA – Stages of FMEA.

**UNIT V QUALITY SYSTEMS 9**

Need for ISO 9000 and other quality systems – ISO 9000:2000 quality system – Elements – Implementation of quality system – Documentation, quality auditing, TS 16949, ISO 14000 – concept – Requirements and benefits.

**Total: 45**

**TEXT BOOKS**

1. Besterfiled, D.H., “Total Quality Management”, Pearson Education, Inc. 2003.
2. Evans, J.R. and Lidsay, W.M., “The Management and Control of Quality”, 5th Edition, Thomson Learning, 2002.

**REFERENCES**

1. Feigenbaum, A.V., “Total Quality Management, McGraw Hill, 1991.
2. Oakland, J.S., “Total Quality Management Butterworth, Heinemann Ltd., 1989.
3. Narayana, V. and Sreenivasan, N.S., “Quality Management Concepts and Tasks”, New Age International, 1996.

## CE1401 – ESTIMATION AND QUANTITY SURVEYING

L T P C  
3 1 0 4

### **UNIT I INTRODUCTION 9**

Types of estimates – Units of measurements – Methods of estimates – Advantages Load bearing and framed structures – Calculation of quantities of brick work – RCC – PCC– Plastering – White washing – Colour washing and painting – Varnishing for shops – Rooms – Residential building with flat and pitched roof – Various types of arches – Calculation of brick work and RCC works in arches – Estimate of joineries for panelled and glazed doors – Windows – Ventilators– Handrails.

### **UNIT II ESTIMATE OF OTHER STRUCTURES 9**

Estimating of septic tank, soak pit – Sanitary and water supply installations – Water supply pipe line – Sewer line – Tube well – Open well – Estimate of bituminous and cement concrete roads – Estimate of retaining walls – Culverts – Estimating of irrigation works – Aqueduct, syphon, fall.

### **UNIT III SPECIFICATION AND TENDERS 9**

Data – Schedule of rates – Analysis of rates – Specifications – Sources – Detailed and general specifications – Tenders – Contracts – Types of contracts – Arbitration and legal requirements.

### **UNIT IV VALUATION 9**

Necessity – Basics of value engineering – Capitalised value – Depreciation – Escalation – Value of building – Calculation of standard rent – Mortgage – Lease.

### **UNIT V REPORT PREPARATION 9**

Principles for report preparation – Report on estimate of residential building – Culvert – Roads – Water supply and sanitary installations – Tube wells – Open wells.

**L: 45 T: 15 Total: 60**

### **TEXT BOOKS**

1. Dutta, B.N., “Estimating and Costing in Civil Engineering”, UBS Publishers and Distributors Pvt. Ltd., 2003.
2. Kohli, D.D and Kohli, R.C., “A Text Book of Estimating and Costing”, S.Chand and Company Ltd., 2004.

### **REFERENCE**

1. Vazirani, V.N and Chandola S.P. “Civil Engineering Estimating and Costing: Including Quantity Surveying, Valuation and Contracting “, Khanna Publishers,2006.

## CE1402 – PRE STRESSED CONCRETE STRUCTURES

**L T P C**  
**3 0 0 3**

### **UNIT I INTRODUCTION – THEORY AND BEHAVIOUR 9**

Basic concepts – Advantages – Materials required – Systems and methods of prestressing – Analysis of sections – Stress concept – Strength concept – Load balancing concept – Effect of loading on the tensile stresses in tendons – Effect of tendon profile on deflections – Factors influencing deflections – Calculation of deflections – Short term and long term deflections – Losses of prestress – Estimation of crack width.

### **UNIT II DESIGN 9**

Flexural strength – Simplified procedures as per codes – Strain compatibility method – Basic concepts in selection of cross section for bending – Stress distribution in end block – Design of anchorage zone reinforcement – Limit state design criteria – Partial prestressing – Applications.

### **UNIT III CIRCULAR PRESTRESSING 9**

Design of prestressed concrete tanks – Poles and sleepers.

### **UNIT IV COMPOSITE CONSTRUCTION 9**

Analysis for stresses – Estimate for deflections – Flexural and shear strength of composite members.

### **UNIT V PRE-STRESSED CONCRETE BRIDGES 9**

General aspects – Pretensioned prestressed bridge decks – Post tensioned prestressed bridge decks – Principles of design only.

**Total: 45**

### **TEXT BOOKS**

1. Krishna Raju, N., “Prestressed Concrete”, Tata McGraw Hill Company, 1998.
2. Mallic, S.K. and Gupta, A.P., “Prestressed Concrete”, Oxford and IBH publishing Co. Pvt. Ltd. 1997.

### **REFERENCES**

1. Ramaswamy, G.S., “Modern Prestressed Concrete Design”, Arnold Heinimen, 1990.
2. Lin, T.Y., “Design of Prestressed Concrete Structures”, Asia Publishing House, 1995.
3. Sheppard, D.A., William, R. and Philips, “Plant Cast Precast and Prestressed Concrete – A Design Guide”, McGraw Hill, 1992.



## **CE1405 – COMPUTER AIDED DESIGN AND DRAWING**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>1</b>	<b>0</b>	<b>3</b>	<b>3</b>

1. Design and drawing of RCC cantilever and counterfort type retaining walls with reinforcement details.
2. Design of solid slab and RCC Tee beam bridges for IRC loading and reinforcement details.
3. Design of pressed, rectangular and hemispherical bottomed steel tank – Staging – Detailed drawings.
4. Design and drafting of Intz type water tank, Detailing of circular and rectangular water tanks.
5. Design of plate girder bridge–Twin girder deck type Railway Bridge – Truss Girder bridges – Detailed Drawings including connections.

**Total: 60**

### **TEXT BOOKS**

1. Krishna Raju, N., “Structural Design and Drawing (Concrete and Steel)”, CBS Publishers, 2005.
2. Punmia, B.C., Ashok Kumar Jain and Arun Kumar Jain, “Design of steel structures”, 2nd Edition, Lakshmi publications Pvt. Ltd, 1998.

### **REFERENCE**

1. Krishnamurthy, D., “Structural Design and Drawing – Vol. I and Vol. II”, CBS Publishers and Distributors, 1990.

**EXAMINATION DURATION      4 HOURS**

## CE1406 – CONCRETE LABORATORY

**L T P C**  
**0 0 3 2**

### LIST OF EXPERIMENTS

**Cement:** **12**

1. Test for fineness
2. Test for setting times including normal consistency test
3. Mortar cube preparation and testing

**Aggregates:** **12**

1. Sieve analysis test - Grade Curves
2. Crushing Value - Test
3. Test on Aggregates - Los Angeles Abrasive Testing Machine

**Concrete:** **12**

1. Cube compression test
2. Tension test of concrete - cylinder split test
3. Flexural test on concrete specimen
4. Test using Vee Bee consistometer
5. Compaction factor test
6. Mix design using test parameters and assessing the strength of concrete

**9**

**Total: 45**

### LIST OF EQUIPMENTS (for a batch of 30 students)

- |   |   |       |
|---|---|-------|
| 1. 90 micron sieve                                | – | 2 No. |
| 2. Vicat's Apparatus                              | – | 2 No. |
| 3. 70.6 mm x 70.6 mm cube moulds                  | – | 6 No. |
| 4. IS:406-1962 specification sieve                | – | 2 No. |
| 5. Cylindrical plunger                            | – | 2 No. |
| 6. Deval machine                                  | – | 1 No. |
| 7. 150 mm x 150 mm cube moulds                    | – | 6 No. |
| 8. Cylindrical mould-150 mm dia and 300 mm height | – | 6 No. |
| 9. Steel prism mould (100 mm x 100 mm x 500 mm)   | – | 6 No. |
| 10. Vee-bee consistometer                         | – | 2 No. |
| 11. Compaction factor Apparatus                   | – | 2 No. |

## SEMESTER VIII

### GE1451 – ENGINEERING ECONOMICS AND COST ANALYSIS

L	T	P	C
3	0	0	3

#### UNIT I BASIC ECONOMICS 15

Definition of economics – Nature and scope of economic science – Nature and scope of managerial economics – Basic terms and concepts – Goods – Utility – Value – Wealth – Factors of production – Land – Its peculiarities – Labour – Economies of large and small scale – Consumption – Wants – Its characteristics and classification – Law of diminishing marginal utility – Relation between economic decision and technical decision – Demand – Demand schedule – Demand curve – Law of demand – Elasticity of demand – Types of elasticity – Factors determining elasticity – Measurement – Its significance – Supply – Supply schedule – Supply curve – Law of supply – Elasticity of supply – Time element in the determination of value – Market price and normal price – Perfect competition – Monopoly – Monopolistic competition.

#### UNIT II ORGANISATION 7

Introduction – Principle of organisation – Organisation chart – Forms of business – Proprietorship – Partnership – Joint stock company – Cooperative organisation – State enterprise – Mixed economy – Money and banking – Banking – Kinds – Commercial banks – Central banking functions – Control of credit – Monetary policy – Credit instrument.

#### UNIT III FINANCING 8

Financial Management – Types of financing – Short term borrowing – Long term borrowing – Internal generation of funds – External commercial borrowings – Assistance from government budgeting support and international finance corporations – Analysis of financial statement – Balance Sheet – Profit and Loss account – Funds flow statement.

#### UNIT IV COST ANALYSIS 9

Types of costing – Traditional costing approach – Activity base costing – Fixed cost – Variable cost – Marginal cost – Cost output relationship in the short run and in long run – Pricing practice – Full cost pricing – Marginal cost pricing – Going rate pricing – Bid pricing – Pricing for a rate of return – Appraising project profitability – Internal rate of return – Pay back period – Net present value – Cost benefit analysis – Feasibility reports – Appraisal process – Technical feasibility- Economic feasibility – Financial feasibility.

#### UNIT V BREAK EVEN ANALYSIS 6

Introduction – Break even point and break even chart – P/V ratio – Managerial uses of break even analysis.

**Total: 45**

**TEXT BOOKS**

1. Dewett, K.K. and Varma, J.D., “Elementary Economic Theory”, S Chand, 2006.
2. Sharma, J.C., “Construction Management and Accounts” Satya Prakashan, 1994.

**REFERENCES**

1. Barthwal, R.R., “Industrial Economics - An Introductory Text Book”, New Age International (P) Ltd., 2007.
2. Jhingan, M.L., “Micro Economic Theory”, Konark Pvt.Ltd, 1987.
3. Khan, M.Y. and Jain, P.K., “Financial Management”, McGraw-Hill Publishing Co., Ltd, 2004.

## **CE1451 – CONSTRUCTION PROJECT MANAGEMENT**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

### **UNIT I THE OWNER'S PERSPECTIVE 9**

Introduction – The project life cycle – Major types of construction – Selection of professional services – Construction contractors – Financing of constructed facilities – Legal and regulatory requirements –The changing environment of the construction industry –The role project managers.

### **UNIT II ORGANIZING FOR PROJECT MANAGEMENT 9**

What is project management? – Trends in modern management – Strategic planning and project programming – Effects of project risks on organization – Organization of project participants –Traditional designer – Constructor sequence – Professional construction management – Owner– Builder – Operation – Turnkey operation – Leadership and motivation for the project team – Interpersonal behavior in project organization – Perceptions of owners and contractors.

### **UNIT III THE DESIGN AND CONSTRUCTION PROCESS 9**

Design and construction as an integrated system – Innovation and technological feasibility –Innovation and technological feasibility – Design methodology – Functional design – Physical structures – Geo-technical engineering investigation – Construction site environment – Value engineering – Construction planning – Industrialized construction and prefabrication – Computer – Aided engineering.

### **UNIT IV LABOUR, MATERIAL AND EQUIPMENT UTILIZATION 9**

Historical perspective – Labor productivity – Factors affecting job – Site productivity – Labor relations in construction – Problems in collective bargaining – Materials management – Materials procurement and delivery – Inventory control – Tradeoffs of cost in material management – Construction equipment – Choice of equipment and standard production rates – Construction processes queues and resource bottlenecks

### **UNIT V COST ESTIMATION 9**

Costs associated with construction facilities – Approaches to cost estimation – Type of construction cost estimates – Effects of scale on construction cost – Unit cost – Method of estimation – Methods for allocation of joint costs – Historical cost data – Cost indices – Applications of cost indices to estimating – Estimate based on engineers list of quantities –Allocation of construction costs over time – Computer aided cost estimation – Estimation of operating costs.

**Total: 45**

### **TEXT BOOKS**

1. Chris Hendrickson and Tung Au., “Project Management for Construction – Fundamental Concepts for owners Engineers, Architects and Builders”, Prentice Hall, 2000.
2. Chitkara, K.K., “Construction Project Management Planning, Scheduling and Control”, Tata McGraw Hill Publishing Co., 1998.

### **REFERENCES**

1. Choudhury, S., “Project Management”, Tata McGraw Hill Publishing Co., 1988.
2. Ludwig, E.E., “Applied project Engineering and Management”, Gulf Publishing Co., 1988.
3. Harold Kerzner., “Project Mangement - A systems Approach to Planning Scheduling and Controlling”, CBS Publishers and Distributors, 1988.

# LIST OF ELECTIVES FOR VII SEMESTER

## CE1001 – AIRPORTS AND HARBOURS

L	T	P	C
3	0	0	3

### UNIT I AIRPORT PLANNING AND DESIGN 8

Components of airports – Airport planning – Runway design – Orientation – Wind rose diagram – Taxiway design – Separation distances – Design speed – Drainage.

### UNIT II AIRPORT AND LAYOUTS 10

Airport zoning – Clearance over highways and railways – Airport layouts – Apron – Hangars – Terminal buildings – Airports buildings – Passenger flow – Passenger facilities.

### UNIT III AIR TRAFFIC CONTROL 8

Visual aids – Runway and taxiway markings – Wind direction indicators – Runway and taxiway lightings – Air traffic control network – Helipads – Service equipments.

### UNIT IV DOCKS AND HARBOURS 10

Definition of terms – Harbours – Ports – Docks – Tides – Waves – Littoral drift – Sounding, satellite ports – Classification of harbors – Site selection and investigation – Dry and wet docks – Light houses – Mooring accessories.

### UNIT V COASTAL STRUCTURES 9

Piers – Sliways – Breakwaters – Wharves – Jetties – Quays – Spring fenders – Coastal shipping – Inland water transport – Container transportation – Pipe ways – Rope ways.

**Total: 45**

#### TEXT BOOKS

1. Khanna, S.K., Arora, M.G. and Jain, S.S., “Airport Planning and Design”, Namchand and Brother, 1999.
2. Bindra, S.P., “A course in Docks and Harbour Engineering”, Dhanpat Rai and Sons, 1993.

#### REFERENCES

1. Seetha Raman, S., “Docks and Harbour Engineering”, Umesh Publications, 1992.
2. Ranga Wala, S., “Airport Engineering”, Chasotar Publishing House, 1996.
3. Vazirani and Chandolas, S.P., “Transportation Engineering”, Khanna Publications, 1991.

## CE1002 – ELECTRONIC SURVEYING

L	T	P	C
3	0	0	3

### UNIT I BASICS 9

Methods of measuring distance – Historical development – Basic principles – Classifications – Applications and comparison with conventional surveying.

### UNIT II ELECTRONIC RESOURCE 9

Fundamentals of electronics – Resonant circuits – Semiconductors – Lasers – Cathode ray tube – Photo multiplier tube – Transducers – Oscillators – Frequency mixing – Modulation and demodulation – Kerrcell modulator – Measurement of phase difference – Reflectors and power sources.

### UNIT III PROPAGATION OF ELECTROMAGNETIC WAVES 9

Definition – Classification – Applications – Propagation properties – Wave propagation at lower and higher frequencies – Refractive index – Factors affecting – Computation of group refractive index for light and near infrared waves at standard conditions and ambient conditions – Reference refractive index – First velocity correction – Computation of refractive index for microwaves.

### UNIT IV ATMOSPHERIC PARAMETERS – REFRACTIVE INDEX 9

Measurement of atmospheric parameters – Mean refractive index – Real time application of first velocity correction – Second velocity correction and total atmospheric correction.

### UNIT V ELECTROMAGNETIC DISTANCE MEASURING SYSTEM 9

Electro optical system – Measuring principle – Working principle – Sources of error– Infrared EDM instruments – Laser EDM instruments and total station – Microwave system – Measuring principle – Working principle – Sources of error – Microwave EDM instruments – Comparison with electro optical system – Care and maintenance of EDM instruments – Modern positioning systems – EDM traversing – Trilateration and base line measurement using EDM.

**Total: 45**

### TEXT BOOKS

1. Rueger, J.M., “Electronic Distance Measurement “, Springer-Verlag, 1990.
2. Laurila, S.H., “Electronic Surveying in Practice”, John Wiley and Sons Inc, 1983.

### REFERENCES

1. Burnside, C.D., “Electromagnetic Distance Measurement” Crosby Lock wood staples, 1971.
2. Soastamoinen, J.J., “Surveyor’s Guide to Electro-magnetic Distance Measurement”, Adam Hilger Limited, 1967.

## CE1003 – CARTOGRAPHY

L	T	P	C
3	0	0	3

### UNIT I INTRODUCTION 9

Cartography today – Nature of cartography – History of cartography – Graticules – Cartometry.

### UNIT II EARTH 9

Earth – Map relations – Basic geodesy – Map projections – Scale – Reference and coordinate system – Transformation – Basic transformation – Affin transformation.

### UNIT III SOURCES OF DATA 9

Sources of data – Ground survey and positioning – Remote sensing data collection – Census and sampling – Data – Models for digital cartographic information – Map digitizing.

### UNIT IV PERCEPTION AND DESIGN 9

Cartographic design – Color theory and models – Color and pattern creation and specification – Color and pattern – Typography and lettering the map – Map compilation.

### UNIT V CARTOGRAPHY ABSTRACTION 9

Selection and generalisation principles – Symbolisation – Topographic and thematic maps – Map production and reproduction – Map series.

**Total: 45**

### TEXT BOOKS

1. Anson, R.W. and Ormeling, F.J., “Basic Cartography for Students and Technicians”, Vol. I, II and III, 2nd Edition, Elsevier Applied Science Publishers, 1994.
2. Arthur H. Robinson, “Elements of Cartography”, 6th Edition, John Wiley and Sons, 1995.

### REFERENCES

1. John Campbell, “Introductory Cartography”, 2nd Edition, Brown Publishers, 1994.
2. Kraak, M.J. and Ormeling, F.J., “Cartography - Visualisation and Spatial Data”, Prentice Hall, 1996.

## CE1004 – BRIDGE STRUCTURES

L	T	P	C
3	0	0	3

### UNIT I INTRODUCTION 9

Design of through type steel highway bridges for IRC loading – Design of stringers – Cross girders and main girders – Design of deck type steel highway bridges for IRC loading – Design of main girders.

### UNIT II STEEL BRIDGES 9

Design of pratt type truss girder highway bridges – Design of top chord – Bottom chord – Web members – Effect of repeated loading – Design of plate girder railway bridges for railway loading – Wind effects – Design of web and flange plates – Vertical and horizontal stiffeners.

### UNIT III REINFORCED CONCRETE SLAB BRIDGES 9

Design of solid slab bridges for IRC loading – Design of kerb – Design of tee beam bridges – Design of panel and cantilever for IRC loading.

### UNIT IV REINFORCED CONCRETE GIRDER BRIDGES 9

Design of tee beam – Courbon's theory – Pigeaud's curves – Design of balanced cantilever bridges – Deck slab – Main girder – Design of cantilever – Design of articulation.

### UNIT V PRESTRESSED CONCRETE BRIDGES 9

Design of prestressed concrete bridges – Preliminary dimensions – Flexural and torsion parameters – Courbon's theory – Distribution coefficient by exact analysis – Design of girder section – Maximum and minimum prestressing forces – Eccentricity – Live load and dead load shear forces – cable zone in girder – Check for stresses at various sections – Check for diagonal tension – Diaphragms – End block – Short term and long term deflections.

**Total: 45**

### TEXT BOOKS

1. Johnson Victor, D., “Essentials of Bridge Engineering”, Oxford and IBH Publishing Co., 1990.
2. Ponnuswamy, S., “Bridge Engineering”, Tata McGraw-Hill, 1996.

### REFERENCES

1. Jagadeesh, T. R and Jayaram, M .A, “Design Of Bridge Structures”, PHI Learning Private Limited ,2008
2. Phatak, D.R., “Bridge Engineering”, Satya Prakashan, 1990.

## CE1005 – STORAGE STRUCTURES

L	T	P	C
3	0	0	3

### UNIT I STEEL WATER TANKS 15

Design of rectangular riveted steel water tank – Tee covers – Plates – Stays – Longitudinal and transverse beams – Design of staging – Base plates – Foundation and anchor bolts – Design of pressed steel water tank – Design of stays – Joints – Design of hemispherical bottom water tank – Side plates – Bottom plates – Joints – Ring girder – Design of staging and foundation.

### UNIT II CONCRETE WATER TANKS 15

Design of circular tanks – Hinged and fixed at the base – IS method of calculating shear forces and moments – Hoop tension – Design of intze tank – Dome – Ring girders – Conical dome – Staging – Bracings – Raft foundation – Design of rectangular tanks – Approximate methods and IS methods – Design of under ground tanks – Design of base slab and side wall – Check for uplift.

### UNIT III STEEL BUNKERS AND SILOS 5

Design of square bunker – Jansen’s and Airy’s theories – IS Codal provisions – Design of side plates – Stiffeners – Hooper – Longitudinal beams – Design of cylindrical silo – Side plates – Ring girder – Stiffeners.

### UNIT IV CONCRETE BUNKERS AND SILOS 5

Design of square bunker – Side walls – Hopper bottom – Top and bottom edge beams – Design of cylindrical silo – Wall portion – Design of conical hopper – Ring beam at junction.

### UNIT V PRESTRESSED CONCRETE WATER TANKS 5

Principles of circular prestressing – Design of prestressed concrete circular water tanks.

**Total: 45**

### TEXT BOOKS

1. Rajagopalan, K., “Storage Structures”, Tata McGraw-Hill, 1998.
2. Krishna Raju, N., “Advanced Reinforced Concrete Design”, CBS Publishers and Distributors, 1998.

## CE1006 – TALL BUILDINGS

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

### **UNIT I INTRODUCTION 9**

The tall building in the urban context – The tall building and its support structure – Development of high rise building structures – General planning considerations – Dead loads – Live loads – Construction loads – Snow, rain and ice loads – Wind loads – Seismic loading – Water and earth pressure loads – Loads – Loads due to restrained – Volume changes of material – Impact and dynamic loads – Blast loads – Combination of loads.

### **UNIT II THE VERTICAL STRUCTURE PLANE 9**

Dispersion of vertical forces – Dispersion of lateral forces – Optimum ground level space – Shear wall arrangement – Behaviour of shear walls under lateral loading – The floor structure or horizontal building plane floor framing systems – Horizontal bracing – Composite floor systems – The high rise building as related to assemblage kits skeleton frame systems – Load bearing wall panel systems – Panel – Frame systems – Multistory box systems.

### **UNIT III COMMON HIGH-RISE BUILDING STRUCTURES AND THEIR BEHAVIOUR UNDER LOAD 9**

The bearing wall structure – The shear core structure – Rigid frame systems – The wall – Beam structure – Interspatial and staggered truss systems – Frame – Shear wall building systems – Flat slab building structures – Shear truss – Frame interaction system with rigid – Belt trusses – Tubular systems – Composite buildings – Comparison of high – Rise structural systems other design approaches controlling building drift efficient building forms – The counteracting force or dynamic response.

### **UNIT IV APPROXIMATE STRUCTURAL ANALYSIS AND DESIGN OF BUILDINGS 9**

Approximate analysis of bearing wall buildings – The cross wall structure – The long wall structure – The rigid frame structure approximate analysis for vertical loading – Approximate analysis for lateral loading – Approximate design of rigid frame buildings – Lateral deformation of rigid frame buildings – The rigid frame – Shear wall structure – The vierendeel structure – The hollow tube structure.

### **UNIT V OTHER HIGH-RISE BUILDING STRUCTURE 9**

Deep – Beam systems – High rise suspension systems – Pneumatic high rise buildings – Space frame applied to high rise buildings – Capsule architecture.

**Total: 45**

### **TEXT BOOKS**

1. Wolfgang Schueller "High - Rise building structures", John Wiley and Sons, 1986.
2. Bryan Stafford Smith and Alex Coull., " Tall Building Structures Analysis and Design", John Wiley and Sons, Inc., 1991.

### **REFERENCES**

1. Coull A. Smith and Stafford, B., "Tall Buildings", Pergamon Press, 1997.
2. Lin, T.Y. and Stotes, B.D., "Structural Concepts and Systems for Architects and Engineers", John Wiley, 1994.
3. Beedle, L.S., "Advances in Tall Buildings", CBS Publishers and Distributors, 1996.

## CE1007 – PREFABRICATED STRUCTURES

L	T	P	C
3	0	0	3

### UNIT I INTRODUCTION 9

Need for prefabrication – Principles – Materials – Modular coordination – Standardization – Systems – Production – Transportation – Erection.

### UNIT II PREFABRICATED COMPONENTS 9

Behaviour of structural components – Large panel constructions – Construction of roof and floor slabs – Wall panels – Columns – Shear walls.

### UNIT III DESIGN PRINCIPLES 9

Disuniting of structures – Design of cross section based on efficiency of material used – Problems in design because of joint flexibility – Allowance for joint deformation.

### UNIT IV JOINT IN STRUCTURAL MEMBERS 9

Joints for different structural connections – Dimensions and detailing – Design of expansion joints.

### UNIT V DESIGN FOR ABNORMAL LOADS 9

Progressive collapse – Code provisions – Equivalent design loads for considering abnormal effects such as earthquakes, cyclones, etc – Importance of avoidance of progressive collapse.

**Total: 45**

### TEXT BOOKS

1. CBRI, “Building Materials and Components”, 1990
2. Gerostiza, C.Z., Hendrikson, C. and Rehat, D.R., “Knowledge based process planning for construction and manufacturing”, Academic Press Inc., 1994

### REFERENCES

1. Koncz, T., “Manual of Precast Concrete Construction”, Vol. I, II and III, Bauverlag, GMBH, 1971.
2. “Structural Design Manual, Precast Concrete Connection Details”, Society for the Studies in The Use Of Precast Concrete, Netherland Betor Verlag, 1978.

## CE1008 – WIND ENGINEERING

L	T	P	C
3	0	0	3

### UNIT I INTRODUCTION 9

Terminology – Wind Data – Gust factor and its determination – Wind speed variation with height – Shape factor – Aspect ratio – Drag and lift.

### UNIT II EFFECT OF WIND ON STRUCTURES 9

Static effect – Dynamic effect – Interference effects (concept only) – Rigid structure – Aeroelastic structure (concept only).

### UNIT III EFFECT ON TYPICAL STRUCTURES 9

Tall buildings – Low rise buildings – Roof and cladding – Chimneys, towers and bridges.

### UNIT IV APPLICATION TO DESIGN 9

Design forces on multistorey building – Towers and roof trusses.

### UNIT V INTRODUCTION TO WIND TUNNEL 9

Types of models (Principles only) – Basic considerations – Examples of tests and their use.

**Total: 45**

### TEXT BOOKS

1. Peter Sachs, “Wind Forces in Engineering, Pergamon Press, 1992.
2. Lawson, T.V., “Wind Effects on Buildings, Vol. I and II”, Applied Science and Publishers, 1993.

### REFERENCES

1. Devenport, A.G., “Wind Loads on Structures”, Division of Building Research, 1990.
2. “Wind Force on Structures” – Course Notes, Building Technology Centre, Anna University Chennai, 1995.

## CE1009 – SMART STRUCTURES AND SMART MATERIALS

**L T P C**  
**3 0 0 3**

### **UNIT I INTRODUCTION 9**

Introduction to smart materials and structures – Instrumented structures functions and response – Sensing systems – Self diagnosis – Signal processing consideration – Actuation systems and effectors.

### **UNIT II MEASURING TECHNIQUES 9**

Strain measuring techniques using electrical strain gauges – Types – Resistance – Capacitance – Inductance – Wheatstone bridges – Pressure transducers – Load cells – Temperature Compensation – Strain rosettes.

### **UNIT III SENSORS 9**

Sensing technology – Types of sensors – Physical measurement using Piezo electric strain measurement – Inductively read transducers – The LVDT – Fiber optic techniques – Chemical and bio-chemical sensing in structural assessment – Absorptive chemical sensors – Spectroscopes – Fibre optic chemical sensing systems and distributed measurement.

### **UNIT IV ACTUATORS 9**

Actuator techniques – Actuator and actuator materials – Piezoelectric and electrostrictive material – Magneto structure material – Shape memory alloys – Electro rheological fluids– Electro magnetic actuation – Role of actuators and actuator materials.

### **UNIT V SIGNAL PROCESSING AND CONTROL SYSTEMS 9**

Data acquisition and processing – Signal processing and control for smart structures – Sensors as geometrical processors – Signal processing – Control system – Linear and non-Linear.

**Total: 45**

### **TEXT BOOKS**

1. Brain Culshaw, “Smart Structure and Materials” Artech House , 1996.
2. Dally, J.W. and Riley W.F., “Experimental Stress Analysis”, Tata McGraw-Hill, 1998.

### **REFERENCE**

1. Srinath, L.S., “Experimental Stress Analysis”, Tata McGraw-Hill, 1998.

## CE1010 – ADVANCED STRUCTURAL ANALYSIS

**L T P C**  
**3 0 0 3**

### **UNIT I STATISTICALLY INDETERMINATE RIGID JOINTED STRUCTURES 9**

Degree of statical indeterminacy – Grid structures – Plate analogy – Moment distribution – Viaduct frame – Naylor's moment distribution – Slab less tread riser – Analysis – Winkler – Bach formula – Hooks – Chain links.

### **UNIT II STATICALLY REDUNDANT FRAMES 9**

Degree of redundancy – Plane frames – Space frames – Simple transmission tower – Simple geodesic dome – With pin jointed members – Introduction to lamella grids

### **UNIT III INFLUENCE LINES FOR DETERMINATE AND INDETERMINATE STRUCTURES 9**

3 and 4 span continuous beams – Beams with indeterminate hinges – Muller Brslaulow principle – Double integration – I.L for shear, moment and reaction – Applications – Betti – Maxwell law.

### **UNIT IV MATRIX ANALYSIS RIGID JOINTED STRUCTURES 9**

Storeyed frames – Multi bayed frames – Grid frames – Space frames – Viaduct frames – Gable frames – Vierndeel girders.

### **UNIT V MATRIX ANALYSIS OF PIN JOINTED FRAMES 9**

Pin jointed – Plane frames – Space frames – Hybrid frames – Cable stayed bridges.

**Total: 45**

#### **TEXT BOOKS**

1. Pandit, G.S. and Gupta "Structural Analysis" (Matrix Approach) – Tata McGraw Hill Book Company, 1986.
2. Schodek, D.L., "Structures", 4th Edition, Prentice Hall India, 2004.

#### **REFERENCES**

1. Gere, "Moment Distribution", McGraw Hill Book Company, 1942.
2. Wang, C.K., "Matrix Analysis of Structures", McGraw Hill Book Company, 1970.

## ELECTIVES FOR SEMESTER VIII

### CE1011 – HOUSING PLANNING AND MANAGEMENT

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#### UNIT I INTRODUCTION TO HOUSING 9

Definition of basic terms – House – Home – Household – Apartments – Multi storeyed buildings – Special buildings – Objectives and strategies of National Housing Policies – Principle of sustainable housing, housing laws at state level – Bye-laws at urban and rural local bodies – Levels – Development control regulations – Institutions for housing at national, state and local levels.

#### UNIT II HOUSING PROGRAMMES 9

Basic concepts – Contents and standards for housing programmes – Sites and services – Neighbourhoods – Open development plots – Apartments – Rental housing – Co-operative housing – Slum housing programmes – Role of public – Private and Non-Government organisations.

#### UNIT III PLANNING AND DESIGN OF HOUSING PROJECTS 9

Formulation of housing projects – Site analysis – Layout design – Design of housing units (Design Problems).

#### UNIT IV CONSTRUCTION TECHNIQUES AND COST-EFFECTIVE MATERIALS 9

New constructions techniques – Cost effective modern construction materials – Building centers – Concept – Functions and performance evaluation.

#### UNIT V HOUSING FINANCE AND PROJECT APPRAISAL 9

Appraisal of housing projects – Housing finance – Cost recovery – Cash flow analysis – Subsidy and cross subsidy – Pricing of housing units – Rents – Recovery pattern (Problems).

**Total: 45**

#### TEXT BOOKS

1. Meera Mehta and Dinesh Mehta, “Metropolitan Housing Markets”, Sage Publications Pvt. Ltd., 1999.
2. Francis Cherunilam and Heggade, O.D., “Housing in India”, Himalaya Publishing House, 1997.

#### REFERENCES

1. “Development Control Rules for Chennai Metropolitan Area”, CMA, Chennai, 2002.
2. “National Experiences with Shelter Delivery for the Poorest Groups”, UNCHS (Habitat), 1994.
3. National Housing Policy, 1994, Government of India.

## CE1012 – GROUND WATER ENGINEERING

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

### **UNIT I      FUNDAMENTALS OF GROUND WATER      9**

Introduction – Characteristic of ground water – Distribution of water – Ground water column – permeability – Darcy's law – Laboratory permeability test – Types of aquifers – Hydrogeological cycle – Water level fluctuations.

### **UNIT II      HYDRAULICS OF FLOW      9**

Storage coefficient – Specific field – Heterogeneity and anisotropy – Transmissivity – Governing equations of ground water flow – Steady state flow – Dupuit forchheimer assumptions – Velocity potential – Flow nets.

### **UNIT III      ESTIMATION OF PARAMETERS      9**

Transmissivity and storativity – Pumping test – Unsteady state flow – Thiess method – Jacob method – Image well theory – Effect of partial penetrations of wells – Collectors wells.

### **UNIT IV      GROUND WATER DEVELOPMENT      9**

Infiltration gallery – Conjunctive use – Artificial recharge – Safe yield – Yield test – Geophysical methods – Selection of pumps.

### **UNITV      WATER QUALITY      9**

Ground water chemistry – Origin – Movement and quality – Water quality standards – Saltwater intrusion – Environmental concern.

**Total: 45**

### **TEXT BOOKS**

1. Raghunath, H.M., “Ground Water Hydrology”, Wiley Eastern Ltd., 2000.
2. Todd, D.K., “Ground Water Hydrology”, John Wiley and Sons, 2000.

### **REFERENCES**

1. Delleur .J.W., “The Handbook of Groundwater Engineering”, CRC press, 1998.
2. Walton, C., “Ground Water Resource Evaluation”, McGraw-Hill Publications, 1970.

## CE1013 – WATER RESOURCES ENGINEERING

L	T	P	C
3	0	0	3

### UNIT I GENERAL 9

Water resources survey – Water resources of India and Tamilnadu – Description of water resources planning – Economics of water resources planning, physical and socio economic data – National water policy – Collection of meteorological and hydrological data for water resources development.

### UNIT II NETWORK DESIGN 9

Hydrologic measurements – Analysis of hydrologic data – Hydrologic station network – Station network design – Statistical techniques in network design.

### UNIT III WATER RESOURCE NEEDS 9

Consumptive and non-consumptive water use – Estimation of water requirements for irrigation, drinking and navigation – Water characteristics and quality – Scope and aims of master plan – Concept of basin as a unit for development – Water budget and development plan.

### UNITIV RESERVOIR PLANNING AND MANAGEMENT 9

Reservoir – Single and multipurpose – Multi objective – Fixation of storage capacity – Strategies for reservoir operation – Sedimentation of reservoirs – Design flood levees and flood walls – Channel improvement.

### UNIT V ECONOMIC ANALYSIS 9

Estimation of cost and evaluation of benefits – Discount rate – Discounting factors – Discounting techniques – Computer applications.

**Total: 45**

### TEXT BOOKS

1. Linsley, R.K. and Franzini, J.B., “Water Resources Engineering”, McGraw-Hill Inc, 2000.
2. Douglas, J.L. and Lee, R.R., “Economics of Water Resources Planning”, Tata McGraw-Hill Inc. 2000.

### REFERENCES

1. Chaturvedi, M.C., “Water Resources Systems Planning and Management”, Tata McGraw-Hill Inc., 1997.
2. Goodman Alvin, S., “Principles of Water Resources Planning”, Prentice-Hall, 1984.
3. Duggal, K.N. and Soni, J.P., “Elements of Water Resources Engineering”, New Age International Publishers, 1996.

**CE1014 – INTRODUCTION TO SOIL DYNAMICS AND MACHINE  
FOUNDATIONS**

**L T P C**  
**3 0 0 3**

**UNIT I INTRODUCTION 9**

Vibration of elementary systems – Vibratory motion – Single degree freedom system – Free and forced vibration with and without damping.

**UNIT II WAVES AND WAVE PROPAGATION 9**

Wave propagation in an elastic homogeneous isotropic medium – Raleigh – Shear and compression waves – Waves in elastic half space.

**UNIT III DYNAMIC PROPERTIES OF SOILS 9**

Elastic properties of soils – Coefficient of elastic – Uniform and non-uniform compression – Shear effect of vibration dissipative properties of soils – Determination of dynamic properties of soil – Codal provisions.

**UNIT IV DESIGN PROCEDURES 9**

Design criteria – Dynamic loads – Simple design procedures for foundations under reciprocating machines – Machines producing impact loads – Rotary type machines.

**UNIT V VIBRATION ISOLATION 9**

Vibration isolation technique – Mechanical isolation – Foundation isolation – Isolation by location – Isolation by barriers – Active passive isolation tests.

**Total: 45**

**TEXT BOOKS**

1. Prakesh, S. and Puri, V.K., “Foundation for machines”, McGraw-Hill 1993.
2. Srinivasulu, P. and Vaidyanathan, “Hand book of Machine Foundations”, McGraw-Hill, 1996.

**REFERENCES**

1. Kameswara Rao, “Vibration Analysis and Foundation Dynamics”, Wheeler Publishing, 1998.
2. “IS Code of Practice for Design and Construction of Machine Foundations”, McGraw-Hill, 1996.
3. Moore, P.J., “Analysis and Design of Foundation for Vibration”, Oxford and IBH, 1995.

## CE1015 – AIR POLLUTION MANAGEMENT

L	T	P	C
3	0	0	3

### UNIT I SOURCES AND EFFECTS OF AIR POLLUTANTS 9

Classification of air pollutants – Particulates and gaseous pollutants – Sources of air pollution – Source inventory – Effects of air pollution on human beings – Materials – Vegetation – Animals – Global warming-ozone layer depletion – Sampling and Analysis – Basic Principles of Sampling – Source and ambient sampling – Analysis of pollutants – Principles.

### UNIT II DISPERSION OF POLLUTANTS 9

Elements of atmosphere – Meteorological factors – Wind roses – Lapse rate – Atmospheric stability and turbulence – Plume rise – Dispersion of pollutants – Dispersion models – Applications.

### UNIT III AIR POLLUTION CONTROL 9

Concepts of control – Principles and design of control measures – Particulates control by gravitational – Centrifugal – Filtration – Scrubbing – Electrostatic precipitation – Selection criteria for equipment – Gaseous pollutant control by adsorption – Absorption – Condensation – Combustion – Pollution control for specific major industries.

### UNIT IV AIR QUALITY MANAGEMENT 9

Air quality standards – Air quality monitoring – Preventive measures – Air pollution control efforts – Zoning – Town planning regulation of new industries – Legislation and enforcement – Environmental impact assessment and air quality

### UNIT V NOISE POLLUTION 9

Sources of noise pollution – Effects – Assessment – Standards – Control methods – Prevention.

**Total: 45**

#### TEXT BOOKS

1. Anjaneyulu, D., “Air Pollution and Control Technologies”, Allied Publishers 2002.
2. Heumann, W.L., “Industrial Air Pollution Control Systems”, McGraw-Hill, 1997.

#### REFERENCES

1. Mahajan, S.P., “Pollution Control in Process Industries”, Tata McGraw-Hill Publishing Company, 1991.
2. Peavy, S.W., Rowe, D.R. and Tchobanoglous, G., “Environmental Engineering”, McGraw Hill, 1985.
3. Mahajan, S.P., “Pollution Control in Process Industries”, Tata McGraw-Hill, 1991.

## CE1016 – COMPUTER AIDED DESIGN OF STRUCTURE

**L T P C**  
**3 0 0 3**

### **UNIT I INTRODUCTION 9**

Fundamentals of CAD – Hardware and software requirements – Design process – Applications and benefits.

### **UNIT II COMPUTER GRAPHICS 9**

Graphic primitives – Transformations – Wire frame modeling and solid modeling – Graphic standards – Drafting packages.

### **UNIT III STRUCTURAL ANALYSIS 9**

Fundamentals of finite element analysis – Principles of structural analysis – Analysis packages and applications.

### **UNIT IV DESIGN AND OPTIMISATION 9**

Principles of design of steel and RC structures – Applications to simple design problems – Optimisation techniques – Algorithms – Linear programming – Simplex method.

### **UNIT V EXPERT SYSTEMS 9**

Introduction to artificial intelligence – Knowledge based expert systems – Rules and decision tables – Inference mechanisms – Simple applications.

**Total: 45**

### **TEXT BOOKS**

1. Groover, M.P. and Zimmers, E.W. Jr., “CAD/CAM, Computer Aided Design and Manufacturing”, Prentice Hall of India Ltd, 1993.
2. Krishnamoorthy, C.S., Rajeev, S., “Computer Aided Design”, Narosa Publishing House, 1993.

### **REFERENCES**

1. Harrison, H.B., “Structural Analysis and Design”, Part I and II Pergamon Press, 1990.
2. Rao, S.S., “Optimisation Theory and Applications”, Wiley Eastern Limited, 1977.
3. Richard Forsyth, “Expert System Principles and Case Studies”, Chapman and Hall, 1989.



# CE1018 – FINITE ELEMENT TECHNIQUES

**L T P C**  
**3 0 0 3**

## **UNIT I INTRODUCTION – VARIATIONAL FORMULATION 9**

General field problems in engineering – Modelling – Discrete and continuous models – Characteristics – Difficulties involved in solution – The relevance and place of the finite element method – Historical comments – Basic concept of FEM – Boundary and initial value problems – Gradient and divergence theorems – Functionals – Variational calculus – Variational formulation of VBPS – The method of weighted residuals – The Ritz method.

## **UNIT II FINITE ELEMENT ANALYSIS OF ONE DIMENSIONAL PROBLEMS 9**

One dimensional second order equations – Discretisation of domain into elements – Generalised coordinates approach – Derivation of elements equations – Assembly of elements equations – Imposition of boundary conditions – Solution of equations – Cholesky method – Post processing – Extension of the method to fourth order equations and their solutions – Time dependant problems and their solutions – Example from heat transfer fluid flow and solid mechanics.

## **UNIT III FINITE ELEMENT ANALYSIS OF TWO DIMENSIONAL PROBLEMS 9**

Second order equation involving a scalar – Valued function – Model equation – Variational formulation – Finite element formulation through generalised coordinates approach – Triangular elements and quadrilateral elements – Convergence criteria for chosen models – Interpolation functions – Elements matrices and vectors – Assembly of element matrices – Boundary conditions – Solution techniques.

## **UNIT IV ISOPARAMETRIC ELEMENTS AND FORMULATION 9**

Natural coordinates in 1, 2 and 3 dimensions – Use of area coordinates for triangular elements in – Two dimensional problems – Isoparametric elements in 1,2 and 3 dimensional – Lagrangean and serendipity elements – Formulations of elements equations in one and two dimensions – Numerical integration.

## **UNIT V APPLICATIONS TO FIELD PROBLEMS IN TWO DIMENSIONALS 9**

Equations of elasticity – Plane elasticity problems – Axisymmetric problems in elasticity – Bending of elastic plates – Time dependent problems in elasticity – Heat – Transfer in two dimensions – Incompressible fluid flow.

**Total: 45**

**TEXT BOOKS**

1. Chandrupatla, T.R. and Belegundu, A.D., "Introduction to Finite Element in Engineering", 3rd Edition, Prentice Hall, 2003.
2. Rao, S.S., "The Finite Element Method in Engineering", Pergaman Press, 2003.

**REFERENCES**

1. Reddy, J.N., "An Introduction to Finite Element Method", McGraw-Hill, 1985.
2. Desai, C.S. and Abel, J.F., "Introduction to the Finite Element Method", Affiliated East West Press, 1972.

## CE1019 – REPAIR AND REHABILITATION OF STRUCTURES

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

### **UNIT I CONCRETE - INFLUENCE ON SERVICEABILITY AND DURABILITY 9**

Quality assurance for concrete construction as built concrete properties strength permeability – Thermal properties and cracking – Effects due to climate – Temperature – Chemicals – Wear and erosion – Design and construction errors – Corrosion mechanism – Effects of cover thickness and cracking – Methods of corrosion protection – Corrosion inhibitors – Corrosion resistant steels – Coatings – Cathodic protection.

### **UNIT II MAINTENANCE AND REPAIR STRATEGIES 9**

Definitions – Maintenance, repair and rehabilitation – Facets of maintenance importance of maintenance preventive measures on various aspects inspection – Assessment procedure for evaluating damaged structure causes of deterioration – Testing techniques.

### **UNIT III MATERIALS FOR REPAIR 9**

Special concretes and mortar – Concrete chemicals – Special elements for accelerated strength gain – Expansive cement – Polymer concrete, sulphur infiltrated concrete, ferro cement – Fibre reinforced concrete.

### **UNIT IV TECHNIQUES FOR REPAIR 9**

Rust eliminators and polymers coating for rebars during repair foamed concrete – Mortar and dry pack – Vacuum concrete – Guniting and shotcrete Epoxy injection – Mortar repair for cracks – Shoring and underpinning.

### **UNIT V EXAMPLES OF REPAIR TO STRUCTURES - DEMOLITION 9**

Repairs to overcome low member strength – Deflection – Cracking – Chemical disruption – weathering wear – Fire, leakage – Marine exposure – Engineered demolition techniques for dilapidated structures – Case studies.

**Total: 45**

### **TEXT BOOKS**

1. Denison Campbell, Allen and Harold Roper, “Concrete Structures”, Materials, Maintenance and Repair Longman Scientific and Technical, 1991.
2. Allen, R.T. and Edwards, S.C., “Repair of Concrete Structures”, Blakie and Sons, 1987.

### **REFERENCES**

1. Shetty, M.S., “Concrete Technology - Theory and Practice”, S.Chand and Company, 1992.
2. Raikar, R.N., “Learning from failures - Deficiencies in Design”, Construction and Service - R and D Centre (SDCPL), Raikar Bhavan, 1987.

## **CE1020 – EXPERIMENTAL TECHNIQUES AND INSTRUMENTATION**

**L T P C**  
**3 0 0 3**

### **UNIT I FORCES AND STRAIN MEASUREMENT 9**

Strain gauge – Principle – Types – Performance and uses – Photo elasticity – Principle and applications – Moire Fringe – Hydraulic jacks and pressure gauges – Electronic load cells – Proving rings – Calibration of testing machines.

### **UNIT II VIBRATION MEASUREMENTS 9**

Characteristics of structural vibrations – Linear Variable Differential Transformer (LVDT)– Transducers for velocity and acceleration measurements.

Vibration meter – Seismographs – Vibration analyzer – Display and recording of signals – Cathode Ray Oscilloscope – XY Plotter – Chart plotters – Digital data acquisition systems.

### **UNIT III ACOUSTICS AND WIND FLOW MEASURES 9**

Principles of Pressure and flow measurements – Pressure transducers – Sound level meter – Venturimeter and flow meters – Wind tunnel and its use in structural analysis – Structural modeling – Direct and indirect model analysis.

### **UNIT IV DISTRESS MEASUREMENTS AND CONTROL 9**

Diagnosis of distress in structures – Crack observation and measurements – Corrosion of reinforcement in concrete – Half cell, construction and use – Damage assessment – Controlled blasting for demolition.

### **UNIT V NON DESTRUCTIVE TESTING METHODS 9**

Load testing on structures, buildings, bridges and towers – Rebound hammer – Acoustic emission – Ultrasonic testing principles and application – Holography – Use of laser for structural testing – Brittle coating.

**Total: 45**

### **TEXT BOOKS**

1. Dalley, J.W. and Riley, W.F., “Experimental Stress Analysis”, Mc Graw Hill Book Company, 1991.
2. Sadhu Singh , “Experimental Stress Analysis”, Khanna Publishers, 1996.

### **REFERENCES**

1. Garas, F.K., Clarke, J.L. and Armer, G.S.T., “Structural Assessment”, Butterworths, 1987.
2. Bray, D.E. and Stanley, R.K., “Non-destructive Evaluation”, Mc Graw Hill Publishing Company, 1989.