ANNA UNIVERSITY CHENNAI :: CHENNAI 600 025

CURRICULUM 2004

B.E. CIVIL ENGINEERING

SEMESTER III

(Applicable to the students admitted from the Academic year 2006 – 2007 onwards)

Code No.	Course Title	L	T	P	M
THEORY					
MA1201	Mathematics – III	3	1	0	100
CY1201	Environmental Science and Engineering	3	0	0	100
AG1201	Applied Geology	3	0	0	100
CE1201	Mechanics of Solids	3	1	0	100
CE1202	Mechanics of Fluids	3	1	0	100
CE1203	Construction Techniques, Equipment and Practice	4	0	0	100
CE1204	Surveying– I	3	0	0	100
PRACTICAL					
CE1205	Survey Practical – I	0	0	4	100
CE1206	Computer Aided Building Drawing	0	0	4	100

SEMESTER IV

(Applicable to the students admitted from the Academic year 2006 – 2007 onwards)

Code No.	Course Title	L	T	P	M
THEORY					
MA1251	Numerical Methods	3	1	0	100
CE1251	Mechanics of Soils	3	0	0	100
CE1252	Strength of Materials	3	1	0	100
CE1253	Applied Hydraulic Engineering	3	1	0	100
CE1254	Surveying – II	3	0	0	100
CE1255	Highway Engineering	3	0	0	100
PRACTICAL					
CE1256	Strength of Materials Lab	0	0	3	100
CE1257	Hydraulic Engineering Laboratory	0	0	3	100
CE1258	Survey Practical – II	0	0	4	100
GE1302	Communication Skills and Seminar **	0	0	2	**

SEMESTER V
(Applicable to the students admitted from the Academic year 2006 – 2007 onwards)

Code No.	Course Title	L	T	P	M
THEORY					
CE1301	Irrigation Engineering	4	0	0	100
CE1302	Structural Analysis – Classical methods	3	1	0	100
CE1303	Railways, Docks & Harbours and Airports	4	0	0	100
CE1304	Environmental Engineering	3	0	0	100
CE1305	Foundation Engineering	3	0	0	100
E1***	Elective – I	3	0	0	100
PRACTICAL					
CE1306	Environmental Engineering Laboratory	0	0	3	100
CE1307	Soil Engineering Laboratory	0	0	3	100
GE1303	Communication Skills and Technical Seminar **	0	0	2	**

SEMESTER VI
(Applicable to the students admitted from the Academic year 2006 – 2007 onwards)

Code No.	Course Title	L	T	P	M
THEORY					
MG1351	Principles of Management	3	0	0	100
CE1351	Structural Analysis – Modern methods	3	1	0	100
CE1352	Design of Steel Structures	4	2	0	100
CE1353	Construction Planning & Scheduling	3	0	0	100
CE1354	Design of RC Elements	3	0	0	100
E2***	Elective – II	3	0	0	100
PRACTICAL					
CE1355	Irrigation Engineering Drawing	0	0	3	100
CE1356	Environmental Engineering Drawing	0	0	3	100
CE1357	Survey Camp	-	-	-	100
GE1351	Presentation Skills and Technical Seminar **	0	0	3	0

SEMESTER VII
(Applicable to the students admitted from the Academic year 2006 – 2007 onwards)

Code No.	Course Title	L	T	P	M
THEORY					
CE1401	Design of RC and Reinforced Brick Masonry Structures	4	2	0	100
CE1402	Estimation and Quantity Surveying	3	0	0	100

Code No.	Course Title	L	T	P	M
CE1403	Basics of Dynamics and Aseismic Design	3	0	0	100
CE1404	Building Services	3	0	0	100
E3***	Elective – III	3	0	0	100
E4***	Elective – IV				
PRACTICAL					
CE1405	Computer Aided Design and Drafting Laboratory	0	0	4	100
CE1406	Design Project	0	0	4	100

SEMESTER VIII

(Applicable to the students admitted from the Academic year 2006 – 2007 onwards)

Code No.	Course Title	L	T	P	M
THEORY					
CE1451	Engineering Economics and Cost Analysis	3	0	0	100
E5***	Elective – V	3	0	0	100
E6***	Elective – VI	3	0	0	100
PRACTICAL					
CE1452	Comprehension**	0	0	3	0
CE1453	Project Work	0	0	6	200

** No Examination

LIST OF ELECTIVES
SEMESTER V

Code No.	Course Title	L	T	P	M
MA1253	Probability and Statistics	3	0	0	100
CE1036	Architecture	3	0	0	100
GE1301	Professional Ethics and Human Values	3	0	0	100
CE1004	Remote Sensing Techniques and Applications	3	0	0	100
GE1001	Intellectual Property Rights (IPR)	3	0	0	100

SEMESTER VI

Code No.	Course Title	L	T	P	M
EC1022	Object Oriented Programming	3	0	0	100
GE1002	Indian Constitution and Society	3	0	0	100
CE1001	Hydrology	3	0	0	100
CE1003	Electronic Surveying	3	0	0	100
MG1401	Total Quality Management	3	0	0	100
CE1002	Cartography	3	0	0	100

SEMESTER VII

Code No.	Course Title	L	T	P	M
CE1005	Geographical Information System	3	0	0	100
GE1003	Contract Laws and Regulations	3	0	0	100
CE1006	Traffic Engineering Management	3	0	0	100
CE1007	Housing Planning & Management	3	0	0	100
CE1008	Habitat Systems and Design	3	0	0	100
CE1009	Ground Water Engineering	3	0	0	100
CE1010	Management of Irrigation Systems	3	0	0	100
CE1011	Coastal Zone Management	3	0	0	100
CE1012	Water Resources Engineering	3	0	0	100
CE1013	Pavement Engineering	3	0	0	100
CE1014	Ground Improvement Techniques	3	0	0	100
CE1015	Introduction to Soil Dynamics and Machine Foundations	3	0	0	100
CE1016	Rock Engineering	3	0	0	100
CE1017	Environmental Impact Assessment of Civil Engineering Projects	3	0	0	100
CE1018	Industrial Waste Management	3	0	0	100
CE1019	Air Pollution Management	3	0	0	100
CE1020	Municipal Solid Waste and Management	3	0	0	100
CE1021	Ecological Engineering	3	0	0	100

SEMESTER VIII

Code No.	Course Title	L	T	P	M
CE1022	Bridge Structures	3	0	0	100
CE1023	Storage Structures	3	0	0	100
CE1024	Design of Plate and Shell Structures	3	0	0	100
CE1025	Tall Buildings	3	0	0	100
CE1026	Structural Dynamics	3	0	0	100
CE1027	Prefabricated structures	3	0	0	100
CE1028	Wind Engineering	3	0	0	100
CE1029	Computer Aided Design of Structure	3	0	0	100
CE1030	Pre-stressed Concrete Structures	3	0	0	100
CE1031	Industrial Structures	3	0	0	100
CE1032	Smart Structures and smart Materials	3	0	0	100
CE1033	Finite Element Technique	3	0	0	100
CE1034	Earthquake Engineering	3	0	0	100
CE1035	Repair and Rehabilitation of Structures	3	0	0	100

MA1201   **MATHEMATICS III**   **3 1 0 100**
                            (Common to all branches)

OBJECTIVES

The course objective is to develop the skills of the students in the areas of boundary value problems and transform techniques. This will be necessary for their effective studies in a large number of engineering subjects like heat conduction, communication systems, electro-optics and electromagnetic theory. The course will also serve as a prerequisite for post graduate and specialized studies and research.

1.   PARTIAL DIFFERENTIAL EQUATIONS   9

Formation of partial differential equations by elimination of arbitrary constants and arbitrary functions – Solution of standard types of first order partial differential equations – Lagrange's linear equation – Linear partial differential equations of second and higher order with constant coefficients.

2.   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 identify – Harmonic Analysis.

3.   BOUNDARY VALUE PROBLEMS   9

Classification of second order quasi linear partial differential equations – Solutions of one dimensional wave equation – One dimensional heat equation – Steady state solution of two-dimensional heat equation (Insulated edges excluded) – Fourier series solutions in Cartesian coordinates.

4.   FOURIER TRANSFORM   9

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

5.   Z -TRANSFORM AND DIFFERENCE EQUATIONS   9

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

TUTORIALS   15

TOTAL : 60

TEXT BOOKS
1.   Grewal, B.S., "Higher Engineering Mathematics", Thirty Sixth Edition, Khanna Publishers, Delhi, 2001.
2.   Kandasamy, P., Thilagavathy, K., and Gunavathy, K., "Engineering Mathematics Volume III", S. Chand & Company ltd., New Delhi, 1996.
3.   Wylie C. Ray and Barrett Louis, C., "Advanced Engineering Mathematics", Sixth Edition, McGraw-Hill, Inc., New York, 1995.

REFERENCES

1.   Andrews, L.A., and Shivamoggi B.K., "Integral Transforms for Engineers and Applied Mathematicians," Macmillen , New York ,1988.
2.   Narayanan, S., Manicavachagom Pillay, T.K. and Ramaniah, G., "Advanced Mathematics for Engineering Students", Volumes II and III, S. Viswanathan (Printers and Publishers) Pvt. Ltd. Chennai, 2002.
3.   Churchill, R.V. and Brown, J.W., "Fourier Series and Boundary Value Problems", Fourth Edition, McGraw-Hill Book Co., Singapore, 1987.

CY1201   ENVIRONMENTAL SCIENCE AND ENGINEERING   3 0 0 100

AIM

The aim of this course is to create awareness in every engineering graduate about the importance of environment, the effect of technology on the environment and ecological balance and make him/her sensitive to the environment problems in every professional endeavor that he/she participates.

OBJECTIVE

At the end of this course the student is expected to understand what constitutes the environment, what are precious resources in the environment, how to conserve these resources, what is the role of a human being in maintaining a clean environment and useful environment for the future generations and how to maintain ecological balance and preserve bio-diversity.

UNIT I INTRODUCTION TO ENVIRONMENTAL STUDIES AND NATURAL RESOURCES   10

Definition, scope and importance – Need for public awareness – Forest resources: Use and over-exploitation, deforestation, case studies. Timber extraction, mining, dams and their effects on forests and tribal people – Water resources: Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems – Mineral resources: Use 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.

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

UNIT II   ECOSYSTEMS AND BIODIVERSITY   14

Concept 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.

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

UNIT III   ENVIRONMENTAL POLLUTION   8

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 – Soil 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.
Field Study of local polluted site – Urban / Rural / Industrial / Agricultural

UNIT IV   SOCIAL ISSUES AND THE ENVIRONMENT   7

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   6

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.

TOTAL : 45

TEXT BOOKS

1.   Gilbert M.Masters, Introduction to Environmental Engineering and Science, Pearson Education Pvt., Ltd., Second Edition, ISBN 81-297-0277-0, 2004.
2.   Miller T.G. Jr., Environmental Science, Wadsworth Publishing Co.
3.   Townsend C., Harper J and Michael Begon, Essentials of Ecology, Blackwell Science.
4.   Trivedi R.K. and P.K. Goel, Introduction to Air Pollution, Techno-Science Publications.

REFERENCES

1.   Bharucha Erach, The Biodiversity of India, Mapin Publishing Pvt. Ltd., Ahmedabad India, Email: mapin@icenet.net
2.   Trivedi R.K., Handbook of Environmental Laws, Rules, Guidelines, Compliances and Standards, Vol. I and II, Enviro Media.
3.   Cunningham, W.P.Cooper, T.H.Gorhani, Environmental Encyclopedia, Jaico Publ., House, Mumbai, 2001.

4.   Wager K.D., Environmental Management, W.B. Saunders Co., Philadelphia, USA, 1998.

AG1201   APPLIED GEOLOGY   3 0 0 100

OBJECTIVE

At the end of this course the student shall be able to understand about geological formations, classification and morphology of rocks, and the importance of the study of geology for civil engineers with regard to founding structures like dams, bridges, buildings, etc. The student shall also be able to appreciate the importance of geological formation in causing earthquakes and land slides.

1.   GENERAL GEOLOGY   9

Geology in Civil Engineering – Branches of geology – Earth Structures and composition – Elementary knowledge on continental drift and plate technologies. 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

2.   MINERALOGY   9

Elementary knowledge on symmetry elements of important crystallographic systems – physical properties of minerals – study of the following rock forming minerals – Quartz family. Feldpar 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.

3.   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 conglo, Conglomerate and breccia. Metamorphic rocks. Quartizite, Marble, Slate, Phyllite, Gniess and Schist.

4.   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

5.   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

CE1201   **MECHANICS OF SOLIDS**   3 1 0 100

OBJECTIVE

The subject of Mechanics of Solids cuts broadly across all branches of engineering profession. At the end of this course, the student will have knowledge about behaviour of members subjected to various type of forces. The subject can be mastered best by solving numerous problems.

1.   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, modules 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.

2.   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.

3.   TRANSVERSE LOADING ON BEAMS   9

Beams – types of supports – simple and fixed, types of load – concentrated, uniformly distributed, varying distributed load, combination of above loading – relationship between bending moment and shear force – bending moment, 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

4.   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, I sections, solid circular sections, hollow circular sections, angle and channel sections – shear flow – shear centre.

5.   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.

TUTORIALS   15

TOTAL : 60

TEXT BOOKS

1.   Egor P Popov, Engineering Mechanics of Solids, Prentice Hall of India, New Delhi, 2003
2.   V. N. Vazirani, M.M. Ratwani, Analysis of Structures, Volume – 1, Khanna Publishers, New Delhi

REFERENCES

1.   Kazimi S.M.A, Solid Mechanics, Tata McGraw-Hill Publishing Co, New Delhi, 2003.
2.   William Nash, Theory and Problems of Strength of Materials, Schaum's Outline Series, McGraw-Hill International Edition.
3.   Srinath L.N, Advanced Mechanics of Solids, Tata McGraw-Hill Publishing Co., New Delhi, 2003.

CE1202   **MECHANICS OF FLUIDS**   **3 1 0 100**

OBJECTIVE

The student is introduced to the definition and properties of fluid. Principles of fluid statics, kinematics and dynamics are dealt with subsequently. The application of similitude and model study are covered subsequently. After undergoing this course, the student would have learnt fluid properties and application to real situations of fluid flow.

1.   DEFINITIONS AND FLUID PROPERTIES   5

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

2.   FLUID STATICS & 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 (Pilot tube, current meter, Hot wire and hot film anemometer, float technique, Laser Doppler velocimetry)

3.   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

4.   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

5.   SIMILITUDE AND MODEL STUDY   10

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

TUTORIALS   15

TOTAL : 60

TEXT BOOKS

1.   Kumar, K.L., "Engineering Fluid Mechanics", Eurasia Publishing House (P) Ltd., New Delhi, 1995.
2.   Garde, R.J. and Mirajgaoker, A.G., "Engineering Fluid Mechanics", Nem Chand Bros., Roorkee
3.   Rajput, R.K., "A text book of Fluid Mechanics in SI Units"
4.   Fox, Robert, W. and Macdonald, Alan,T., "Introduction to Fluid Mechanics", John Wiley & Sons, 1995

REFERENCES

1. Streeter, Victor, L. and Wylie, Benjamin E., "Fluid Mechanics", McGraw-Hill Ltd., 1998.
2. E. John Finnemore and Joseph B. Franzini, "Fluid Mechanics with Engineering Applications", McGraw-Hill International Edition.
3. Pernard Messay, "Mechanics of Fluids" 7th Edition, Nelson Thornes Ltd. U. K. 1998.

CE1203   CONSTRUCTION TECHNIQUES, EQUIPMENT AND PRACTICES

4 0 0 100

OBJECTIVE

The main objective of this course is to make the student aware of the various construction techniques, practices and the equipment needed for different types of construction activities. At the end of this course the student shall have a reasonable knowledge about the various construction procedures for sub to super structure and also the equipment needed for construction of various types of structures from foundation to super structure.

1.   CONSTRUCTION PRACTICES   15

Specifications, details and sequence of activities and construction co-ordination – Site Clearance – Marking – Earthwork - masonry – stone 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.

2.   SUB STRUCTURE CONSTRUCTION   15

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.

3.   SUPER STRUCTURE CONSTRUCTION   15

Launching girders, bridge decks, off shore platforms – special forms for shells - techniques for heavy decks – in-situ pre-stressing in high rise structures, aerial transporting handling - erecting light weight components on tall structures -erection of transmission towers - Construction sequences in cooling towers, silos, chimney, sky scrapers, bow string bridges, cable stayed bridges -Support structure for heavy Equipment and conveyors -Erection of articulated structures, braced domes and space decks

4.   EPAIR AND REHABILITATION   5

Study on causes of building damage and deterioration – Assessment of materials and methods of repair and restoration.

5.   CONSTRUCTION EQUIPMENT   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, drilling, blasting — dewatering and pumping equipment – Transporters.

TOTAL : 60

TEXT BOOKS

1. Peurifoy, R.L., Ledbetter, W.B. and Schexnayder, C., "Construction Planning, Equipment and Methods", 5th Edition, McGraw Hill, Singapore, 1995.
2. Arora S.P. and Bindra S.P., Building Construction, Planning Techniques and Method of Construction, Dhanpat Rai and Sons, 1997.

REFERENCES

1. Jha J and Sinha S.K., Construction and Foundation Engineering, Khanna Publishers, 1993.
2. Sharma S.C. "Construction Equipment and Management", Khanna Publishers New Delhi, 1988.
3. Deodhar, S.V. "Construction Equipment and Job Planning", Khanna Publishers, New Delhi, 1988.
4. Dr. Mahesh Varma, "Construction Equipment and its Planning and Application", Metropolitan Book Company, New Delhi-, 1983.

CE1204   SURVEYING I   3 0 0 100

OBJECTIVE

At the end of the course the student will posses knowledge about Chain surveying, Compass surveying, Plane table surveying, Levelling, Theodolite surveying and Engineering surveys.

1.   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.

2.   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.

3.   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.

4.   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.

5.   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 - Compound and reverse curves - Transition curves - Functions and requirements - Setting out by offsets and angles - Vertical curves - Sight distances - Mine Surveying - instruments - Tunnels - Correlation of under ground and surface surveys - Shafts - Adits.

TOTAL : 45

TEXT BOOKS

1. Bannister A. and Raymond S., Surveying, ELBS, Sixth Edition, 1992.
2. Kanetkar T.P., Surveying and Levelling, Vols. I and II, United Book Corporation, Pune, 1994.

REFERENCES

1. Clark D., Plane and Geodetic Surveying, Vols. I and II, C.B.S. Publishers and Distributors, Delhi, Sixth Edition, 1971.
2. James M.Anderson and Edward M.Mikhail, Introduction to Surveying, McGraw-Hill Book Company, 1985.
3. Heribert Kahmen and Wolfgang Faig, Surveying, Walter de Gruyter, 1995.
4. Punmia B.C. Surveying, Vols. I, II and III, Laxmi Publications, 1989

CE1205   SURVEY PRACTICAL I   0 0 4 100

OBJECTIVE

At the end of the course the student will posses knowledge about Survey field techniques

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

TOTAL : 60

SURVEY PRACTICAL I & SURVEY PRACTICAL II

LIST OF EQUIPMENTS
(For a batch of 30 students)

SI. No.	Description of Equipments	Quantity
1.	Theodolites	Atleast 1 for every 10 students

2.	Dumpy level	Atleast 1 for every 10 students
3.	Plain table	Atleast 1 for every 10 students
4.	Pocket stereoscope	1
5.	Ranging rods	
6.	Leveling staff	
7.	Cross staff	1 for a set of 5 students
8.	Chains	
9.	Tapes	
10.	Arrows	

CE1206   **COMPUTER AIDED BUILDING DRAWING**   **0 0 4 100**

OBJECTIVE

At the end of this course the student should be able to draft on computer building drawings (Plan, elevation and sectional views) in accordance with development and control rules satisfying orientation and functional requirements for the following:

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

TEXT BOOKS

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

REFERENCES

1. Building drawing – Shah, Tata McGraw-Hill
2. Building planning & Drawing – Dr. N. Kumaraswamy, A. Kameswara Rao, Charotar Publishing
3. Shah, Kale and Patki, Building Drawing, 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)

SI. 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 & Drafting software	1 copy for a set of 3 students

MA1251   NUMERICAL METHODS   3 1 0 100

AIM

> With the present development of the computer technology, it is necessary to develop efficient algorithms for solving problems in science, engineering and technology. This course gives a complete procedure for solving different kinds of problems occur in engineering numerically.

OBJECTIVES

At the end of the course, the students would be acquainted with the basic concepts in numerical methods and their uses are summarized as follows:

  i. The roots of nonlinear (algebraic or transcendental) equations, solutions of large system of linear equations and eigen value problem of a matrix can be obtained numerically where analytical methods fail to give solution.

  ii. When huge amounts of experimental data are involved, the methods discussed on interpolation will be useful in constructing approximate polynomial to represent the data and to find the intermediate values.

  iii. The numerical differentiation and integration find application when the function in the analytical form is too complicated or the huge amounts of data are given such as series of measurements, observations or some other empirical information.

  iv. Since many physical laws are couched in terms of rate of change of one/two or more independent variables, most of the engineering problems are characterized in the form of either nonlinear ordinary differential equations or partial differential equations. The methods introduced in the solution of ordinary differential equations and partial differential equations will be useful in attempting any engineering problem.

1. SOLUTION OF EQUATIONS AND EIGENVALUE PROBLEMS 9

> Linear interpolation methods (method of false position) – Newton's method – Statement of fixed point theorem – Fixed point iteration: x=g(x) method – Solution of linear system by Gaussian elimination and Gauss-Jordon methods - Iterative methods: Gauss Jacobi and Gauss-Seidel methods - Inverse of a matrix by Gauss Jordon method – Eigen value of a matrix by power method.

2. INTERPOLATION AND APPROXIMATION 9

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

3. NUMERICAL DIFFERENTIATION AND INTEGRATION 9

> Derivatives from difference tables – Divided differences and finite differences –Numerical integration by trapezoidal and Simpson's 1/3 and 3/8 rules – Romberg's method – Two and Three point Gaussian quadrature formulas – Double integrals using trapezoidal and Simpsons's rules.

4. INITIAL VALUE PROBLEMS FOR ORDINARY DIFFERENTIAL EQUATIONS 9

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

5. **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.   C.F. Gerald and P.O. Wheatley, 'Applied Numerical Analysis', Sixth Edition, Pearson Education Asia, New Delhi, 2002.

2.   E. Balagurusamy, 'Numerical Methods', Tata McGraw Hill Pub.Co.Ltd, New Delhi, 1999.

REFERENCE BOOKS

1.   P. Kandasamy, K. Thilagavathy and K. Gunavathy, 'Numerical Methods', S.Chand Co. Ltd., New Delhi, 2003.

2.   R.L. Burden and T.D. Faires, 'Numerical Analysis', Seventh Edition, Thomson Asia Pvt. Ltd., Singapore, 2002.

CE1251   MECHANICS OF SOILS   3 0 0 100

OBJECTIVE

After undergoing this course, the student gains adequate knowledge on engineering properties of soil.

1.   INTRODUCTION   10

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.

2.   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.

3.   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

4.   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, UCC 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.

5.   SLOPE STABILITY   8

Slope failure mechanisms - Modes - Infinite slopes - Finite slopes – Total and effective stress analysis - Stability analysis for purely cohesive and C-ϕ soils - Method of slices – Modified Bishop's method - Friction circle method - stability number – problems – Slope protection measures.

TOTAL : 45

TEXT BOOKS:

1.   Punmia P.C., "Soil Mechanics and Foundations", Laximi Publications Pvt. Ltd., New Delhi, 1995.
2.   Gopal Ranjan and Rao A.S.R., "Basic and applied soil mechanics", New Age International Publishers, New Delhi, 2000.
3.   Venkatramaiah, C. "Geotechnical Engineering", New Age International Publishers, New Delhi, 1995
4.   Khan I.H., "A text book of Geotechnical Engineering", Prentice Hall of India, New Delhi, 1999.

REFERENCES

1.   Coduto, D.P., "Geotechnical Engineering Principles and Practices", Prentice Hall of India Private Limited, New Delhi, 2002.
2.   McCarthy D.F., "Essentials of Soil Mechanics and Foundations Basic Geotechniques", Sixth Edition, Prentice-Hall, New Jersey, 2002.
3.   Das, B.M, "Principles of Geotechnical Engineering", (fifth edition), Thomas Books/ cole, 2002
4.   Muni Budhu, "Soil Mechanics and Foundations", John Willey & Sons, Inc, New York, 2000.

CE1252   STRENGTH OF MATERIALS   3 1 0 100

OBJECTIVE

This subject is useful for a detailed study of forces and their effects along with some suitable protective measures for the safe working condition. This knowledge is very essential for an engineer to enable him in designing all types of structures and machines.

1.   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

2.   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)

3. 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.

4. STATE OF STRESS IN THREE DIMENSIONS 9

Spherical and deviatory 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

5. ADVANCED TOPICS IN BENDING OF BEAMS 9

Unsymmetrical bending of beams of symmetrical and unsymmetrical sections – curved beams – Winkler Bach formula – stress concentration – fatigue and fracture.

TUTORIALS   15

TOTAL : 60

TEXT BOOKS

1.   Egor P Popov, "Engineering Mechanics of Solids", Prentice Hall of India, New Delhi, 2003
2.   V.N. Vazirani, M.M.Ratwani, "Analysis of Structures", Vol-1, Khanna Publishers, New Delhi

REFERENCES

1.   Kazimi S.M.A, "Solid Mechanics", Tata McGraw-Hill Publishing Co., New Delhi, 2003
2.   William Nash, "Theory and Problems of Strength of Materials", Schaum's Outline Series, McGraw Hill International Edition
3.   R.S. Khurmi, "Strength of Materials", S. Chand & Company Ltd, New Delhi, 2003

CE1253   **APPLIED HYDRAULIC ENGINEERING**   **3 1 0 100**

OBJECTIVE

Student is introduced to open channel flow characteristics including hydraulic jump and surges. Hydraulic machines viz flow through turbines and pumps including their performance characteristics and design aspects are taught. Student, at the end of the semester will have the abilities to analyse flow characteristics in open channel and design hydraulic machines.

1. OPEN CHANNEL FLOW 8

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

2. UNIFORM FLOW 8

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

3. VARIED FLOW 10

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 – Surge channel transitions.

4. TURBINES 10

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

5. 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.

TUTORIAL 15
TOTAL : 60

TEXT BOOKS

1. Subramanya K., "Flow in Open channels", Tata McGraw-Hill Publishing Company, 1994.
2. Kumar K.L., "Engineering Fluid Mechanics", Eurasia Publishing House (P) Ltd., New Delhi, (7th Edition), 1995.
3. Jain A.K., "Fluid Mechanics (including Hydraulic Machines)", Khanna Publishers, 8th edition, 1995.
4. Ranga Raju, K.G., "Flow through Open Channels", Tata McGraw-Hill, 1985

CE1254   SURVEYING II   3 0 0 100

OBJECTIVE

At the end of the course the student will posses knowledge about Tachometric surveying, Control surveying, Survey adjustments, Astronomical surveying and Photogrametry.

1. TACHEOMETRIC SURVEYING 6

Tacheometric 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.

2. CONTROL SURVEYING 8

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

3. 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.

4. 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 - Practical astronomy - Field observations and calculations for azimuth.

5. OTHER TOPICS 12

Photogrammetry - Introduction - Terrestial and aerial Photographs - Stereoscopy - Parallax - Electromagnetic distance measurement - Carrier waves - Principles - Instruments - Trilateration - 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 - Cartography - Cartographic concepts and techniques - Cadastral surveying - Definition - Uses - Legal values - Scales and accuracies.

TOTAL : 45

TEXT BOOKS

1. Bannister A. and Raymond S., Surveying, ELBS, Sixth Edition, 1992.
2. Punmia B.C., Surveying, Vols. I, II and III, Laxmi Publications, 1989.

REFERENCES

1. Clark D., Plane and Geodetic Surveying, Vols. I and II, C.B.S. Publishers and Distributors, Delhi, Sixth Edition, 1971.
2. James M.Anderson and Edward M.Mikhail, Introduction to Surveying, McGraw-Hill Book Company, 1985.
3. Wolf P.R., Elements of Photogrammetry, McGraw-Hill Book Company, Second Edition, 1986.
4. Robinson A.H., Sale R.D. Morrison J.L. and Muehrche P.C., Elements of Cartography, John Wiley and Sons, New York, Fifth Edition, 1984.
5. Heribert Kahmen and Wolfgang Faig, Surveying, Walter de Gruyter, 1995.
6. Kanetkar T.P., Surveying and Levelling, Vols. I and II, United Book Corporation, Pune, 1994.

CE1255   HIGHWAY ENGINEERING   3 0 0 100

OBJECTIVE

The objective of the course is to educate the students on the various components of Highway Engineering. It exposes the students to highway planning, engineering surveys for highway alignment, Design of Geometric Elements of Highways and Urban roads, Rigid and Flexible pavements design. The students further learn the desirable properties of highway materials and various practices adopted for construction. This course enables the students to develop skill on evaluation of the pavements and to decide appropriate types of maintenance.

1. HIGHWAY PLANNING AND ALIGNMENT 9

Tresaguet and Macadam's method of Road Construction, Highway Development in India - Jayakar Committee Recommendations and Realisations, Twenty-year Road Development Plans, Concepts of On-going Highway Development Programmes at National Level,

Institutions for Highway Development at National level - Indian Roads Congress, Highway Research Board, National Highway Authority of India, Ministry of Road Transport and Highways (MORTH) and 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 (IRC),

Highway Cross Sectional Elements – Right of Way, Carriage Way, Camber, Kerbs, Shoulders and Footpaths [IRC Standards], Cross sections of different Class of Roads.

2. GEOMETRIC DESIGN OF HIGHWAYS 9

Design of Horizontal Alignments – Superelevation, Widening of Pavements on Horizontal Curves and Transition Curves [Derivation of Formulae and Problems]

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 (OSD), 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]

3. DESIGN OF RIGID AND FLEXIBLE 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-Problems] – Joints

4. HIGHWAY MATERIALS AND CONSTRUCTION PRACTICE 9

Desirable Properties and Testing of Highway Materials: - (Tests have to be demonstrated in Highway Engineering Laboratory)

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 specifications]

Highway Drainage [IRC Recommendations]

5. 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 – and Special Repairs.

Pavement Evaluation – Pavement Surface Conditions and Structural Evaluation, Evaluation of pavement Failure and strengthening -

Overlay design by Benkelman Beam Method [Procedure only], Principles of Highway Financing

TOTAL : 45

TEXT BOOKS

1. Khanna K and Justo C E G, Highway Engineering, Khanna Publishers, Roorkee, 2001.

2.   Kadiyali L R, Principles and Practice of Highway Engineering, Khanna Technical Publications, Delhi, 2000.

REFERENCES

1.   IRC Standards (IRC 37 - 2001 & IRC 58 -1998)
2.   Bureau of Indian Standards (BIS) Publications on Highway Materials
3.   Specifications for Road and Bridges, MORTH (India)

CE1256   STRENGTH OF MATERIALS LABORATORY   0 0 3 100

OBJECTIVE

The experimental work involved in this laboratory should make the student understand the fundamental modes of loading of the structures and also make measurements of loads, displacements and strains. Relating these quantities, the student should be able to obtain the strength of the material and stiffness properties of structural elements.

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

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
2.	Torsion testing machine for steel rods	1
3.	Izod impact testing machine	1
4.	Hardness testing machine Rockwell Vicker's } (any 2) Brinnel	1 each
5.	Beam deflection test apparatus	1
6.	Extensometer	1
7.	Compressometer	1
8.	Dial gauges	Few

CE1257 HYDRAULIC ENGINEERING LAB   **0 0 3 100**

OBJECTIVE

Student should be able to verify the principles studied in theory by conducting the experiments.

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.

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
       Pirot tube assembly   -   **1 No.**

4.   Flow measurement
   open channel flow
     (i)   Channel with provision for fixing notches
         (rectangular, triangular & trapezoidal forms)   -   1 Unit
     (ii)   Flume assembly with provisions for conducting
         experiments on Hydraulic jumps, generation of
         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 & 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 & 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 & accessories	- 1 Unit
	(ii)	Francis turbine assembly with fittings & accessories	- 1 Unit
	(iii)	Kaplan turbine assembly with fittings & accessories	- 1 Unit

CE1258   SURVEY PRACTICAL II   0 0 4 100

OBJECTIVE

At the end of the course the student will posses knowledge about Survey field techniques.
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. Demonstration of EDM.

                                            TOTAL : 60

CE1301   **IRRIGATION ENGINEERING**   **4 0 0 100**

OBJECTIVE

At the end of the semester, the student shall understand the need and mode of irrigation. The student also shall know the irrigation management practices of the past, present and future. The structures involved, the elementary hydraulic design of different structures and the concepts of maintenance shall also form part. Finally, the student shall be in a position to conceive and plan any type of irrigation project.

1.   INTRODUCTION   12

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.

2.   IRRIGATION METHODS   10

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

3.   DIVERSION AND IMPOUNDING STRUCTURES   14

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.

4.   CANAL IRRIGATION   14

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.

5.   IRRIGATION WATER MANAGEMENT   10

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 : 60

TEXT BOOKS
1.   Asawa, G.L., "Irrigation Engineering", New Age International Publishers
2.   Sharma R.K., and Sharma T.K., "Irrigation Engineering", S. Chand and company, New Delhi
3.   Gupta, B.L, & Amir Gupta, "Irrigation Engineering", Satya Praheshan, New Delhi

     REFERENCES

1.   Dilip Kumar Majumdar, "Irrigation Water Management (Principles & Practices)", Prentice

        Hall of India (P), Ltd.

2.   Basak, N.N, "Irrigation Engineering", Tata McGraw-Hill Publishing Co.
3.   Garg, S.K., "Irrigation Engineering"

CE1302   STRUCTURAL ANALYSIS – CLASSICAL METHODS   3 1 0 100

OBJECTIVE

The members of a structure are subjected to internal forces like axial forces, shearing forces, bending and torsional moments while transferring the loads acting on it. Structural analysis deals with analysing these internal forces in the members of the structures. At the end of this course students will be conversant with classical method of analysis.

1.   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

2.   MOVING LOADS AND INFLUENCE LINES   9
              (DETERMINATE & 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 deformeter

3.   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.

4.   SLOPE DEFLECTION METHOD   9

Continuous beams and rigid frames (with and without sway) – Symmetry and antisymmetry – Simplification for hinged end – Support displacements.

5.   MOMENT DISTRIBUTION METHOD   9

Distribution and carry over of moments – Stiffness and carry over factors – Analysis of continuous beams – Plane rigid frames with and without sway – Naylor's simplification.

                                                                    TUTORIAL   15

                                                                    TOTAL : 60

TEXT BOOKS

1.   "Comprehensive Structural Analysis – Vol. 1 & Vol. 2", Vaidyanadhan, R and Perumal, P, Laxmi Publications, New Delhi, 2003

2.   "Structural Analysis", L.S. Negi & R.S. Jangid, Tata McGraw-Hill Publications, New Delhi, Sixth Edition, 2003

3.   "Intermediate Structures", Wang, C.K., McGraw-Hill

REFERENCES

1.   Analysis of Indeterminate Structures – C.K. Wang, Tata McGraw-Hill

CE1303   RAILWAYS, AIRPORTS AND DOCKS & HARBOURS   4 0 0 100

OBJECTIVE

This course imparts the students knowledge of planning, design, construction and maintenance of railway tracks. The students acquire proficiency in the application of modern techniques such as GIS, GPS and remote sensing in Railway Engineering. The student develops skills on airport planning and design with the prime focus on runway and taxiway geometrics. Students become conversant with the definition, purpose, location and materials of coastal structures such as piers, breakwaters, wharves, jetties, quays and spring fenders. The students acquire knowledge on site investigation for location and planning of harbours.

1.   RAILWAY PLANNING AND DESIGN   12

Role of Indian Railways in National Development -
Engineering Surveys for Track Alignment – Obligatory points - Conventional and Modern methods (Remote Sensing, GIS & GPS, EDM and other equipments)
Permanent Way, its Components and Functions of each Component:
Rails - Types of Rails, Rail Fastenings, Concept of Gauges, Coning of Wheels, Creeps and kinks
Sleepers – Functions, Materials, Density
Ballasts – Functions, Materials, Ballastless Tracks
Geometric Design of Railway Tracks – Gradients and Grade Compensation, Super-Elevation, Widening of Gauges in Curves, Transition Curves, Horizontal and Vertical Curves (Derivations of Formulae and Problems)

2.   RAILWAY TRACK CONSTRUCTION, MAINTENANCE AND OPERATION   12

Points and Crossings - Design of Turnouts, Working Principle
Signalling, Interlocking and Track Circuiting
Construction & Maintenance – Conventional, Modern methods and Materials, Track Drainage
Track Modernisation– Automated maintenance and upgrading, Technologies, Re-laying of Track, Lay outs of Railway Stations and Yards, Rolling Stock, Tractive Power, Track Resistance, Level Crossings

3.   AIRPORT PLANNING AND DESIGN   12

Advantages and Limitations of Air Transport, Components of Airports
Airport Planning – Air traffic potential, Site Selection, Design of Components, Cost Estimates, Evaluation and Institutional arrangements
Runway Design- Orientation, Cross wind Component, Wind rose Diagram (Problems), Geometric Design and Corrections for Gradients (Problems), Drainage
Taxiway Design – Geometric Design Elements, Minimum Separation Distances, Design Speed, Airport Drainage
Airport Zoning - Clear Zone, Approach Zone, Buffer Zone, Turning Zone, Clearance over Highways and Railways

4.   AIRPORT LAYOUTS, VISUAL AIDS, AND AIR TRAFFIC CONTROL   12

Airport Layouts – Apron, Terminal Building, Hangars, Motor Vehicle Parking Area and
Circulation Pattern, Case studies of Airport Layouts
Airport Buildings – Primary functions, Planning Concept, Principles of Passenger Flow, Passenger Facilities

Visual Aids – Runway and Taxiway Markings, Wind Direction Indicators, Runway and Taxiway Lightings
Air Traffic Control – Basic Actions, Air Traffic Control Network
Helipads, Hangars, Service Equipments.

5. **HARBOUR ENGINEERING & OTHER MODES OF TRANSPORT** 12

Definition of Terms - Harbours, Ports, Docks, Tides and Waves, Littoral Drift, Sounding, Area, Depth, Satellite Ports
Requirements and Classification of Harbours
Site Selection & Selection Investigation – Speed of water, Dredging, Range of Tides, Waves and Tidal Currents, Littoral Transport with Erosion and Deposition, Soundings, Anchoring Grounds, Geological Characteristics, Winds & Storms, Position and Size of Shoals
Shore Considerations- Proximity to Towns/Cities, Utilities, Construction Materials, Coast Lines
 Dry and Wet Docks,, Planning and Layouts
Entrance, Position of Light Houses, Navigating
Terminal Facilities – Port Buildings, Warehouse, Transit Sheds, Inter-modal Transfer Facilities, Mooring Accessories, Navigational Aids
Coastal Structures- Piers, Breakwaters, Wharves, Jetties, Quays, Spring Fenders
Coastal Shipping, Inland Water Transport and Container Transportation.
Pipe Ways, Rope Ways,

TOTAL : 60

TEXT BOOKS

1. Saxena Subhash C and Satyapal Arora, A Course in Railway Engineering, Dhanpat Rai and Sons, Delhi, 1998.
2. Khanna S K, Arora M G and Jain S S, Airport Planning and Design, Nemchand and Brothers, Roorkee, 1994.
3. S P Bindra, A Course in Docks and Harbour Engineering, Dhanpat Rai and Sons, New Delhi, 1993.

REFERENCES

1. Rangwala, Railway Engineering, Charotar Publishing House, 1995.
2. Rangwala, Airport Engineering, Charotar Publishing House, 1996.
3. Oza and Oza, "A course in Docks & Harbour Engineering".
4. J.S. Mundrey, "A course in Railway Track Engineering".

CE1304   ENVIRONMENTAL ENGINEERING   3 0 0 100

OBJECTIVE

This subject deals with treatment of water and wastewater including estimation of water and sanitary sewage (excluding industrial waste water). On completion of the course, the student is expected to know about the design principles involved in treatment of municipal water and wastewater. (The detailed design of treatment units are covered under the subject Environmental Engineering Design and hence the same is not covered under this subject).

1. **WATER SUPPLY SYSTEMS – SOURCE & CONVEYANCE** 6

Objectives – Population forecasting – Design period – Water demand characteristics – Sources of water – Source selection – Water quality parameters & significance – Standards – Intake

structures – Conveyance – Hydraulics – Laying, jointing & testing of pipes – Pump selection – appurtenances

2. DESIGN PRINCIPLES OF WATER TREATMENT   10

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

3. SEWERAGE SYSTEM : COLLECTION & TRANSMISSION   10

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

4. SEWAGE TREATMENT & DESIGN PRINCIPLES   10

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 & oxidation ditch – Trickling filter - Stabilisation ponds – Septic tanks with soak pits – Sludge: treatment and disposal – Biogas recovery – Sewage farming

5. 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 & II", Khanna Publishers, New Delhi
2.   Modi, P.N., "Environmental Engineering I & II", Standard Book House, Delhi – 6

REFERENCES

1.   Manual on Water Supply and Treatment, CPHEEO, Government of India, New Delhi, 1999
2.   Manual on Sewerage and Sewage Treatment, CPHEEO, Government of India, New Delhi, 1993
3.   Hand book on Water Supply and Drainage, SP35, B.I.S., New Delhi, 1987
4.   Metcalf and Eddy, M.C., "Wastewater Engineering – Treatment & Reuse", Tata McGraw-Hill Publications, New Delhi, 2003

CE1305   FOUNDATION ENGINEERING   3 0 0 100

OBJECTIVE

At the end of this course student acquires the capacity to investigate the soil condition and to design suitable foundation.

1. SITE INVESTIGATION AND SELECTION OF FOUNDATION   9

Scope and objectives – Methods of exploration-averaging and boring – Water boring and rotary 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.

2.   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 minimising settlement, differential settlement.

3.   FOOTINGS AND RAFTS   9

Types of foundation – Contact pressure distribution below footings & raft - Isolated and combined footings – types – proportioning - mat foundation – types – use - proportioning – floating foundation.

4.   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.

5.   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, New Delhi, 1999.
2. Gopal Ranjan and Rao, A.S.R. "Basic and Applied Soil Mechanics", Wiley Eastern Ltd., New Delhi (India), 2003.

REFERENCES

1. Das, B.M. "Principles of Foundation Engineering (Fifth edition), Thomson Books / COLE, 2003

2. Swamisaran, "Analysis and Design of Structures – Limit state Design", Oxford IBH Publishing Co-Pvt. Ltd., New Delhi, 1998
3. Kaniraj, S.R, "Design aids in Soil Mechanics and Foundation Engineering", Tata McGraw Hill publishing company Ltd., New Delhi, 2002
4. Bowles J.E, "Foundation analysis and design", McGraw-Hill, 1994
5. Punmia, B.C., "Soil Mechanics and Foundations", Laxmi publications pvt. Ltd., New Delhi, 1995.
6. Venkatramaiah, C. "Geotechnical Engineering", New Age International Publishers, New Delhi, 1995

7. N.N. Som and S.C. Das, "Theory and Practice of Foundation Design", Prentice Hall of India Pvt. Ltd., New Delhi, 2003

CE1306   ENVIRONMENTAL ENGINEERING LABORATORY   0 0 3 100

OBJECTIVE

This subject includes the list of experiments to be conducted for characterisation of water and municipal sewage. At the end of the course, the student is expected to be aware of the procedure for quantifying quality parameters for water and sewage.

LIST OF EXPERIMENTS

1. Sampling and preservation methods and significance of characterisation of water and wastewater.
2. Determination of
   i) P^H and turbidity
   ii) Hardness
3. Determination of iron & 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 & II", Khanna Publishers, New Delhi
3. Modi, P.N., "Environmental Engineering Vol. I & II", Standard Book House, Delhi-6

LIST OF EQUIPMENTS
(for a batch of 30 students)

1. P^H 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 / Cruicibles	-	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

CE1307   **SOIL ENGINEERING LABORATORY**   0 0 3 100

OBJECTIVE

At the end of this course, the student acquires the capacity to test the soil to assess its Engineering and Index properties.

1. Grain size distribution - Sieve analysis
2. Grain 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.
   Direct shear test on cohesionless soil
   Unconfined compression test on cohesive soil
   Triaxial compression test
9. One dimensional consolidation test (Determination of co-efficient of consolidation only)
10. Field density test (Core cutter and sand replacement methods)

TOTAL : 45

REFERENCES

1. "Soil Engineering Laboratory Instruction Manual", Published by the Engineering College Co-operative Society, Chennai, 2002.
2. Head, K.H, "Manual of Soil Laboratory Testing (Vol-1 to 3)", John Wiley & Sons, Chichester, 1998.
3. Lambe T.W., "Soil Testing for Engineers", John Wiley and Sons, New York, 1990.
4. "I.S.Code of Practice (2720) Relevant Parts", as amended from time to time.
5. Saibaba Reddy, E. and Rama Sastri, K., "Measurement of Engineering Properties of Soils", New Age International Publishers, New Delhi, 2002.

LIST OF EQUIPMENT
(For a batch of 30 students)

Sl. No.	Description of Equipments	Quantity
1.	Sieves	2 sets
2.	Hydrometer	2 sets
3.	Liquid and plastic limit apparatus	2 sets
4.	Shinkage limit apparatus	3 sets
5.	Proctor compaction apparatus	2 sets
6.	UTM of minimum of 20KN capacity	1
7.	Direct shear apparatus	1
8.	Thermeometer	2
9.	Field density measuring device	2
10.	Triaxial shear apparatus	1
11.	Three gang consolidation test device	1

MG1351   **PRINCIPLES OF MANAGEMENT**   **3 0 0 100**
(Common to all Branches)

OBJECTIVE

Knowledge on the principles of management is essential for all kinds of people in all kinds of organizations. After studying this course, students will be able to have a clear understanding of the managerial functions like planning, organizing, staffing, leading and controlling. Students will also gain some basic knowledge on international aspect of management.

1. HISTORICAL DEVELOPMENT   9

Definition of Management – Science or Art – Management and Administration – Development of Management Thought – Contribution of Taylor and Fayol – Functions of Management – Types of Business Organisation.

2. PLANNING   9

Nature & Purpose – Steps involved in Planning – Objectives – Setting Objectives – Process of Managing by Objectives – Strategies, Policies & Planning Premises- Forecasting – Decision-making.

3. ORGANISING   9

Nature and Purpose – Formal and informal organization – Organization Chart – Structure and Process – Departmentation by difference strategies – Line and Staff authority – Benefits and Limitations – De-Centralization and Delegation of Authority – Staffing – Selection Process - Techniques – HRD – Managerial Effectiveness.

4. DIRECTING   9

Scope – Human Factors – Creativity and Innovation – Harmonizing Objectives – Leadership – Types of Leadership Motivation – Hierarchy of needs – Motivation theories – Motivational Techniques – Job Enrichment – Communication – Process of Communication – Barriers and Breakdown – Effective Communication – Electronic media in Communication.

5. CONTROLLING   9

System and process of Controlling – Requirements for effective control – The Budget as Control Technique – Information Technology in Controlling – Use of computers in handling the information – Productivity – Problems and Management – Control of Overall Performance –

Direct and Preventive Control – Reporting – The Global Environment – Globalization and Liberalization – International Management and Global theory of Management.

TOTAL : 45

TEXT BOOKS

1.   Harold Kooritz & Heinz Weihrich "Essentials of Management", Tata McGraw-Hill, 1998
2.   Joseph L Massie "Essentials of Management", Prentice Hall of India, (Pearson) Fourth Edition, 2003.

REFERENCES

1.   Tripathy PC And Reddy PN, "Principles of Management", Tata McGraw-Hill, 1999.
2.   Decenzo David, Robbin Stephen A, "Personnel and Human Reasons Management", Prentice Hall of India, 1996
3.   JAF Stomer, Freeman R. E and Daniel R Gilbert Management, Pearson Education, Sixth Edition, 2004.
4.   Fraidoon Mazda, "Engineering Management", Addison Wesley, 2000.

CE1351   **STRUCTURAL ANALYSIS – MODERN METHODS   3 1 0 100**

OBJECTIVE

This course is in continuation of Structural Analysis – Classical Methods. Here in advanced method of analysis like Matrix method and Plastic Analysis are covered. Advanced topics such as FE method and Space Structures are covered.

1.   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).

2.   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.

3.   FINITE ELEMENT METHOD   9

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

4.   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

5.   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

TUTORIALS 15

TOTAL : 60

TEXT BOOKS

1. Vaidyanathan, R. and Perumail, P., "Comprehensive structural Analysis – Vol. I & II", Laxmi Publications, New Delhi, 2003
2. Coates R.C, Coutie M.G. and Kong F.K., "Structural Analysis", ELBS and Nelson, 1990
3. L.S. Negi & R.S. Jangid, "Structural Analysis", Tata McGraw-Hill Publications, New Delhi, 2003

REFERENCES

1. Ghali.A, Nebille,A.M. and Brown,T.G. "Structural Analysis" A unified classical and Matrix approach" –5th edition. Spon Press, London and New York, 2003.
2. Vazirani V.N, & Ratwani, M.M, "Analysis of Structures", Khanna Publishers, Delhi
3. Structural Analysis – A Matrix Approach – G.S. Pandit & S.P. Gupta, Tata McGraw Hill
4. Matrix Analysis of Framed Structures – Jr. William Weaver & James M. Gere, CBS Publishers and Distributors, Delhi.

CE1352   DESIGN OF STEEL STRUCTURES   4 2 0 100

OBJECTIVE

This course covers the design of structural steel members subjected to compressive, tensile and bending loads, as per current codal provisions including connections. Design of structural systems such as roof trusses, gantry girders are included.

1.   INTRODUCTION   9

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

2.   **TENSION MEMBERS**   **6**

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

3.   **COMPRESSION MEMBERS**   **15**

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

4.   **BEAMS**   **15**

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

5.   **ROOF TRUSSES AND INDUSTRIAL STRUCTURES**   **15**

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

TUTORIAL 30

TOTAL : 90

TEXT BOOKS

1. Dayaratnam, P., "Design of Steel Structures", Second edition, S. Chand & Company, 2003

REFERENCES

1. Ramachandra, S., "Design of Steel Structures – Vol. I & II", Standard Publication, New Delhi
2. "Teaching Resources for Structural Steel Design – Vol. I & II", INSDAG, Kolkatta.
3. Gaylord, E.H., Gaylord, N.C., and Stallmeyer, J.E., "Design of Steel Structures", 3rd edition, McGraw-Hill Publications, 1992

CE1353   CONSTRUCTION PLANNING & SCHEDULING   3 0 0 100

OBJECTIVE

At the end of this course the student is expected to have learnt how to plan construction projects, schedule the activities using network diagrams, determine the cost of the project, control the cost of the project by creating cash flows and budgeting and how to use the project information as an information and decision making tool.

1.   CONSTRUCTION PLANNING   5

Basic concepts in the development of construction plans-choice of Technology and Construction method-Defining Work Tasks- Definition- Precedence relationships among activities-Estimating Activity Durations-Estimating Resource Requirements for work activities-coding systems

2.   SCHEDULING PROCEDURES AND TECHNIQUES   15

Relevance of construction schedules-Bar charts - The critical path method-Calculations for critical path scheduling-Activity float and schedules-Presenting project schedules-Critical path scheduling for Activity-on-node and with leads, Lags and Windows-Calculations for scheduling with leads, lags and windows-Resource oriented scheduling-Scheduling with resource constraints and precedences -Use of Advanced Scheduling Techniques-Scheduling with uncertain durations-Crashing and time/cost trade offs -Improving the Scheduling process – Introduction to application software

3.   COST CONTROL MONITORING AND ACCOUNTING   15

The cost control problem-The project Budget-Forecasting for Activity cost control - financial accounting systems and cost accounts-Control of project cash flows-Schedule control-Schedule and Budget updates-Relating cost and schedule information

4.   QUALITY CONTROL AND SAFETY DURING CONSTRUCTION   5

Quality and safety Concerns in Construction-Organizing for Quality and Safety-Work and Material Specifications-Total Quality control-Quality control by statistical methods -Statistical Quality control with
Sampling by Attributes-Statistical Quality control by Sampling and Variables-Safety.

5.   ORGANIZATION AND USE OF PROJECT INFORMATION   5

Types of project information-Accuracy and Use of Information-Computerized organization and use of Information -Organizing information in databases-relational model of Data bases-Other conceptual Models of Databases-Centralized database Management systems-Databases and application programs-Information transfer and Flow.

                                                                      TOTAL : 45

TEXT BOOKS

1. Chitkara, K.K. "Construction Project Management Planning", Scheduling and Control, Tata McGraw-Hill Publishing Co., New Delhi, 1998.
2. Chris Hendrickson and Tung Au, "Project Management for Construction – Fundamentals Concepts for Owners", Engineers, Architects and Builders, Prentice Hall, Pitsburgh, 2000.

REFERENCES

1. Moder.J., C.Phillips and Davis, "Project Management with CPM", PERT and Precedence Diagramming, Van Nostrand Reinhold Co., Third Edition, 1983.
2. Willis., E.M., "Scheduling Construction projects", John Wiley and Sons 1986.
3. Halpin,D.W., "Financial and cost concepts for construction Management", John Wiley and Sons, New York, 1985.

CE1354   DESIGN OF RC ELEMENTS   3 0 0 100

OBJECTIVE

This course covers the different types of philosophies related to Design of Reinforced Concrete Structures with emphasis on Limit State Method. The design of Basic elements such as slab, beam, column and footing which form part of any structural system with reference to Indian standard code of practice for Reinforced Concrete Structures and Design Aids are included. At the end of course the student shall be in a position to design the basic elements of reinforced concrete structures.

1.   METHODS OF DESIGN OF CONCRETE STRUCTURES   9

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 un-cracked section – Calculation of thickness and reinforcement for Liquid retaining structure

2.   LIMIT STATE DESIGN FOR FLEXURE   9

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

3.   LIMIT STATE DESIGN FOR BOND, ANCHORAGE SHEAR & TORSION   9

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.

4.   LIMIT STATE DESIGN OF COLUMNS   9

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

5.   LIMIT STATE DESIGN OF FOOTING AND DETAILING   9

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 : 45

TEXT BOOKS

1.   Varghese, P.C., "Limit State Design of Reinforced Concrete", Prentice Hall of India, Pvt. Ltd., New Delhi
2.   Krishna Raju, N., "Design of Reinforced Concrete Structures", CBS Publishers & Distributors, New Delhi

REFERENCES

1.   Jain, A.K., "Limit State Design of RC Structures", Nemchand Publications, Rourkee
2.   Sinha, S.N., "Reinforced Concrete Design", Tata McGraw-Hill Publishing Company Ltd., New Delhi
3.   Unnikrishna Pillai, S., Devadas Menon, "Reinforced Concrete Design", Tata McGraw-Hill Publishing Company Ltd., New Delhi

CE1355   IRRIGATION ENGINEERING DRAWING   0 0 3 100

OBJECTIVE

At the end of the semester, the student shall be able to conceive, design and draw all types of irrigation structures in detail showing plan, elevation and sections.

1.   TANK IRRIGATION STRUCTURES   10

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

2.   IMPOUNDING STRUCTURES   10

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

3.   CANAL TRANSMISSION STRUCTURES   10

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

4.   CANAL REGULATION STRUCTURES   9

Canal head works – Canal regulator – Canal escape – Silt exclusion structures – Drawing showing detailed plan, elevation and foundation

5.   IRRIGATION WATER MANAGEMENT STRUCTURES   6

On farm development works – Structures for proportional field distribution – Duck bill weirs – Detailed drawings showing foundations and superstructure details.

TOTAL : 45

TEXT BOOKS
1.   Garg, S.K, "Irrigation Engineering and Design of Structures"
2.   Satyanarayana Murthy, "Irrigation Design and Drawing", Published by Mrs. L. Banumathi, Tuni, East Godavari District, A.P. 1998
3.   Sharma R.K, "Irrigation Engineering and Hydraulic Structures", Oxford and IBH Publishing Co., New Delhi, 2002

REFERENCE
1.   Elhis, "Irrigation Engineering Structures"

CE1356   ENVIRONMENTAL ENGINEERING DRAWING   0 0 3 100

OBJECTIVE

This subject includes process design (excluding Structural Design) of major units associated with water and sewage treatment and transport including house building drainage. At the end of the course, the student is expected to know about the sizing of treatment plant units and draw the general arrangement.

1.   Design & drawing of aerators, chemical feeding facility, flash mixer, flocculator, clarifier – Slow sand filter – Rapid sand filter – Pressure filter – Chlorinator – Bleaching powder doser – Softeners – Demineralisation plant
2.   Design and drawing of infiltration gallery – Iron removal plants – Fluoride removal plants – Service reservoirs

3. Design and drawing of screen chamber – Grit channel – Primary clarifier – Activated sludge process – Aeration tank & oxidation ditch – Trickling filters – Secondary clarifiers – Upflow anaerobic sludge blanket reactors – Upflow anaerobic filter – Sludge digester – Sludge drying beds – Waste stabilisation ponds
4. Drawing of raw water – Intake towers – Manholes – Sewer lines – Pumping stations for water and sewage
5. Design and drawing of:
    Water supply and drainage for buildings – Septic tanks and disposal arrangements – House service connection for water supply and drainage – Appurtenances in water supply and drainage

TOTAL : 45

REFERENCES

1. Manual on Water Supply and Treatment, CPHEEO, Government of India, New Delhi, 1999
2. Manual of Sewerage and Sewage Treatment, CPHEEO, Government of India, New Delhi, 1993
3. Hand book on Water Supply and Drainage, SP35, B.I.S., New Delhi, 1987
4. Peary, H.S., Rowe, D.R., and Tchobanoglous, G., "Environmental Engineering", McGraw-Hill Book Co., New Delhi, 1995
5. Metcalf & Eddy, "Wastewater Engineering (Treatment and Reuse)", 4th Edition, Tata McGraw-Hill, New Delhi, 2003

CE1357   SURVEY CAMP   0 0 0 100

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

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 HOI and external examiner appointed by
    the University – with equal Weightage)

                            Total   : 100 marks

CE1401   DESIGN OF REINFORCED CONCRETE & BRICK MASONRY STRUCTURES
                                                         4 2 0 100

OBJECTIVE

This course covers the design of Reinforced Concrete Structures such as Retaining Wall, Water Tanks, Staircases, Flat slabs and Principles of design pertaining to Box culverts, Mat foundation and Bridges. At the end of the course student has a comprehensive design knowledge related to structures, systems that are likely to be encountered in professional practice.

1.   RETAINING WALLS   12

Design of cantilever and counter fort retaining walls

2.   WATER TANKS   12

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

3.   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

4.   YIELD LINE THEORY   12

Application of virtual work method to square, rectangular, circular and triangular slabs

5.   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, design of axially and eccentrically loaded brick walls

                                                         TUTORIAL   30

                                                         TOTAL : 90

         TEXT BOOKS

1.   Krishna Raju, N., "Design of RC Structures", CBS Publishers and Distributors, Delhi
2.   Dayaratnam, P., "Brick and Reinforced Brick Structures", Oxford & IBH Publishing House, 1997
3.   Varghese, P.C., "Limit State Design of Reinforced Concrete Structures"

         REFERENCES

1.   Mallick, D.K. and Gupta A.P., "Reinforced Concrete", Oxford and IBH Publishing Company
2.   Syal, I.C. and Goel, A.K., "Reinforced Concrete Structures", A.H. Wheelers & Co. Pvt. Ltd., 1994
3.   Ram Chandra, "Limit State Design", Standard Book House.

CE1402   ESTIMATION AND QUANTITY SURVEYING   3 0 0 100

OBJECTIVE

This subject covers the various aspects of estimating of quantities of items of works involved in buildings, water supply and sanitary works, road works and irrigation works. This also covers the rate analysis, valuation of properties and preparation of reports for estimation of various items. At

the end of this course the student shall be able to estimate the material quantities, prepare a bill of quantities, make specifications and prepare tender documents. Student should also be able to prepare value estimates.

1. INTRODUCTION 3

Types of estimates – Units of measurements – Methods of estimates – Advantages

2. ESTIMATE OF BUILDINGS 12

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 etc.

3. ESTIMATE OF OTHER STRUCTURES 12

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.

4. SPECIFICATION AND TENDERS 6

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

5. VALUATION 6

Necessity – Basics of value engineering – Capitalised value – Depreciation – Escalation – Value of building – Calculation of Standard rent – Mortage – Lease

6. REPORT PREPARATION 6

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

TOTAL : 45

TEXT BOOKS

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

CE1403   BASICS OF DYNAMICS AND ASEISMIC DESIGN   3 0 0 100

OBJECTIVE

The main objective of this course is to introduce to the student the phenomena of earthquakes, the process, measurements and the factors that affect the design of structures in seismic areas. This objective is achieved through imparting rudiments of theory of vibrations necessary to understand and analyse the dynamic forces caused by earthquakes and structures. Further, the student is also taught the codal provisions as well as the aseismic design methodology.

1. THEORY OF VIBRATIONS 9

Concept of inertia and damping – Types of Damping – Difference between static forces and dynamic excitation – Degrees of freedom – SDOF idealisation – Equations of motion of SDOF system for mass as well as base excitation – Free vibration of SDOF system – Response to harmonic excitation – Impulse and response to unit impulse – Duhamel integral

2. MULTIPLE DEGREE OF FREEDOM SYSTEM 9

Two degree of freedom system – Normal modes of vibration – Natural frequencies - Mode shapes - Introduction to MDOF systems – Decoupling of equations of motion – Concept of mode superposition (No derivations).

3. ELEMENTS OF SEISMOLOGY 9

Causes of Earthquake – Geological faults – Tectonic plate theory – Elastic rebound – Epicentre – Hypocentre – Primary, shear and Raleigh waves – Seismogram – Magnitude and intensity of earthquakes – Magnitude and Intensity scales – Spectral Acceleration - Information on some disastrous earthquakes

4. RESPONSE OF STRUCTURES TO EARTHQUAKE 9

Response and design spectra – Design earthquake – concept of peak acceleration – Site specific response spectrum – Effect of soil properties and damping – Liquefaction of soils – Importance of ductility – Methods of introducing ductility into RC structures.

5. DESIGN METHODOLOGY 9

IS 1893, IS 13920 and IS 4326 – Codal provisions – Design as per the codes – Base isolation techniques – Vibration control measures – Important points in mitigating effects of earthquake on structures.

TOTAL : 45

TEXT BOOKS

1. Arya, A.S., ed., "Earthquake Engineering", Jai Krishna 60th Birthday Anniversary Commemoration Volume, ISET, Sarita Prakashan, Meerut, 1974.
2. Chopra, A.K., "Dynamics of Structures – Theory and Applications to Earthquake Engineering", Second Edition, Pearson Education, 2003.

REFERENCES

1. Biggs, J.M., "Introduction to Structural Dynamics", McGraw–Hill Book Co., N.Y., 1964
2. Dowrick, D.J., "Earthquake Resistant Design", John Wiley & Sons, London, 1977
3. Paz, M., "Structural Dynamics – Theory & Computation", CSB Publishers & Distributors, Shahdara, Delhi, 1985
4. NPEEE Publications

CE1404   BUILDING SERVICES   3 0 0 100

OBJECTIVE

This subject covers the various aspects of pumps and machinery involved in Civil Engineering practice and the principles of electrical and air conditioning facilities involved. Building water supply and drainage have been covered under subjects namely Environmental Engineering and Environmental Engineering Drawing.

1. MACHINERIES 8

Hot Water Boilers – Lifts and Escalators – Special features required for physically handicapped and elderly – Conveyors – Vibrators – Concrete mixers – DC/AC motors – Generators – Laboratory services – Gas, water, air and electricity

2. ELECTRICAL SYSTEMS IN BUILDINGS   10

Basics of electricity – Single / Three phase supply – Protective devices in electrical installations – Earthing for safety – Types of earthing – ISI specifications – Types of wires, wiring systems and their choice – Planning electrical wiring for building – Main and distribution boards – Transformers and switch gears – Layout of substations

3. PRINCIPLES OF ILLUMINATION & DESIGN   8

Visual tasks – Factors affecting visual tasks – Modern theory of light and colour – Synthesis of light – Additive and subtractive synthesis of colour – Luminous flux – Candela – Solid angle illumination – Utilisation factor – Depreciation factor – MSCP – MHCP – Lans of illumination – Classification of lighting – Artificial light sources – Spectral energy distribution – Luminous efficiency – Colour temperature – Colour rendering.

Design of modern lighting – Lighting for stores, offices, schools, hospitals and house lighting. Elementary idea of special features required and minimum level of illumination required for physically handicapped and elderly in building types.

4. REFRIGERATION PRINCIPLES & APPLICATIONS   10

Thermodynamics – Heat – Temperature, measurement transfer – Change of state – Sensible heat – Latent heat of fusion, evaporation, sublimation – saturation temperature – Super heated vapour – Subcooled liquid – Pressure temperature relationship for liquids – Refrigerants – Vapour compression cycle – Compressors – Evaporators – Refrigerant control devices – Electric motors – Starters – Air handling units – Cooling towers – Window type and packaged air-conditioners – Chilled water plant – Fan coil systems – Water piping – Cooling load – Air conditioning systems for different types of buildings – Protection against fire to be caused by A.C. Systems

5. FIRE SAFETY INSTALLATION   9

Causes of fire in buildings – Safety regulations – NBC – Planning considerations in buildings like non-combustible materials, construction, staircases and lift lobbies, fire escapes and A.C. systems. Special features required for physically handicapped and elderly in building types – Heat and smoke detectors – Fire alarm system, snorkel ladder – Fire lighting pump and water storage – Dry and wet risers – Automatic sprinklers

TOTAL : 45

REFERENCES

1. E.R.Ambrose, "Heat Pumps and Electric Heating", John and Wiley and Sons, Inc., New York, 1968.
2. Handbook for Building Engineers in Metric systems, NBC, New Delhi, 1968.
3. Philips Lighting in Architectural Design, McGraw-Hill, New York, 1964.
4. R.G.Hopkinson and J.D.Kay, "The Lighting of buildings", Faber and Faber, London, 1969.
5. William H.Severns and Julian R.Fellows, "Air-conditioning and Refrigeration", John Wiley and Sons, London, 1988.
6. A.F.C. Sherratt, "Air-conditioning and Energy Conservation", The Architectural Press, London, 1980.
7. National Building Code.

CE1405   COMPUTER AIDED DESIGN & DRAFTING LABORATORY   0 0 4 100

OBJECTIVE

At the end of the course the student acquires hands on experience in design and preparation of structural drawings for concrete / steel structures normally encountered in Civil Engineering practice.

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, "Structural Design & Drawing (Concrete & Steel)", CBS Publishers
2.   Punmia, B.C., Ashok Kumar Jain, Arun Kumar Jain, "Design of steel structures", Lakshmi publications Pvt. Ltd.

REFERENCES

1.   Krishnamurthy, D., "Structural Design & Drawing – Vol. II", CBS Publishers & Distributors, Delhi

2.   Krishnamurthy, D., "Structural Design & Drawing – Vol. III Steel Structures", CBS Publishers & Distributors, New Delhi

EXAMINATION DURATION   4 HOURS

LIST OF EQUIPMENTS

1. 1. Models of Structures   -   1 each.

2. Computers Pentium IV   -   30 Nos.

3. Analysis and Design Software
        - Minimum 5 user License   -   1 No.

4. Auto CAD Software
        - Multi user License   -   1 No.

CE1406   DESIGN PROJECT   0 0 4 100

OBJECTIVE

The objective of this course is to impart and improve the design capability of the student. This course conceives purely a design problem in any one of the disciplines of Civil Engineering; e.g., Design of an RC structure, Design of a waste water treatment plant, Design of a foundation system, Design of traffic intersection etc. The design problem can be allotted to either an individual student or a group of students comprising of not more than four. At the end of the course the group should submit a complete report on the design problem consisting of the data given, the design calculations, specifications if any and complete set of drawings which follow the design.

TOTAL : 60

EVALUATION PROCEDURE

The method of evaluation will be as follows:

1.   Internal Marks   : 20 marks
       (decided by conducting 3 reviews by the guide appointed by the
        Institution)
2.   Evaluation of Project Report   : 30 marks
       (Evaluated by the external examiner appointed the University).
       Every student belonging to the same group gets the same mark

3.   Viva voce examination   : 50 marks
       (evaluated by the internal examiner appointed by the HOD with the
       approval of HOI, external examiner appointed by the University and
       Guide of the course – with equal Weightage)

                                                   Total   : 100 marks

CE1451   ENGINEERING ECONOMICS AND COST ANALYSIS   3 0 0 100

OBJECTIVE

The main objective of this course is to make the Civil Engineering student know about the basic law of economics, how to organise a business, the financial aspects related to business, different methods of appraisal of projects and pricing techniques. At the end of this course the student shall have the knowledge of how to start a construction business, how to get finances, how to account, how to price and bid and how to assess the health of a project.

1.   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

2.   ORGANISATION AND FINANCING   15

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 - 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

3.   COST ANALYSIS   10

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

4.   BREAK EVEN ANALYSIS   5

Basic assumptions – break even chart – managerial uses of break even analysis

TOTAL : 45

TEXT BOOKS

1.   Dewett K.K. & Varma J.D., Elementary Economic Theory, S Chand
2.   Sharma JC "Construction Management and Accounts" Satya Prakashan, New Delhi
REFERENCES

1.   Barthwal R.R., Industrial Economics - An Introductory Text Book, New Age
2.   Jhingan M.L., Micro Economic Theory, Konark
3.   Samuelson P.A., Economics - An Introductory Analysis, McGraw-Hill
4.   Adhikary M., Managerial Economics
5.   Khan MY and Jain PK "Financial Management" McGraw-Hill Publishing Co., Ltd
6.   Varshney RL and Maheshwary KL " Managerial Economics" S Chand and Co

CE1452	COMPREHENSION	0 0 3 0

OBJECTIVE

The objective of this course which does not carry an examination is to make the student comprehend, through a series of lectures, the knowledge pool he / she has gone through the seven semesters. This should form a basis on which the student shall be able to perform better in competitive examinations and interviews.

TOTAL : 45

CE1453	PROJECT WORK	0 0 6 200

OBJECTIVE

The objective of the project work is to enable the students to work in convenient groups of not more than four members in a group on a project involving theoretical and experimental studies related to Civil Engineering. Every Project Work shall have a Guide who is a member of the faculty of Civil Engineering of the college where the student is registered. The hours allotted for this course shall be utilized by the students to receive directions from the Guide, on library

reading, laboratory work, computer analysis or field work and also to present in periodical seminars the progress made in the project.

Each student shall finally produce a comprehensive report covering background information, literature Survey, problem statement, Project work details and conclusions.

This experience of project work shall help the student in expanding his / her knowledge base and also provide opportunity to utilise the creative ability and inference capability.

TOTAL : 90

EVALUATION   PROCEDURE

The method of evaluation will be as follows:

1.   Internal Marks   : 20 marks
        (decided by conducting 3 reviews by the guide appointed by the
         Institution)

2.   Evaluation of Project Report   : 30 marks
        (Evaluated by the external examiner appointed the University).
        Every student belonging to the same group gets the same mark

3.   Viva voce examination   : 50 marks
        (evaluated by the internal examiner appointed by the HOD with the
        approval of HOI, external examiner appointed by the University and
        Guide of the course – with equal Weightage)

                                        Total   : 100 marks

LIST OF ELECTIVES

GE1301   PROFESSIONAL ETHICS AND HUMAN VALUES   3 0 0 100
                    (Common to all branches)

OBJECTIVE

(i)   To create an awareness on Engineering Ethics and Human Values.
(ii)   To instill Moral and Social Values and Loyalty
(iii)   To appreciate the rights of Others

1.   HUMAN VALUES   10

Morals, Values and Ethics – Integrity – Work Ethic – Service Learning – Civic Virtue – Respect for Others – Living Peacefully – caring – Sharing – Honesty – Courage – Valuing Time – Co-operation – Commitment – Empathy – Self-Confidence – Character – Spirituality

2.   ENGINEERING ETHICS   9

Senses of 'Engineering Ethics' - variety of moral issued - types of inquiry - moral dilemmas - moral autonomy - Kohlberg's theory - Gilligan's theory - consensus and controversy – Models of Professional Roles - theories about right action - Self-interest - customs and religion - uses of ethical theories.

3.   ENGINEERING AS SOCIAL EXPERIMENTATION   9

Engineering as experimentation - engineers as responsible experimenters - codes of ethics - a balanced outlook on law - the challenger case study

4.   SAFETY, RESPONSIBILITIES AND RIGHTS   9

Safety and risk - assessment of safety and risk - risk benefit analysis and reducing risk - the three mile island and chernobyl case studies.
Collegiality and loyalty - respect for authority - collective bargaining - confidentiality - conflicts of interest - occupational crime - professional rights - employee rights - Intellectual Property Rights (IPR) - discrimination.

5.   GLOBAL ISSUES   8

Multinational corporations - Environmental ethics - computer ethics - weapons development - engineers as managers-consulting engineers-engineers as expert witnesses and advisors -moral leadership-sample code of Ethics like ASME, ASCE, IEEE, Institution of Engineers (India), Indian Institute of Materials Management, Institution of electronics and telecommunication engineers (IETE), India, etc.

TOTAL : 45

TEXT BOOKS

1.   Mike Martin and Roland Schinzinger, "Ethics in engineering", McGraw-Hill, New York 1996.
2.   Govindarajan M, Natarajan S, Senthil Kumar V. S, "Engineering Ethics", Prentice Hall of India, New Delhi, 2004.

REFERENCES

1.   Charles D. Fleddermann, "Engineering Ethics", Pearson Education/ Prentice Hall, New Jersey, 2004 (Indian Reprint)
2.   Charles E Harris, Michael S. Protchard and Michael J Rabins, "Engineering Ethics – Concepts and Cases", Wadsworth Thompson Learning, United States, 2000 (Indian Reprint now available)
3.   John R Boatright, "Ethics and the Conduct of Business", Pearson Education, New Delhi, 2003.
4.   Edmund G Seebauer and Robert L Barry, "Fundamentals of Ethics for Scientists and Engineers", Oxford University Press, Oxford, 2001.

CE1004   REMOTE SENSING TECHNIQUES AND APPLICATIONS   3 0 0 100

OBJECTIVE

At the end of the course the student will posses knowledge of Remote Sensing Techniques and its
application in natural resource management.

1.   INTRODUCTION   9

Definition – Physics of remote sensing – electromagnetic radiation (EMR) – remote sensing windows – interaction of EMR with atmosphere, earth surface, soils, water and vegetation – platform and sensors – image interpretations.

2.   LAND USE STUDIES   9

Definition of land use – land use / land cover classification – schemes and levels of classification systems with RS data – land use mapping – change detection – urban land use planning, site suitability analysis, transportation planning.

3.   WATER RESOURCES   9

Areal assessment of surface water bodies – Capacity survey of water bodies – mapping of snow-covered areas – flood risk zone mapping – identification of groundwater potential zones, recharge areas – droughts, definition, drought assessment and management.

4.   AGRICULTURE, SOIL AND FORESTRY   9

Crop inventory mapping – production estimation – command area monitoring – soil mapping – crop stress detection - estimation of soil erosion – forest types and density mapping – forest fire risk zone mapping.

5.   EARTH SCIENCE   9

Lithology – lithological mapping – structural mapping – Geomorphology – nature and type of landforms – identification – use of remote sensing data for land slides – targeting mineral resources – Engineering geology and Environmental geology.

TOTAL : 45

REFERENCES

1.   Lillesand, T.M and Kicter R.W. Remote Sensing and Image interpretation. John Willey and sons, inc. New York, 2002.
2.   **Michael Hord, R. Remote sensing methods and application, John Wiley and Sons, New York, 1986.**
3.   Steven, M.D, and Cllark, J.A. Application of Remote sensing in Agriculture, Butterworths, London, 1990.
4.   Space Applications Centre. Manual for Forest mapping and Damage detection using satellite data, Report No.IRS-UP/SAC/FMDD/TN/16/90,1990, pp-253.
5.   Sabins, F.F.Jr. Remote sensing principles and interpretation, W.H.Freeman & Co., 1978.

6.   Manual of Remote Sensing Vol. II. American Society of Photogrammetry

GE 1001   INTELLECTUAL PROPERTY RIGHTS (IPR)   3 0 0 100

UNIT I

Introduction – Invention and Creativity – Intellectual Property (IP) – Importance – Protection of IPR – Basic types of property (i. Movable Property ii. Immovable Property and iii. Intellectual Property).   **5**

UNIT II

IP – Patents – Copyrights and related rights – Trade Marks and rights arising from Trademark registration – Definitions – Industrial Designs and Integrated circuits – Protection of Geographical Indications at national and International levels – Application Procedures.   **10**

UNIT III

International convention relating to Intellectual Property – Establishment of WIPO – Mission and Activities – History – General Agreement on Trade and Tariff (GATT).   **10**

UNIT IV

Indian Position Vs WTO and Strategies – Indian IPR legislations – commitments to WTO-Patent Ordinance and the Bill – Draft of a national Intellectual Property Policy – Present against unfair competition.   **10**

UNIT V

Case Studies on – Patents (Basumati rice, turmeric, Neem, etc.) – Copyright and related rights – Trade Marks – Industrial design and Integrated circuits – Geographic indications – Protection against unfair competition.   **10**

TEXT BOOK

1.   Subbaram N.R. " Handbook of Indian Patent Law and Practice ", S. Viswanathan (Printers and Publishers) Pvt. Ltd., 1998.

REFERENCES

1.   Eli Whitney, United States Patent Number : 72X, Cotton Gin, March 14, 1794.
2.   Intellectual Property Today : Volume 8, No. 5, May 2001, [www.iptoday.com].
3.   Using the Internet for non-patent prior art searches, Derwent IP Matters, July 2000. [www.ipmatters.net/features/000707_gibbs.html.

GE 1002   INDIAN CONSTITUTION AND SOCIETY   3 0 0 100

UNIT I
Historical Background – Constituent Assembly of India – Philosophical foundations of the Indian Constitution – Preamble – Fundamental Rights – Directive Principles of State Policy – Fundamental Duties – Citizenship – Constitutional Remedies for citizens.   **9**

UNIT II
Union Government – Structures of the Union Government and Functions – President – Vice President – Prime Minister – Cabinet – Parliament – Supreme Court of India – Judicial Review.   **9**

UNIT III

State Government – Structure and Functions – Governor – Chief Minister – Cabinet – State Legislature – Judicial System in States – High Courts and other Subordinate Courts.

9

UNIT IV

Indian Federal System – Center – State Relations – President's Rule – Constitutional Amendments – Constitutional Functionaries - Assessment of working of the Parliamentary System in India. **9**

UNIT V

Society : Nature, Meaning and definition; Indian Social Structure; Castle, Religion, Language in India; Constitutional Remedies for citizens – Political Parties and Pressure Groups; Right of Women, Children and Scheduled Castes and Scheduled Tribes and other Weaker Sections. **9**

TEXT BOOKS

1. Durga Das Basu, " Introduction to the Constitution of India ", Prentice Hall of India, New Delhi.
2. R.C.Agarwal, " (1997) Indian Political System ", S.Chand and Company, New Delhi.
3. Maciver and Page, " Society: An Introduction Analysis ", Mac Milan India Ltd., New Delhi.
4. K.L.Sharma, " (1997) Social Stratification in India: Issues and Themes ", Jawaharlal Nehru University, New Delhi.

REFERENCES

1. Sharma, Brij Kishore, " Introduction to the Constitution of India:, Prentice Hall of India, New Delhi.
2. U.R.Gahai, " (1998) Indian Political System ", New Academic Publishing House, Jalaendhar.
3. R.N. Sharma, " Indian Social Problems ", Media Promoters and Publishers Pvt. Ltd.
4. Yogendra Singh, " (1997) Social Stratification and Charge in India ", Manohar, New Delhi.

CE1001   **HYDROLOGY**   **3 0 0 100**

OBJECTIVE

At the end of the semester, the student shall be having a good understanding of all the components of the hydrological cycle. The mechanics of rainfall, its spatial and temporal measurement and their applications will be understood. Simple statistical analysis and application of probability distribution of rainfall and run off shall also be understood. Student will also learn simple methods of flood routing and ground water hydrology.

1.   PRECIPITATION   **10**

Hydrologic cycle – Types of precipitation – Forms of precipitation – Measurement of Rainfall – Spatial measurement methods – Temporal measurement methods – Frequency analysis of point rainfall – Intensity, duration, frequency relationship – Probable maximum precipitation.

2. ABSTRACTION FROM PRECIPITATION 10

Losses from precipitation – Evaporation process – Reservoir evaporation – Infiltration process – Infiltration capacity – Measurement of infiltration – Infiltration indices – Effective rainfall.

3. HYDROGRAPHS 10

Factors affecting Hydrograph – Baseflow separation – Unit hydrograph – Derivation of unit hydrograph – S curve hydrograph – Unit hydrograph of different deviations - Synthetic Unit Hydrograph

4. FLOODS AND FLOOD ROUTING 9

Flood frequency studies – Recurrence interval – Gumbel's method – Flood routing – Reservoir flood routing – Muskingum's Channel Routing – Flood control

5. GROUND WATER HYDROLOGY 6

Types of aquifers – Darcy's law – Dupuit's assumptions – Confined Aquifer – Unconfined Aquifer – Recuperation test – Transmissibility – Specific capacity – Pumping test – Steady flow analysis only.

TOTAL : 45

TEXT BOOKS

1. Subramanya, K., "Engineering Hydrology", Tata McGraw-Hill Publishing Co., Ltd., 2000
2. Raghunath, H.M., "Hydrology", Wiley Eastern Ltd., 2000

REFERENCES

1. Chow, V.T. and Maidment, "Hydrology for Engineers", McGraw-Hill Inc., Ltd., 2000
2. Singh, V.P., "Hydrology", McGraw-Hill Inc., Ltd., 2000

CE1003   **ELECTRONIC SURVEYING**   **3 0 0 100**

OBJECTIVE

At the end of the course the student will posses knowledge about Electronic surveying

1. BASICS 15

Methods of measuring distance, historical development, basic principles, classifications, applications and comparison with conventional surveying. 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.

2. PROPAGATION OF ELECTROMAGNETIC WAVES 15

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, measurement of atmospheric parameters, mean refractive index, real time application of first velocity correction, second velocity correction and total atmospheric correction.

3. ELECTROMAGNETIC DISTANCE MEASURING SYSTEM 15

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

REFERENCES

1. Burnside, C.D. Electromagnetic distance measurement Crosby Lock wood staples, U.K. 1971.
2. Rueger, J.M. Electronic Distance Measurement, Springer-Verlag, Berlin, 1990.
3. Laurila, S.H. Electronic Surveying in Practice, John Wiley and Sons Inc, 1983.
4. Soastamoinen, J.J. Surveyor's guide to electro-magnetic Distance Measurement, Adam Hilger Ltd., 1967.

MG1401   TOTAL QUALITY MANAGEMENT   3 0 0 100
(Common to all branches)

OBJECTIVE

i)   To understand the Total Quality Management concept and principles and the various tools available to achieve Total Quality Management.
ii)   To understand the statistical approach for quality control.
iii) To create an awareness about the ISO and QS certification process and its need for the industries.

1. 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.

2. 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.

3. 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.

4. 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.

5. 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 BOOK

1. Dale H.Besterfiled, et al., Total Quality Management, Pearson Education, Inc. 2003. (Indian reprint 2004). ISBN 81-297-0260-6.

REFERENCES

1. James R.Evans & William M.Lidsay, The Management and Control of Quality, (5th Edition), South-Western (Thomson Learning), 2002 (ISBN 0-324-06680-5).
2. Feigenbaum.A.V. "Total Quality Management, McGraw Hill, 1991.
3. Oakland.J.S. "Total Quality Management Butterworth – Hcinemann Ltd., Oxford. 1989.
4. Narayana V. and Sreenivasan, N.S. Quality Management – Concepts and Tasks, New Age International 1996.
5. Zeiri. "Total Quality Management for Engineers Wood Head Publishers, 1991.

CE1002   **CARTOGRAPHY**   **3 0 0 100**

OBJECTIVE

At the end of the course the student will posses knowledge about Cartographic Concepts.

1.   INTRODUCTION   9

Cartography today - Nature of Cartography - History of Cartography - Graticules - Cartometry.

2.   EARTH   9

Earth-Map Relations - Basic Geodesy - Map Projections, Scale, Reference and Coordinate system - Transformation - Basic Transformation - Affin Transformation.

3.   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.

4.   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.

5.   CARTOGRAPHY ABSTRACTION   9

Selection and Generalisation Principles - Symbolisation - Topographic and thematic maps - Map production and Reproduction - Map series.

TOTAL : 45

TEXT BOOKS

1. R.W. ANSON and F.J. ORMELING, Basic Cartography for students and Technicians. Vol. I, II and III, Elsevrir Applied Science Publishers 2nd Edition, 1994.
2. ARTHUR, H. ROBINSON Et al Elements of Cartography, Sixth Edition, John Wiley and Sons, 1995.
3. John Campbell, Introductory Cartography Second Edition, 1994. Wm.C. Brown Publishers.

4.   M.J.Kraak and F.J. Ormeling, Cartography: Visualisation and spatial data. Prentice Hall – 1996.

CE1005   **GEOGRAPHICAL INFORMATION SYSTEM**   **3 0 0 100**

OBJECTIVE

At the end of the course the student will posses knowledge about GIS Techniques and its application in the field of Civil Engineering

1.   GIS TECHNIQUE AND DATA INPUT   **13**

MAP – Types of Maps – Development of GIS – Components of GIS – Hardware, software, organisation – Types of data – Spatial and non-spatial data – Print, Line and Polygon – Vector and Raster data – Database structures – Files – Vector and Raster data structures.

2.   DATA ANALYSIS AND MODELLING   **10**

Data Retrieval – Query – Simple Analysis – Spatial Analysis – Overlay – Vector Data Analysis – Raster Data Analysis – Modelling using GIS – Digital Elevation Model – Cost and path analysis – Expert Systems – Artificial Intelligence – Integration with GIS

3.   DATA OUTPUT AND ERROR ANALYSIS   **6**

Data Output – Types – Devices used – Raster and Vector Display Devices – Printers – Plotters – Photowrite Devices – Sources of Errors – Types of Errors – Elimination – Accuracies

4.   GIS APPLICATIONS IN RESOURCE MANAGEMENT   **8**

Fields of Applications – Natural Resources – Agriculture – Soil – Water Resources – Wasteland Management - Social Resources - Cadastral Records – LIS

5.   ADVANCED GIS APPLICATION   **8**

AM/FM – Utility Network Management – Integration with Remote Sensing – Knowledge based techniques – Multicriteria Techniques – Introduction to Object Oriented Data base Models.

                                                                      TOTAL:45

TEXT BOOKS

1.   Burrough P A, Principles of GIS for Land Resources Assessment, Oxford Publication, 2000
2.   Michael N Demers, Fundamentals of Geographical Information Systems, Second Edition, John Wiley Publications, 2002

REFERENCES

1.   Paul A Longley, Michael F Goodchild etal, Geographical Information Systems Volume I and II, Second Edition, John Wiley Publications, 1999.

CE1006   **TRAFFIC ENGINEERING AND MANAGEMENT**   **3 0 0 100**

OBJECTIVE

The students acquire comprehensive knowledge of traffic surveys and studies such as 'Volume Count', 'Speed and delay', 'Origin and destination', 'Parking', 'Pedestrian' and 'Accident surveys'. They achieve knowledge on design of 'at grade' and 'grade separated' intersections. They also become familiar with various traffic control and traffic management measures.

1.   INTRODUCTION   **9**

Significance and scope, Characteristics of Vehicles and Road Users, Skid Resistance and Braking Efficiency (Problems), Components of Traffic Engineering- Road, Traffic and Land Use Characteristics

2.   TRAFFIC SURVEYS AND ANALYSIS   9

Surveys and Analysis - Volume, Capacity, Speed and Delays, Origin and Destination, Parking, Pedestrian Studies, Accident Studies and Safety Level of Services- Problems

3.   TRAFFIC CONTROL   9

Traffic signs, Road markings, Design of Traffic signals and Signal co-ordination (Problems), Traffic control aids and Street furniture, Street Lighting, Computer applications in Signal design

4.   GEOMETRIC DESIGN OF INTERSECTIONS   9

Conflicts at Intersections, Classification of Intersections at Grade, - Chanallised and Unchanallised Intersection - Grade Separators (Concepts only), Principles of Intersection Design, Elements of Intersection Design, Chanallisation and Rotary design (Problems), Grade Separators

5.   TRAFFIC MANAGEMENT   9

Traffic Management- Traffic System Management (TSM) and Travel Demand Management (TDM), Traffic Forecasting techniques, Restrictions on turning movements, One-way Streets, Traffic Segregation, Traffic Calming, Tidal flow operations, Exclusive Bus Lanes - Introduction to Intelligence Transport System (ITS)

                                                                                                    TOTAL : 45

TEXT BOOKS

1.   Khanna K and Justo C E G, Highway Engineering, Khanna Publishers, Roorkee, 2001.
2.   Kadiyali L R, Traffic Engineering and Transport Planning, Khanna Technical Publications, Delhi, 2000.

REFERENCES

1.   Indian Roads Congress (IRC) specifications: Guidelines and special publications on Traffic Planning and Management
2.   Guidelines of Ministry of Road Transport and Highways, Government of India.
3.   Subhash C.Saxena, A Course in Traffic Planning and Design, Dhanpat Rai Publications, New Delhi, 1989.

CE1007   HOUSING PLANNING AND MANAGEMENT   3 0 0 100

OBJECTIVE

The objective of the course is to train the students to have a comprehensive knowledge of planning, design, evaluation, construction and financing of housing projects. The course focuses on cost effective construction materials and methods. Emphasis has also been given on the principles of sustainable housing policies and programmes.

1.   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

2.   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.

3.   PLANNING AND DESIGN OF HOUSING PROJECTS   9

Formulation of Housing Projects – Site Analysis, Layout Design, Design of Housing Units (Design Problems)

4.   CONSTRUCTION TECHNIQUES AND COST-EFFECTIVE MATERIALS   9

New Constructions Techniques – Cost Effective Modern Construction Materials, Building Centers – Concept, Functions and Performance Evaluation

5.   HOUSING FINANCE AND PROJECT APPRAISAL   9

Appraisal of Housing Projects – Housing Finance, Cost Recovery – Cash Flow Analysis, Subsidy and Cross Subsidy, Pricing o f Housing Units, Rents, Recovery Pattern (Problems).

TOTAL : 45

TEXT BOOKS

1.   Meera Mehta and Dinesh Mehta, Metropolitan Housing Markets, Sage Publications Pvt. Ltd., New Delhi, 1999.
2.   Francis Cherunilam and Odeyar D Heggade, Housing in India, Himalaya Publishing House, Bombay, 1997.

REFERENCES

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

CE1009   GROUND WATER ENGINEERING   3 0 0 100

OBJECTIVES

To understand the distribution of ground water, evaluation of aquifer parameters, solving ground water equations. Ground water quality and development of ground water methods are dealt.

1.   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.

2.   HYDRAULICS OF FLOW   9

Storage coefficient - Specific field - Heterogeneity and Anisotrophy -Transmissivity - Governing equations of ground water flow - Steady state flow - Dupuit Forchheimer assumptions - Velocity potential - Flow nets

3.   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.

4.   GROUND WATER DEVELOPMENT   9

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

5.   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.   C Walton, "Ground Water Resource Evaluation", McGraw-Hill Publications

CE1010   MANAGEMENT OF IRRIGATION SYSTEMS   3 0 0 100

OBJECTIVE

At the end of the semester, the student shall have a clear concept of irrigation water management practices -`
of the past, present and future. He/she shall also be able to appreciate the importance due and duly given to stake holders.

1.   IRRIGATION SYSTEM REQUIREMENTS   9

Irrigation systems – Supply and demand of water – Cropping pattern – Crop rotation – Crop diversification – Estimation of total and peak crop water requirements – Effective and dependable rainfall – Irrigation efficiencies.

2.   IRRIGATION SCHEDULING   8

Time of irrigation – Critical stages of water need of crops – Criteria for scheduling irrigation – Frequency and interval of irrigation

3.   MANAGEMENT   9

Structural and non-structural strategies in water use and management – Conjunctive use of surface and ground waters – Quality of irrigation water.

4.   OPERATION   9

Operational plans – Main canals, laterals and field channels – Water control and regulating structures – Performance indicators – Case study

5.   INVOLVEMENT OF STAKE HOLDERS   10

Farmer's participation in System operation – Water user's associations – Farmer councils – Changing paradigms on irrigation management – Participatory irrigation management

TOTAL : 45

TEXT BOOKS

1. Dilip Kumar Majumdar, "Irrigation Water Management – Principles and Practice", Prentice Hall of India Pvt. Ltd., New Delhi, 2000

2. Hand book on Irrigation Water Requirement, R.T. Gandhi, et. al., Water Management Division, Department of Agriculture, Ministry of Agriculture, New Delhi

REFERENCES

1. Hand Book on Irrigation System Operation Practices, Water Resources Management and Training Project, Technical report No. 33, CWC, New Delhi, 1990

2. Maloney, C. and Raju, K.V., "Managing Irrigation Together", Practice and Policy in India, Stage Publication, New Delhi, India, 1994

CE1011   **COASTAL ZONE MANAGEMENT**   3 0 0 100

OBJECTIVE

At the end of the semester, the student shall be able to understand the coastal processes, coastal dynamics, impacts of structures like docks, harbours and quays leading to simple management perspectives along the coastal zone.

1.   COASTAL ZONE   9

Coastal zone – Coastal zone regulations – Beach profile – Surf zone – Off shore – Coastal waters – Estuaries – Wet lands and Lagoons – Living resources – Non living resources.

2.   WAVE DYNAMICS   10

Wave classification – Airy's Linear Wave theory – Deep water waves – Shallow water waves – Wave pressure – Wave energy – Wave Decay – Reflection, Refraction and Diffraction of waves – Breaking of waves – Wave force on structures – Vertical – Sloping and stepped barriers – Force on piles.

3.   WAVE FORECASTING AND TIDES   9

Need for forecasting - SMB and PNJ methods of wave forecasting – Classification of tides – Darwin's equilibrium theory of tides – Effects on structures – seiches, Surges and Tsunamis.

4.   COASTAL PROCESSES   8

Erosion and depositional shore features – Methods of protection – Littoral currents – Coastal aquifers – Sea water intrusion – Impact of sewage disposal in seas.

5.   HARBOURS   9

Types of classification of harbours – Requirements of a modern port – Selection of site – Types and selection of break waters – Need and mode of dredging – Selection of dredgers.

TOTAL : 45

TEXT BOOKS

1. Richard Sylvester, "Coastal Engineering, Volume I and II", Elseiner Scientific Publishing Co., 1999
2. Quinn, A.D., "Design & Construction of Ports and Marine Structures", McGraw-Hill Book Co., 1999

REFERENCES

1. Ed. A.T. Ippen, "Coastline Hydrodynamics", McGraw-Hill Inc., New York, 1993
2. Dwivedi, S.N., Natarajan, R and Ramachandran, S., "Coastal Zone Management in Tamilnadu"

CE1012   WATER RESOURCES ENGINEERING   3 0 0 100

OBJECTIVE

The student is exposed to the different phases in Water Resources viz planning, collection of relevant data on water resources and also on National Water Policy. Reservoir planning, management and economic analysis aspects are covered in detail.

1.   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.

2.   NETWORK DESIGN   9

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

3.   WATER RESOURCE NEEDS   9

Consumptive and non-consumptive water use - Estimation of water requirements for irrigation, for 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.

4.   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.

5.   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.

3.	Duggal, K.N. and Soni, J.P., "Elements of Water Resources Engineering", New Age International Publishers

REFERENCES

1.	Chaturvedi M.C., "Water Resources Systems Planning and Management", Tata McGraw-Hill Inc., New Delhi, 1997.
2.	Goodman Alvin S., "Principles of Water Resources Planning", Prentice-Hall, 1984.
3.	Maass et al. Design of Water Resources Systems, Macmillan, 1968.

CE1013   **PAVEMENT ENGINEERING**   **3 0 0 100**

OBJECTIVE

Student gains knowledge on various IRC guidelines for designing rigid and flexible pavements. Further, he/she will be in a position to assess quality and serviceability conditions of roads.

**1.	TYPE OF PAVEMENT AND STRESS DISTRIBUTION ON LAYERED SYSTEM	9**

Introduction - Pavement as layered structure - Pavement types - rigid and flexible -Stress and deflections in pavements under repeated loading

**2.	DESIGN OF FLEXIBLE PAVEMENTS	9**

Flexible pavement design - Empirical - Semi empirical and theoretical Methods - Design procedure as per latest IRC guidelines – Design and specification of rural roads

**3.	DESIGN OF RIGID PAVEMENTS	9**

Cement concrete pavements - Modified Westergard approach - Design procedure as per latest IRC guidelines - Concrete roads and their scope in India.

**4.	PERFORMANCE EVALUATION AND MAINTENANCE	9**

Pavement Evaluation [Condition and evaluation surveys (Surface Appearance, Cracks, Patches And Pot Holes, Undulations, Ravelling, Roughness, Skid Resistance), Structural Evaluation By Deflection Measurements, Present Serviceability Index]
Pavement maintenance. [IRC Recommendations Only]

**5.	STABILISATION OF PAVEMENTS	8**

Stabilisation with special reference to highway pavements - Choice of stabilisers -Testing and field control –Stabilisation for rural roads in India -use of Geosynthetics (geotextiles & geogrids) in roads.

TOTAL : 45

TEXT BOOKS

1.	Kadiyali, L.R., "Principles and Practice of Highway Engineering", Khanna tech. Publications, New Delhi, 1989.
2.	Croney, D., Design and Performance of Road Pavements, HMO Stationary Office, 1979.
3.	Wright, P.H., "Highway Engineers", John Wiley & Sons, Inc., New York, 1996
4.	Design and Specification of Rural Roads (Manual), Ministry of rural roads, Government of India, New Delhi, 2001

REFERENCES

1. Yoder R.J and Witczak M.W., "Principles of Pavement Design", John Wiley, 1975.
2. Guidelines for the Design of Flexible Pavements, IRC:37 - 2001, The Indian roads Congress, New Delhi.
3. Guideline for the Design of Rigid Pavements for Highways, IRC:58-1998, The Indian Roads Congress, New Delhi.

CE1014   GROUND IMPROVEMENT TECHNIQUES   3 0 0 100

OBJECTIVE

After this course, the student is expected to identify basic deficiencies of various soil deposits and he/she be in a position to decide various ways and means of improving the soil and implementing techniques of improvement.

1.   INTRODUCTION   9

Role of ground improvement in foundation engineering - methods of ground improvement – Geotechnical problems in alluvial, laterite and black cotton soils -Selection of suitable ground improvement techniques based on soil condition.

2.   DRAINAGE AND DEWATERING   9

Drainage techniques - Well points - Vaccum and electroosmotic methods - Seepage analysis for two dimensional flow-fully and partially penetrating slots in homogenous deposits (Simple cases only).

3.   INSITU TREATMENT OF COHESIONLESS AND COHESIVE SOILS   9

Insitu densification of cohesionless and consolidation of cohesive soils -Dynamic compaction and consolidation - Vibrofloation - Sand pile compaction - Preloading with sand drains and fabric drains – Stone columns – Lime piles - Installation techniques only - relative merits of various methods and their limitations.

4.   EARTH REINFORCEMENT   9

Concept of reinforcement - Types of reinforcement material - Applications of reinforced earth – use of Geotextiles for filtration, drainage and separation in road and other works.

5.   GROUT TECHNIQUES   9

Types of grouts - Grouting equipment and machinery - Injection methods - Grout monitoring – Stabilisation with cement, lime and chemicals - Stabilisation of expansive soils.

                                                                        TOTAL : 45

TEXT BOOKS

1. Koerner R.M., "Construction and Geotechnical Methods in Foundation Engineering", McGraw-Hill, 1994.
2. Purushothama Raj, P. "Ground Improvement Techniques", Tata McGraw-Hill Publishing Company, New Delhi, 1995

REFERENCES

1. Moseley M.P., Ground Improvement Blockie Academic and Professional, Chapman and Hall, Glassgow, 1993.
2. Jones J.E.P., Earth Reinforcement and Soil Structure, Butterworths, 1995.
3. Koerner, R.M., "Design with Geosynthetics", (3rd Edition) Prentice Hall, New Jersey, 2002

4. Jewell, R.A., "Soil Reinforcement with Geotextiles", CIRIA special publication, London, 1996
5. Das, B.M., "Principles of Foundation Engineering", Thomson Books / Cole, 2003.

CE1015 INTRODUCTION TO SOIL DYNAMICS AND MACHINE FOUNDATIONS

3 0 0 100

OBJECTIVE

At the end of this program the, student is expected to assess the dynamic properties of soil and various design parameters required for the design of machine foundation as well as design of foundation for various reciprocating machines.

1. INTRODUCTION 9

Vibration of elementary systems-vibratory motion-single degree freedom system-free and forced vibration with and without damping

2. WAVES AND WAVE PROPAGATION 9

Wave propagation in an elastic homogeneous isotropic medium- Raleigh, shear and compression waves-waves in elastic half space

3. 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

4. DESIGN PROCEDURES 9

Design criteria -dynamic loads - simple design procedures for foundations under reciprocating machines - machines producing impact loads - rotary type machines

5. 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. Swamisaran, "Soil Dynamics and Machine Foundations", Galgotia Publications Pvt. Ltd., 1999
2. S.Prakesh & V.K Puri, Foundation for machines, McGraw-Hill 1993
3. Srinivasulu, P & Vaidyanathan, Hand book of Machine Foundations, McGraw-Hill, 1996
4. Kramar S.L, "Geotechnical Earthquake Engineering", Prentice Hall International series, Pearson Education (Singapore) Pvt. Ltd.
5. Kameswara Rao, "Dynamics Soil Tests and Applications", Wheeler Publishing, New Delhi, 2003

REFERENCES

1. Kameswara Rao, "Vibration Analysis and Foundation Dynamics", Wheeler Publishing, New Delhi, 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.

CE1016   **ROCK ENGINEERING**   **3 0 0 100**

OBJECTIVE

Student gains the knowledge on the mechanics of rock and its applications in underground structures and rock slope stability analysis.

1.   CLASSIFICATION AND INDEX PROPERTIES OF ROCKS   6

Geological classification – Index properties of rock systems – Classification of rock masses for engineering purpose.

2.   ROCK STRENGTH AND FAILURE CRITERIA   12

Modes of rock failure – Strength of rock – Laboratory and field measurement of shear, tensile and compressive strength – Stress strain behaviour in compression – Mohr-coulomb failure criteria and empirical criteria for failure – Deformability of rock.

3.   INITIAL STRESSES AND THEIR MEASUREMENTS   10

Estimation of initial stresses in rocks – influence of joints and their orientation in distribution of stresses – technique for measurements of insitu stresses.

4.   APPLICATION OF ROCK MECHANICS IN ENGINEERING   10

Simple engineering application – Underground openings – Rock slopes – Foundations and mining subsidence.

5.   ROCK BOLTING   7

Introduction – Rock bolt systems – rock bolt installation techniques – Testing of rock bolts – Choice of rock bolt based on rock mass condition.

                                                      TOTAL : 45

TEXT BOOKS

1.   Goodman P.E., "Introduction to Rock Mechanics", John Wiley and Sons, 1999.
2.   Stillborg B., "Professional User Handbook for rock Bolting", Tran Tech Publications, 1996.

REFERENCES

1.   Brow E.T., "Rock Characterisation Testing and Monitoring", Pergaman Press, 1991.
2.   Arogyaswamy R.N.P., "Geotechnical Application in Civil Engineering", Oxford and IBH, 1991.
3.   Hock E. and Bray J., "Rock Slope Engineering, Institute of Mining and Metallurgy", 1991.

CE1017   ENVIRONMENTAL IMPACT ASSESSMENT OF CIVIL ENGINEERING PROJECTS   3 0 0 100

OBJECTIVE

This subject deals with the various impacts of infrastructure projects on the components of environment and method of assessing the impact and mitigating the same.

The student is expected to know about the various impacts of development projects on environment and the mitigating measures.

1. INTRODUCTION 5

Impact of development projects under Civil Engineering on environment - Environmental Impact Assessment (EIA) - Environmental Impact Statement (EIS) – EIA capability and limitations – Legal provisions on EIA.

2. METHODOLOGIES 5

Methods of EIA –Check lists – Matrices – Networks – Cost-benefit analysis – Analysis of alternatives – Case studies.

3. PREDICTION AND ASSESSMENT 10

Assessment of Impact on land, water and air, noise, social, cultural flora and fauna; Mathematical models; public participation – Rapid EIA.

4. ENVIRONMENTAL MANAGEMENT PLAN 10

Plan for mitigation of adverse impact on environment – options for mitigation of impact on water, air and land, flora and fauna; Addressing the issues related to the Project Affected People – ISO 14000

5. CASE STUDIES 15

EIA for infrastructure projects – Bridges – Stadium – Highways – Dams – Multi-storey Buildings – Water Supply and Drainage Projects

TOTAL : 45

TEXT BOOKS

1. Canter, R.L., "Environmental Impact Assessment", McGraw-Hill Inc., New Delhi, 1996.
2. Shukla, S.K. and Srivastava, P.R., "Concepts in Environmental Impact Analysis", Common Wealth Publishers, New Delhi, 1992.

REFERENCES

1. John G. Rau and David C Hooten (Ed)., "Environmental Impact Analysis Handbook", McGraw-Hill Book Company, 1990.
2. "Environmental Assessment Source book", Vol. I, II & III. The World Bank, Washington, D.C., 1991.
3. Judith Petts, "Handbook of Environmental Impact Assessment Vol. I & II", Blackwell Science, 1999.

CE1018   INDUSTRIAL WASTE MANAGEMENT   3 0 0 100

This subject deals with the pollution from major industries and methods of controlling the same. The student is expected to know about the polluting potential of major industries in the country and the methods of controlling the same.

1. INTRODUCTION 7

Types of industries and industrial pollution – Characteristics of industrial wastes – Population equivalent – Bioassay studies – effects of industrial effluents on streams, sewer, land, sewage treatment plants and human health – Environmental legislations related to prevention and control of industrial effluents and hazardous wastes

2. CLEANER PRODUCTION 8

Waste management Approach – Waste Audit – Volume and strength reduction – Material and process modifications – Recycle, reuse and byproduct recovery – Applications.

3. POLLUTION FROM MAJOR INDUSTRIES   10

Sources, Characteristics, waste treatment flow sheets for selected industries such as Textiles, Tanneries, Pharmaceuticals, Electroplating industries, Dairy, Sugar, Paper, distilleries, Steel plants, Refineries, fertilizer, thermal power plants – Wastewater reclamation concepts

4. TREATMENT TECHNOLOGIES   12

Equalisation – Neutralisation – Removal of suspended and dissolved organic solids - Chemical oxidation – Adsorption - Removal of dissolved inorganics – Combined treatment of industrial and municipal wastes – Residue management – Dewatering - Disposal

5. HAZARDOUS WASTE MANAGEMENT   8

Hazardous wastes - Physico chemical treatment – solidification – incineration – Secured land fills

TOTAL : 45

TEXT BOOKS

1. M.N.Rao & A.K.Dutta, "Wastewater Treatment", Oxford - IBH Publication, 1995.

2. W .W. Eckenfelder Jr., "Industrial Water Pollution Control", McGraw-Hill Book Company, New Delhi, 2000.

REFERENCES

1. T.T.Shen, "Industrial Pollution Prevention", Springer, 1999.
2. R.L.Stephenson and J.B.Blackburn, Jr., "Industrial Wastewater Systems Hand book", Lewis Publisher, New Yark, 1998

3. H.M.Freeman, "Industrial Pollution Prevention Hand Book", McGraw-Hill Inc., New Delhi, 1995.

4. Bishop, P.L., "Pollution Prevention: Fundamental & Practice", McGraw-Hill, 2000.

CE1019   AIR POLLUTION MANAGEMENT   3 0 0 100

OBJECTIVE

This subject covers the sources, characteristics and effects of air and noise pollution and the methods of controlling the same. The student is expected to know about source inventory and control mechanism.

1. 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.

2. 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.

3. AIR POLLUTION CONTROL   15

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.

4. AIR QUALITY MANAGEMENT 7

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

5. NOISE POLLUTION 5

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

TOTAL : 45

TEXT BOOKS

1. Anjaneyulu, D., "Air Pollution and Control Technologies", Allied Publishers, Mumbai, 2002.
2. Rao, C.S. Environmental Pollution Control Engineering, Wiley Eastern Ltd., New Delhi, 1996.
3. Rao M.N., and Rao H. V. N., Air Pollution Control, Tata-McGraw-Hill, New Delhi, 1996.

REFERENCES

1. W.L.Heumann, Industrial Air Pollution Control Systems, McGraw-Hill, New Yark, 1997
2. Mahajan S.P., Pollution Control in Process Industries, Tata McGraw-Hill Publishing Company, New Delhi, 1991.
3. Peavy S.W., Rowe D.R. and Tchobanoglous G. Environmental Engineering, McGraw Hill, New Delhi, 1985.
4. Garg, S.K., "Environmental Engineering Vol. II", Khanna Publishers, New Delhi
5. Mahajan, S.P., "Pollution Control in Process Industries", Tata McGraw-Hill, New Delhi, 1991

CE1020   MUNICIPAL SOLID WASTE MANAGEMENT   3 0 0 100

OBJECTIVE

This subject covers the various sources and characterisation of municipal solid wastes and the on-site/off-site processing of the same and the disposal methods. The student is expected to know about the various effects and disposal options for the municipal solid waste.

1. SOURCES AND TYPES OF MUNICIPAL SOLID WASTES 9

Sources and types of solid wastes - Quantity – factors affecting generation of solid wastes; characteristics – methods of sampling and characterization; Effects of improper disposal of solid wastes – public health effects. Principle of solid waste management – social & economic aspects; Public awareness; Role of NGOs; Legislation.

2. ON-SITE STORAGE & PROCESSING 9

On-site storage methods – materials used for containers – on-site segregation of solid wastes – public health & economic aspects of storage – options under Indian conditions – Critical Evaluation of Options.

3. COLLECTION AND TRANSFER 9

Methods of Collection – types of vehicles – Manpower requirement – collection routes; transfer stations – selection of location, operation & maintenance; options under Indian conditions.

4. OFF-SITE PROCESSING 9

Processing techniques and Equipment; Resource recovery from solid wastes – composting, incineration, Pyrolysis - options under Indian conditions.

5. DISPOSAL 9

Dumping of solid waste; sanitary land fills – site selection, design and operation of sanitary landfills – Leachate collection & treatment

TOTAL : 45

TEXT BOOKS

1. George Tchobanoglous et.al., "Integrated Solid Waste Management", McGraw-Hill Publishers, 1993.
2. B.Bilitewski, G.HardHe, K.Marek, A.Weissbach, and H.Boeddicker, "Waste Management", Springer, 1994.

REFERENCES

1. Manual on Municipal Solid Waste Management, CPHEEO, Ministry of Urban Development, Government of India, New Delhi, 2000
2. R.E.Landreth and P.A.Rebers, "Municipal Solid Wastes – problems and Solutions", Lewis Publishers, 1997.
3. Bhide A.D. and Sundaresan, B.B., "Solid Waste Management in Developing Countries", INSDOC, 1993.

CE1021   ECOLOGICAL ENGINEERING   3 0 0 100

OBJECTIVE

This subject deals with the scope and applications of ecological principles for wastewater treatment and reuse. The student is expected to be aware of the various effects of industrialisation on ecology and ecological based waste purification methods.

1. PRINCIPLES AND CONCEPTS 9

Scope and applications of Ecological Engineering – Development and evolution of ecosystems – principles and concepts pertaining to species, populations and community

2. ECOSYSTEM FUNCTIONS 10

Energy flow and nutrient cycling – Food chain and food webs – biological magnification, diversity and stability, immature and mature systems. Primary productivity – Biochemical cycling of nitrogen, phosphorous, sulphur and carbon dioxide; Habitat ecology - Terrestrial, fresh water, estuarine and marine habitats.

3. ECOLOGICAL ENGINEERING METHODS 10

Bio monitoring and its role in evaluation of aquatic ecosystem; Rehabilitation of ecosystems through ecological principles – step cropping, bio-wind screens, Wetlands, ponds, Root Zone Treatment for wastewater, Reuse of treated wastewater through ecological systems.

4. ECOLOGICAL EFFECTS OF INDUSTRIALISATION 8

Ecological effects of exploration, production, extraction, processing, manufacture & transport.

5. CASE STUDIES 8

Case studies of Integrated ecological engineering systems.

TOTAL : 45

TEXT BOOKS

1. Odum, E.P., "Fundamental of Ecology", W.B.Sauders, 1990.
2. Kormondy, E.J., "Concepts of Ecology", Prentice Hall, New Delhi, 1996

REFERENCES

1. Mitch, J.W. and Jorgensen, S.E., Ecological Engineering – An Introduction to Ecotechnology, John Wiley and Sons, 1996.
2. Colinvaux, P., Ecology, John Wiley and Sons, 1996.
3. Etnier, C & Guterstam, B., "Ecological Engineering for Wastewater Treatment", 2nd Edition, Lewis Publications, London, 1996

CE1022   **BRIDGE STRUCTURES**   3 0 0 100

OBJECTIVE

At the end of this course the student shall be able to choose appropriate bridge structure and design it for given site conditions.

1. 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

2. 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.

3. 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

4. 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.

5. PRESTRESSED CONCRETE BRIDGES   **9**

Design of prestressed concrete bridges - Preliminary dimensions - Flexural and torsional 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., New Delhi, 1990.

2. Ponnuswamy S., "Bridge Engineering", Tata McGraw-Hill, New Delhi, 1996.

REFERENCES

1. Phatak D.R., "Bridge Engineering", Satya Prakashan, New Delhi, 1990.

CE1023   **STORAGE STRUCTURES**   **3 0 0 100**

OBJECTIVE

The main objective of this course is to impart the principles involved in designing structures which have to store different types of materials. The student at the end of the course shall be able to design concrete and steel material retaining structures.

1.   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.

2.   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.

3.   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.

4.   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.

5.   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, New Delhi, 1998.
2.   Krishna Raju N., Advanced Reinforced Concrete Design, CBS Publishers and Distributors, New Delhi, 1998.

CE1024   **DESIGN OF PLATE AND SHELL STRUCTURES**   3 0 0 100

OBJECTIVE

At the end of this course the student shall understand the rudimentary principles involved in the analysis and design of plates and shells.

1.   THIN PLATES WITH SMALL DEFLECTION   **9**

Laterally loaded thin plates – governing differential equations – Simply supported and fixed boundary conditions

2.   RECTANGULAR PLATES   **9**

Simply supported rectangular plates – Navier's solution and Levy's method.

3.   THIN SHELLS   **9**

Classification of shells-structural actions – membrane theory

4.   ANALYSIS OF SHELLS   **9**

Analysis of spherical dome – cylindrical shells – folded plates

5.   DESIGN OF SHELLS   **9**

Design of spherical dome – cylindrical shells – folded plates

                                                                                    TOTAL : 45

   TEXT BOOKS

   1. Bairagi N K, A text book of Plate Analysis, Khanna Publishers, New Delhi, 1996.
   2. G.S. Ramaswamy, Design and Construction of Shell Structures, CBS Plublishers, New Delhi, 1996
   3. S. Timoshenko & S. Woinowsky – Krieger, "Theory of Plates and Shells", McGraw Hill Book Company

   REFERENCES

   1. Szilard R, Theory and analysis of plates, Prentice Hall Inc, 1995
   2. Chatterjee B. K., Theory and Design of Concrete Shells, Oxford & IBH, New Delhi, 1998
   3. Billington D. P., Thin Shell Concrete Structures, McGraw-Hill, 1995

CE1025   **TALL BUILDINGS**   3 0 0 100

OBJECTIVE

At the end of this course the student should have understood the problems associated with large heights of structures with respect to loads (wind and earthquake and deflections of the structure). He should know the rudimentary principles of designing tall buildings as per the existing course.

1.   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.

2. 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.

3. 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.

4. 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.

5. 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.

2. Bryan Stafford Smith and Alex Coull, " Tall Building Structures ", Analysis and Design, John Wiley and Sons, Inc., 1991.

REFERENCES

1. COULL, A. and SMITH, STAFFORD, B. " Tall Buildings ", Pergamon Press, London, 1997.

2. LinT.Y. and Burry D.Stotes, " Structural Concepts and Systems for Architects and Engineers ", John Wiley, 1994.

3. Lynn S.Beedle, Advances in Tall Buildings, CBS Publishers and Distributors, Delhi, 1996.

4. Taranath.B.S., Structural Analysis and Design of Tall Buildings, Mc Graw Hill 1998.

CE1026   **STRUCTURAL DYNAMICS**   **3 0 0 100**

OBJECTIVE

At the end of this course the student is expected to know how to arrive at the dynamic forces and structures, how to idealise the structure into systems of reduced number of degrees of freedom and analyse these systems for the forces. He should also be able to interpret the results.

1. Difference between static loading and dynamic loading – Nature of dynamic loads – Wind, Earthquake and Impact Loads – Damping – Viscous and structural damping – single degree of freedom (SDOF) Systems – Formulation of equation of motion – Newton's Law and D'Alembert's principles – Examples of SDOF modeling.   **9**

2. Free vibration response of SDOF system – Response of undamped and damped SDOF system to harmonic excitation – characteristic of resonance – Response to impulse and an arbitrary forcing function – Duhamel Integral formulation.   **9**

3. MDOF systems – examples – Lumped parameter model – Formulation of equation of motion – Free vibration of MDOF systems as Eigen value problem – concept of mode shapes and natural frequencies – 2 DOF example – orthogonal properties of normal modes.   **9**

4. Harmonic excitation of 2 DOF system – Principle of mode superposition (principle only) for dynamic analysis – vibration isolation – vibration measuring instruments.   **9**

5. Effect of wind and earthquake on structures – Principles of aseismic design – Methods of vibration control – codal provisions for design for wind and earthquake (explanation of provisions only – no design)   **9**

TOTAL : 45

TEXT BOOKS

1. Mario Paz, Structural Dynamics Theory and Computation, Van Nostrand Reinhold, 1992

2. Anil K.Chopra, "Dynamics of Structures Theory and Applications to Earthquake Engineering" Pearson Education., 2003.

REFERENCES

1. Thomson W.T., Theory of Vibration and Applications, Prentice Hall of India, 1992
2. Clough R.W. and Penzien, J., Dynamics of Structures, McGraw-Hill, 1990
3. Craig R.R. Jr., Structural Dynamics – An Introduction to Computer Methods, John Wiley and Sons, 1981

CE1027   **PREFABRICATED STRUCTURES**   **3 0 0 100**

OBJECTIVE

At the end of this course the student shall be able to appreciate modular construction, industrialised construction and shall be able to design some of the prefabricated elements and also have the knowledge of the construction methods using these elements.

1.   INTRODUCTION   9

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

2.   PREFABRICATED COMPONENTS   9

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

3.   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.

4.   JOINT IN STRUCTURAL MEMBERS   9

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

5.   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, India, 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, Vols. 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.

CE1028   **WIND ENGINEERING**   **3 0 0 100**

OBJECTIVE

At the end of this course the student should be able to appreciate the forces generated on structures due to normal wind as well as gusts. He should also be able to analyse the dynamic effects created by these wind forces.

1.   INTRODUCTION   **9**

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

2.   EFFECT OF WIND ON STRUCTURES   **9**

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

3.   EFFECT ON TYPICAL STRUCTURES   **9**

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

4.   APPLICATION TO DESIGN   **9**

Design forces on multistorey building, towers and roof trusses.

5.   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, New York, 1992.
2.   Lawson T.V., Wind Effects on Buildings, Vols. I and II, Applied Science and Publishers, London, 1993.

REFERENCES

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

CE1029   COMPUTER AIDED DESIGN OF STRUCTURE   3 0 0 100

OBJECTIVE

The main objective of this programme is to train the student in the use of computers and creating a computer code as well as using commercially available software for the design of Civil Engineering structures.

1.   INTRODUCTION   9

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

2.   COMPUTER GRAPHICS   9

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

3.   STRUCTURAL ANALYSIS   9

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

4.   DESIGN AND OPTIMISATION   9

Principles of design of steel and RC Structures -Applications to simple design problems – Optimisation techniques - Algorithms - Linear Programming – Simplex method

5.   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, New Delhi, 1993.

2. Krishnamoorthy C.S.Rajeev S., "Computer Aided Design", Narosa Publishing House, New Delhi, 1993

REFERENCES

1. Harrison H.B., "Structural Analysis and Design", Part I and II Pergamon Press, Oxford, 1990.
2. Rao S.S., "Optimisation Theory and Applications", Wiley Eastern Limited, New Delhi, 1977.
3. Richard Forsyth (Ed), "Expert System Principles and Case Studies", Chapman and Hall, London, 1989.

CE1030   PRE-STRESSED CONCRETE STRUCTURES   3 0 0 100

OBJECTIVE
At the end of this course the student shall have a knowledge of methods of prestressing, advantages of prestressing concrete, the losses involved and the design methods for prestressed concrete elements under codal provisions.

1.   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

2.   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.

3.   CIRCULAR PRESTRESSING   9

Design of prestressed concrete tanks – Poles and sleepers

4.   COMPOSITE CONSTRUCTION   9

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

5.   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, New Delhi 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, New Delhi, 1990
2.   Lin T.Y. Design of prestressed concrete structures, Asia Publishing House, Bombay 1995.
3.   David A.Sheppard, William R. and Philips, Plant Cast precast and prestressed concrete – A design guide, McGraw Hill, New Delhi 1992.

CE1031   **INDUSTRIAL STRUCTURES**   **3 0 0 100**

OBJECTIVE

This course deals with some of the special aspects with respect to Civil Engineering structures in industries. At the end of this course the student shall be able to design some of the structures.

1.   PLANNING   **9**

Classification of Industries and Industrial structures – General requirements for industries like cement, chemical and steel plants – Planning and layout of buildings and components.

2.   FUNCTIONAL REQUIREMENTS   **9**

Lighting – Ventilation – Accounts – Fire safety – Guidelines from factories act.

3.   DESIGN OF STEEL STRUCTURES   **9**

Industrial roofs – Crane girders – Mill buildings – Design of Bunkers and Silos

4.   DESIGN OF R.C. STRUCTURES   **9**

Silos and bunkers – Chimneys – Principles of folded plates and shell roofs

5.   PREFABRICATION   **9**

Principles of prefabrication – Prestressed precast roof trusses- Functional requirements for Precast concrete units

                                      TOTAL : 45

TEXT BOOKS

1.   Reinforced Concrete Structural elements – P. Purushothaman
2.   Pasala Dayaratnam – Design of Steel Structure - 1990

REFERENCES

1.   Henn W. Buildings for Industry, vols.I and II, London Hill Books, 1995
2.   Handbook on Functional Requirements of Industrial buildings, SP32 – 1986, Bureau of Indian Standards, New Delhi 1990
3.   Course Notes on Modern Developments in the Design and Construction of Industrial Structures, Structural Engineering Research Centre, Madras, 1982
4.   Koncz, J, Manual of Precast Construction Vol I & II Bauverlay GMBH, 1971.

CE1032   **SMART STRUCTURES AND SMART MATERIALS**   **3 0 0 100**

OBJECTIVE

This course is designed to give an insight into the latest developments regarding smart materials and their use in structures. Further, this also deals with structures which can self adjust their stiffness with load.

1.   INTRODUCTION   **9**

Introduction to Smart Materials and Structures – Instrumented structures functions and response – Sensing systems – Self diagnosis – Signal processing consideration – Actuation systems and effectors.

2.   MEASURING TECHNIQUES   **9**

Strain Measuring Techniques using Electrical strain gauges, Types – Resistance – Capacitance – Inductance – Wheatstone bridges – Pressure transducers – Load cells – Temperature Compensation – Strain Rosettes.

3.   SENSORS   **9**

Sensing Technology – Types of Sensors – Physical Measurement using Piezo Electric Strain measurement – Inductively Read Transducers – The LVOT – Fiber optic Techniques.
Chemical and Bio-Chemical sensing in structural Assessment – Absorptive chemical sensors – Spectroscopes – Fibre Optic Chemical Sensing Systems and Distributed measurement.

4.   ACTUATORS   **9**

Actuator Techniques – Actuator and actuator materials – Piezoelectric and Electrostrictive Material – Magnetostructure Material – Shape Memory Alloys – Electro orheological Fluids– Electro magnetic actuation – Role of actuators and Actuator Materials.

5.   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 – Borton. London-1996.

      REFERENCES

1.   L. S. Srinath – Experimental Stress Analysis – Tata McGraw-Hill, 1998.
    2.   J. W. Dally & W. F. Riley – Experimental Stress Analysis – Tata McGraw-Hill, 1998.

CE1033   **FINITE ELEMENT TECHNIQUES**   **3 1 0 100**

OBJECTIVE

At the end of this course the student shall have a basic knowledge of finite element method and shall be able to analyse linear elastic structures, that he has studied about in core courses, using finite element method.

1.   INTRODUCTION – VARIATIONAL FORMULATION   **8**

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.

2. FINITE ELEMENT ANALYSIS OF ONE DIMENSIONAL PROBLEMS   8

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.

3. FINITE ELEMENT ANALYSIS OF TWO DIMENSIONAL PROBLEMS   8

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.

4. ISOPARAMETRIC ELEMENTS AND FORMULATION   7

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

5. APPLICATIONS TO FIELD PROBLEMS IN TWO DIMENSIONALS   7

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.

6. INTRODUCTION TO ADVANCED TOPICS (NOT FOR EXAMINATION PURPOSE)
                                                                        7

Three dimensional problems – Mixed formulation – use of software packages like NISA, ANSYS OR NASTRAN.

TOTAL : 45

TEXT BOOK

1.   Chandrupatla, T.R., and Belegundu, A.D., "Introduction to Finite Element in Engineering", Third Edition, Prentice Hall, India, 2003

      REFERENCES

1.   J.N.Reddy, "An Introduction to Finite Element Method", McGraw-Hill, Intl. Student Edition, 1985.
   2. Zienkiewics, "The finite element method, Basic formulation and linear problems", Vol.1, 4/e, McGraw-Hill, Book Co.

3.   S.S.Rao, "The Finite Element Method in Engineering", Pergaman Press, 2003.
4.   C.S.Desai and J.F.Abel, "Introduction to the Finite Element Method", Affiliated East West Press, 1972.