UNIVERSITY OF CALICUT

SCHEME AND SYLLABI

FOR

EIGHTH SEMESTER

OF

BACHELOR OF TECHNOLOGY

IN

CIVIL ENGINEERING

FROM 2004 ADMISSION ONWARDS

CALICUT UNIVERSITY (P.O), THENHIPALAM

EIGHTH SEMESTER

Code	Subject	Hours/week			Internal Marks	University Examination	
		L	T	P/D		Hours	Marks
CE04 801	QUANTITY SURVEYING AND VALUATION	3	1	-	50	3	100
CE04 802	CONSTRUCTION ENGINEERING AND MANAGEMENT	3	1	-	50	3	100
CE04 803	ENVIRONMENTAL ENGINEERING II	3	1	-	50	3	100
CE04 804	ELECTIVE II	3	1	-	50	3	100
CE04 805	ELECTIVE III	3	1	-	50	3	100
CE04 806 (P)	**ENVIRONMENTAL ENGINEERING LAB**	-	-	3	50	3	100
CE04 807 (P)	**PROJECT**	-	-	7	100	-	-
CE04 808	VIVA VOCE	-	-	-	-		100
	TOTAL	**15**	**5**	**10**	**400**		**700**

ELECTIVES – II

CE04 804A ADVANCED STRUCTURAL DESIGN II
CE04 804B FINITE ELEMENT METHODS
CE04 804C PAVEMENT DESIGN
CE04 804D COASTAL ENGINEERING AND MARINE STRUCTURES
CE04 804E FUNCTIONAL DESIGN OF BUILDINGS
CE04 804F REMOTE SENSING AND GIS

ELECTIVES – III

CE04 805A INDUSTRIAL STRUCTURES
CE04 805B STRUCTURAL DYNAMICS AND SEISMIC DESIGN
CE04 805C SOIL EXPLORATION, TESTING AND EVALUATION
CE04 805D ENVIRONMENTAL POLLUTION CONTROL ENGINEERING
CE04 805E SURFACE HYDROLOGY AND WATER POWER
CE04 805F URBAN TRANSPORTATION PLANNING

SYLLABI OF EIGHTH SEMESTER

CE 04 801 QUANTITY SURVEYING AND VALUATION

3 hours lecture and 1 hour tutorial per week

Objective

After studying the subject, the student should be able

1. To prepare detailed and approximate estimate to meet a number of requirements and also to have a clear picture of the project expenditure.
2. To have a thorough idea regarding the quality and quantity of materials, quantity and classes of skilled and unskilled labours and tools and plants required for the project.
3. To prepare specifications for the different items of civil engineering project
4. To prepare valuation of the property

Module I (19 hours)

Estimate - explanation of terms - contingencies - work charged establishments - provisional sum - lumpsum item - centage charge - types of estimate - revised estimate - supplementary estimate - maintenance estimate - approximate estimate - plinth area method - cubic rate method - unit rate method - bay method - approximate quantity from bill method - comparison method - cost from materials and labour. - preparation of detailed estimate for R.C building - centre line method and long wall - short wall method - methods of measurements of different items of work.

Module II (11 hours)

Preparation of detailed estimate for sanitary and water supply works - roads - irrigation works - steel structures - doors and windows - detailed specifications for common building materials and items of work as per I.S specifications - calculation of quantities of materials for items of work.

Module III (11 hours)

Preparation of conveyance statement - analysis of rate for items of works required for civil engineering works - preparation of abstract of estimate of civil engineering works. preparation of bar bending schedule for some typical RCC elements.

Module IV (11 hours)

Valuation - explanation of items - types of values - sinking fund - years purchase - depreciation - straight line method - constant percentage method - S.F method - obsolescence - valuation tables - valuation of real property - rental method - profit based method - depreciation method - valuation of land - belting method - development method - hypothecated building scheme method - rent calculation - lease and lease hold property.

Text books

1. Chakraborthi, M. Estimating costing and Specification in Civil Engineering -
2. Dutta B.M.Estimating and costing in civil engineering -
3. Rangawala S.C., Valuation of real properties Charotar Publications.

References

1. I.S.1200-1968 Methods of measurements of buildings and Civil Engineering works
2. Latest schedule of rate of Kerala P.W.D

3. Latest Data book of Kerala P.W.D

Internal Assessment:

2 Tests	2 x 15	= 30 marks
assignments	(minimum 2)	= 15 marks (One may be a field oriented work based on a field project)
Regularity		= 5 marks
Total marks		= 50 marks

University examination pattern:

(Latest schedule of rate of Kerala P.W.D and standard Data book of Kerala P.W.D are permitted inside examination hall)

Q I -8 short type questions of 5 marks each, 2 from each module
Q II -2 questions of 30 marks each from module I with choice to answer any one
Q III -2 questions of 10 marks each from module II with choice to answer any one
Q IV -2 questions of 10 marks each from module III with choice to answer any one
Q V -2 questions of 10 marks each from module IV with choice to answer any one

CE 04 802 CONSTRUCTION ENGINEERING AND MANAGEMENT

3 hours lecture and 1hour tutorial per week

Objective:To make the students familiar with the various facets of construction and its planning like man and material management, tender document preparation, scheduling, standardisation, professional ethics

Module I (13 hours)

Construction management: Network Techniques: Introduction – Bar charts – Use of CPM and PERT for planning – Drawing network diagrams – time estimates – slack – critical path – resource smoothing – resources levelling

Construction Planning: Preparation of job layout, construction schedule, equipment schedule, material schedule and labour schedule.

Module II (13 hours)

Construction equipment: Factors for selection of equipment – equipment for excavation and transportation of earth – hauling equipment – hoisting equipment – pile foundation and pile driving equipment – concrete mixing plant – ready mixed concrete.

Module III (13 hours)

Construction methods and standardisation – different methods of construction – tenders – earnest money deposit – security deposit – general conditions of contract – contract documents – measurements – completion certificate – quality control and inspection – organisation and functioning of standardisation at national and international level – Bureau of Indian Standards (BIS) – International Standardisation Organisation (ISO).

Module IV (13 hours)

Concept of materials management – inventory – inventory control – Economic order quantity- ABC analysis.

Safety in construction – importance – Safety measures in different stages of construction – implementation of safety programme.

Concept of ethics – Professional Ethics – importance – Ethical problems – codes of Business - professional responsibilities –provisions of a professional code – Role of professional bodies.

Text Books:

1. L.S. Srinath – PERT and CPM – Principles and Applications
2. J.Jha and S.K.Sinha – Construction and Foundation Engineering, Khanna Publications.
3. R.L.Peurifoy and Schexnayder – Construction Planning Equipment and Method, Tata Mcgraw Hill

Reference books:

1. V.N.Vazirani and S.P.Chandola – Heavy Construction.
2. L.C.Verma – Standardisation – A new discipline.
3. P.P.Dharwadkarm (Oxd and IBH) – Management in Construction Industry
4. Charles D Fledderman, Engineering Ethics, Prentice Hall, New Mexico, 1999
5. BIS, National Building Code
6. Khanna, O.P., Industrial Engg. and Management., , Dhanapat Rai Publications
7. Gahlot and Dhir – Construction Planning and Management, New Age International

Internal assessment

Assignments = 15 marks

(Suggestion for assignment:

1. Case study analysis of any one construction project to understand general planning, implementation, materials management, labour management and important machinery used. Projects to be of reasonable size for having scope for aforementioned analysis.
2. Preparation of a construction management plan for a project proposed by the teacher.)

Tests 2 X 15 = 30 marks

Regularity = 5 marks

Total = 50 marks

University Examination Pattern:
QI – 8 short answer type questions of 5 marks each, 2 from each module.
QII – 2 questions of 15 marks each from module I with choice to answer any one.
QIII - 2 questions of 15 marks each from module II with choice to answer any one.
QIV- 2 questions of 15 mark each from module III with choice to answer any one.
QV - 2 questions of 15 marks each from module IV with choice to answer any one.

CE 04 803 ENVIRONMENTAL ENGINEERING II

3 hour lectures and 1 hour tutorial per week

Objective

To expose students to the area of waste treatment – with emphasis on domestic liquid wastes – its characterisation, collection, treatment and disposal at individual household level to community level - rural and urban. Also elements of solid waste management and air pollution control are introduced.

Module I (13 Hours)

Wastewater engineering – sanitary pumping – closets – urinals – wash basins – sinks – baths – traps – soil pipes – wastewater pipes –systems of piping – pipe joints and pipe fittings – public lavatories and toilets in factories, railway stations, bus stations and air ports.

House drainage – principles of house drainage – inspection chambers – ventilation – testing of drains – connection of house drains and street sewer.

Systems of sewerage – separate, combined and partially combined systems – quantity of storm sewage – source of sewage – relation to water consumption – groundwater infiltration –fluctuations of sewage flow – quantity of storm sewage – factors affecting storm water sewage – determination of storm water flow – time of concentration – sewers and sewer appurtenances – materials used in the construction of sewers – shape of sewers – hydraulics of sewers – design of sewers – manholes, inlets, catch basins, grease traps – regulators – leaping weirs – side weirs – siphon spillway - inverted siphons – sewage pumps – pumping stations –sewer junctions – outlets - maintenance of sewers – cleaning of sewers- ventilation of sewers.

Module II (13 Hours)

Characteristics of sewage – physical, chemical and biological characteristics – physical and chemical analysis –sampling – population equivalent – characteristics of industrial wastes – treatment of wastewater – screens – grit chambers – detritus tank – skimming tanks – sedimentation tanks –design construction and operation of trickling filters, activated sludge treatment units – oxidation ponds – disinfection of sewage.

Module III (13 Hours)

Sewage disposal, disposal into water –assimilation capacity of streams – disposal into land – surface and subsurface irrigation.

Sludge treatment and disposal, quality of sludge – characteristics of sludge – sludge elutriation – sludge conditioning – vacuum filtration – sludge digestion – disposal of sludge.

Rural sanitation – conservancy and water carriage systems – sanitary latrines – septic tanks – (Design as per I.S.specification)

Module IV (13 Hours)

Solid waste management – solid waste collection – transportation and processing - types and sources of solid waste – solid waste characteristics – automation and mechanism of refuse collection – vehicles for solid waste collection and transportation - solid waste disposal – composting – incineration – sanitary landfill – prevention of malaria.

Gaseous waste management (air pollution and control) – air pollution and health – types of pollutants and their sources – air pollution control strategy – basic approaches – areas of legal responsibility – source identification – particulate control and control of gases and vapors.

Text Books.

1. Birdie G.S and Birdie J.S, Water Supply and Sanitary Engineering, Dhanpat Rai and Sons.
2. Duggal K N, Elements of Environmental Engineering, S Chand and Co Ltd.
3. Garg S K, Environmental Engineering Vol II, Khanna Publishers.

Reference Books:

1. Elhers and Steel, Municipal and Rural Sanitation, McGraw Hill.
2. Sawer and McCarty, Chemistry for Environmental Engg, McGraw Hill.
3. Fair, Gayer and Okun, Water and Wastewater Engineering Vol II, John Wiley.
4. Metcalf and Eddy, Wastewater Engg, Treatment, Disposal and Reuse, Tata McGraw Hill.
5. Ministry of Urban Development, Govt. of India, Manual of wastewater and treatment 1986

Internal Assessment:

2 Tests	2 x 15	= 30 marks
Assignments	(minimum 2)	= 15 marks
Regularity		= 5 marks
Total marks		= 50 marks

University Examination Pattern:

QI – 8 short answer type questions of 5 marks each, 2 from each module.
QII – 2 questions of 15 marks each from module I with choice to answer any one.
QIII - 2 questions of 15 marks each from module II with choice to answer any one.
QIV- 2 questions of 15 mark each from module III with choice to answer any one.
QV - 2 questions of 15 marks each from module IV with choice to answer any one.

CE 04 804 A ADVANCED STRUCTURAL DESIGN II

3 hours lecture and 1 hour tutorial per week

Objective:

To familiarise the students with analysis and design aspects of shell roofs, tall buildings and prestressed concrete structures

Module 1 (16 Hours)

Shell Roof – Introduction-Classification of shells, types of stresses, Analysis and design of simply supported circular cylindrical shells using membrane theory, Beam theory and ASCE manual No.31

Module II (20 Hours)

Folded Plates – Introduction- Analysis using ASCE Task Committee method – Design using Beam Method Tall Buildings –Introduction, Structural Systems, Principles of design of shear wall.

Module III (16 Hours)

Principles of design of Prestressed Concrete Beams –Preliminary design. Prestressed cast in situ composite construction - Principles of design of anchorages (Theory only)

Note:

1. Special importance shall be given to detailing in designs.
2. Limit state design shall be practiced wherever possible
3. Use of I.S. codes and SP16 shall be permitted in the examination hall.

Text Books :

1. Varghese P.C., *Advanced Reinforced Concrete Design* , PHI
2. Krishnaraju, N. Advanced *Reinforced Concrete Design, CBS Publishers*.
3. Jain and Jaikrishna, *Plain and Reinforced Concrete Vol. 11*, Nem Chand
4. Lin.T.Y. and Burns ,Design of prestressed Concrete Structures ,John Wiley
5. Libby , Pre stressed Concrete ,CBS Publishers
6. N. Krishnaraju, Pre stressed Concrete,Oxford and IBH
7. Roy and Sinha, , Pre stressed Concrete

Reference books:

1. Park and Paulay ,Reinforced Concrete Structures
2. IS 2210-1990, *Criteria for The Design of R.C.C. Shell Roofs and Folded Plates*
3. ASCE, *Manual for Design of Cylindrical Concrete Shell Roofs No. 31*
4. Ramaswamy G.S., *Design and Construction of Concrete Shell Roofs*
5. Advanced Engineering Bulletin No. 14, *Design of Combined Frames and Shear Walls*, Portland Cement Association
6. Special Publication, *Shear Wall Frame Interaction - A Design Aid With Commentary By McLeod I.A.*, Portland Cement Association
7. IS 1343 Code of practice for the design of prestressed concrete structures.

Internal assessment:

2 Tests	2x15 = 30 marks
Assignments (minimum 2)	15 marks
Report on any one recent Development in structural Engineering with Basic Principles of Design	
Regularity	5 marks
Total marks	50 marks

University examination pattern:

IS-456 –2000, IS-2210-1990 IS –1343, ASCE Manual no.31 and SP-16 are permitted in the examination hall

Q I -8 short type questions of 5 marks each, 2 or 3 from each module

Q II -2 questions of 20 marks each from module I with choice to answer any one

Q III -2 questions of 20 marks each from module II with choice to answer any one

Q IV -2 questions of 20 marks each from module III with choice to answer any one

CE 04 804 B FINITE ELEMENT METHOD

3 hours lecture and 1 hour tutorial per week

Objective :
To make the Back ground, Basic concepts and Basic Formulation of Finite Element method clear to the students

Module I (13 hours)
Introduction: the finite element method - the element characteristic matrix - element assembly and solution for unknowns - summary of finite element history - basic equations of elasticity - strain-displacement relations - theory of stress and deformation - stress-strain-temperature relations
The direct stiffness method: structure stiffness equations - properties of [K] - solution of unknowns - element stiffness equations - assembly of elements - node numbering to exploit matrix sparsity - displacement boundary conditions - gauss elimination solution of equations - conservation of computer storage - computational efficiency - stress computation - support reactions - summary of the finite element procedure

Module II (13 hours)
Stationary principles, Rayleigh-Ritz and interpolation: principle of stationary potential energy - problems having many d.o.f - potential energy of an elastic body - the Rayleigh-Ritz method - piecewise polynomial field - finite element form of Rayleigh-Ritz method - finite element formulations derived from a functional - interpolation - shape functions for C^0 and C^1 elements - lagrangian interpolation functions for two and three dimensional elements
Displacement based elements for structural mechanics: formulas for element stiffness matrix and load vector - overview of element stiffness matrices - consistent element nodal vector - equilibrium and compatibility in the solution - convergence requirements - patch test - stress calculation - other formulation methods
Straight sided triangles and tetrahedral: natural coordinates for lines, triangles and tetrahedral - interpolation fields for plane triangles - linear and quadratic triangle - quadratic tetrahedron

Module III (13 hours)
The isoparametric formulation: introduction - an isoparametric bar element - plane bilinear element - summary of gauss quadrature - quadratic plane elements - direct construction of shape functions for transition elements - hexahedral (solid) isoparametric elements - triangular isoparametric elements - consistent element nodal loads - validity of isoparametric elements - appropriate order of quadrature - element and mesh instabilities - remarks on stress computation
Coordinate transformation: transformation of vectors - transformation of stress, strain and material properties - transformation of stiffness matrices - transformation of flexibility to stiffness - inclined support - joining dissimilar elements to one another- rigid links - rigid elements

Module IV (13 hours)
Introduction to weighted residual method: some weighted residual methods - galerkin finite element method - integration by parts - axially loaded bar - beam - plane elasticity
Topics in Structural Mechanics : DOF within the elements-condensation- condensation and recovery algorithm-substructuring –structural summary

Text books:
Cook R.D., Malkus D.S. and Plesha M.F., *Concepts and Applications of Finite Element Analysis,* John Wiley

Reference books:

1. Desai C.S., *Elementary Finite Element Method,* Prentice Hall of India
2. Chandrupatla T.R. and Belegundu A.D., *Introduction to Finite Elements in Engineering,* Prentice Hall of India
3. Bathe K.J., *Finite Element Procedures in Engineering Analysis,* Prentice Hall of India
4. Gallaghar R.H., *Finite Element Analysis: Fundamentals,* Prentice Hall Inc.
5. Rajasekaran S., *Finite Element Analysis in Engineering Design,* Wheeler Pub.
6. Krishnamoorthy C. S., *Finite Element Analysis - Theory and Programming,* Tata McGraw Hill
7. Zienkiewics O.C. and Taylor R.L., *The Finite Element Method,* Vol I and II, McGraw Hill

Internal assessment:

Assignments	(minimum 2)	= 15 marks
2 tests	2x15	= 30 marks
Regularity		= 5 marks
Total marks		= 50 marks

University examination pattern:

Q I - 8 short type questions of 5 marks, 2 from each module
Q II - 2 questions of 15marks from module I with choice to answer any one
Q III - 2 questions of 15marks from module II with choice to answer any one
Q IV - 2 questions of 15marks from module III with choice to answer any one
Q V - 2 questions of 15marks from module IV with choice to answer any one

CE 04 804C GROUND IMPROVEMENT TECHNIQUES

3 hours lecture and 1 hour tutorial per week

Module I (14 hours)

Introduction to soil improvements without the addition of any material - dynamic compaction - equipment used - application to granular soils - cohesive soils - depth of improvement - environmental considerations - induced settlements - compaction using vibratory probes - vibro techniques vibro equipment - the vibro compaction and replacement process - control of verification of vibro techniques - vibro systems and liquefaction - soil improvement by thermal treatment - preloading techniques - surface compaction introduction to bio technical stabilization

Module II (14 hours)

Introduction to soil improvement by adding materials - lime stabilization - lime column method - stabilization of soft clay or silt with lime - bearing capacity of lime treated soils - settlement of lime treated soils - improvement in slope stability - control methods - chemical grouting - commonly used chemicals - grouting systems - grouting operations - applications - compaction grouting - introduction - application and limitations - plant for preparing grouting materials - jet grouting - jet grouting process - geometry and properties of treated soils - applications - slab jacking - sand and stone columns

Module III (11 hours)

Soil improvement using reinforcing elements - introduction to reinforced earth - load transfer mechanism and strength development - soil types and reinforced earth - anchored earth nailing reticulated micro piles - soil dowels - soil anchors - reinforced earth retaining walls

Module IV (13 hours)

Geotextiles - polymer type geotextiles - woven geotextiles - non woven geotextiles - geo grids - physical and strength properties - behaviour of soils on reinforcing with geotextiles - effect on strength, bearing capacity, compaction and permeability - design aspects - slopes - clay embankments - retaining walls - pavements

Text Book

1. Moseley, *Text Book on Ground Improvement*, Blackie Academic Professional, Chapman and Hall
2. Purushotham S. Raju, *Ground Improvement Technique*, Laxmi Publications

Reference books

3. Boweven R., *Text Book on Grouting in Engineering Practice*, Applied Science Publishers Ltd
4. Jewell R.A., *Text Book on Soil Reinforcement with Geotextiles*, CIRIA Special Publication, Thomas Telford
5. Van Impe W.E., *Text Book On Soil Improvement Technique and Their Evolution*, Balkema Publishers
6. Donald .H. Gray and Robbin B. Sotir, *Text Book On Bio Technical and Soil Engineering Slope Stabilization*, John Wiley
7. Rao G.V. and Rao G.V.S., *Text Book On Engineering With Geotextiles*, Tata McGraw Hill
8. Korener, *Construction and Geotechnical Methods In Foundation Engineering*, McGraw Hill

Internal assessment:

Assignments (minimum 2)		= 15 marks
2 Tests	2 x 15	= 30 marks
Regularity		= 5 marks
Total marks		= 50 marks

University examination pattern:

Q I -8 short type questions of 5 marks each, 2 from each module
Q II -2 questions of 15 marks each from module I with choice to answer any one
Q III -2 questions of 15 marks each from module II with choice to answer anyone
Q IV -2 questions of 15 marks each from module III with choice to answer anyone
Q V -2 questions of 15 marks each from module IV with choice to answer any one

CE 04 804D COASTAL ENGINEERING AND MARINE STRUCTURES

3 hours lecture and 1 hour tutorial per week

Objective: To develop the background knowledge for onshore and offshore developmental activities.

Module I (16 Hours)

Introduction: man-ocean interaction-effects of ocean on ecology and climate-ocean as a source of food and means of communication-minerals in ocean-ocean for disposal of wastes- integrated coastal zone management (ICZM) and its importance in India.

Theory of ocean waves: formulation of wave motion problem-assumptions made in two dimensional cases-small amplitude wave theory (SAWT) -orbital motions and pressures- problems related to SAWT-wave energy.

Module II (10 Hours)

Brief introduction to finite amplitude wave theories-Stoke's wave theory (3^{rd} order) -mass transport-Gerstner theory-solitary wave theory-relationships among wave dimensions-wind and fetches-generation of waves- surface wind velocity and fetch determination-wave forecasting- S.M.B and P.N.J methods-problems on wave forecasting.

Module III (12 Hours)

Reflection, refraction and diffraction of waves: clapotis or standing waves-super position of waves-diffraction of waves around semi infinite break waters –detached breakwater of finite length-diffraction through openings. Wave forces on structures: forces on vertical walls due to non-breaking waves, breaking waves and broken waves based on linear theory-problems-forces on circular cylinders in the Morison and diffraction regime-Froude-Krylov force-problems related to force on structures-Tsunami, Generation, propagation-warning systems.

Module IV (14 Hours)

Shores and Shore processes: long term and short term changes of shores –factors influencing beach characteristics-beach wave interaction-beach profile modification-littoral drift-stability of shores-shore erosion due to sea level rise-on shore and off shore transport-long shore transport-interaction of shore structures-shore erosion in Kerala-mud banks

Shore Protection works: description and effects of break waters-sea walls-groynes of various types-beach nourishment, break waters, tetrapod, tribar. Hudson's formula and simple design problem.

Reference Books:

1 Chakrabarti,S.K.*Hydrodynamics of Offshore structures*, Computational Mechanics Publications, Southampton Boston

2.Ippen A.T, *Estuary and Coastline Hydrodynamics*

3.Sarpkaya, T.,Isaacson,M. *Mechanics of Wave Forces on Offshore Structures*, Van Nostrand Renhold Company

4.Wiegel R.L, *Oceanographical Engineering*, Prentice Hall.

5. Coastal Engineering Manual (CEM-Department of the Army-US Army Corps of Engineers-2001 or latest revision)

Internal assessment:

Assignment(minimum2)		= 15 marks
2 Tests (minimum2)	2 x15	= 30 marks
Regularly		= 5 marks
Total marks		= 50 marks

University examination pattern:

Wave forecasting charts are permitted in examination hall.

Q1 8short type questions of 5 marks each, 2 from each module
QII 2 questions of 15 marks with each from module I with choice to answer any one
QIII 2 questions of 15 marks each from module II with choice to answer any one
QIV 2 questions of 15 marks each from module III with choice to answer any one
QV 2 questions of 15 marks each from module IV with choice to answer any one

CE 04 804 E : FUNCTIONAL DESIGN OF BUILDINGS

(3hours lecture and 1 hour tutorial per week)

Objective : (1) Study the design concepts for acoustical and lighting services (2) Study principles of climatic design of buildings for tropical climates.

Module I (13 Hours)

Introduction to functional design – principles.

Acoustics : Physics of sound – frequency, intensity, variation with time, dB scale – measurement – airborne and structure borne propagation – effect of noise on man – behavior of sound in free field and enclosures – Sabine's formula – design criteria for spaces – acoustical defects – sound reduction, sound insulation and reverberation control – typical situation like offices, flats, auditorium and factories – acoustic materials – properties – types and fixtures.

Module II (13 Hours)

Lighting and Illumination Engineering: Types of visual tasks – principles of day lighting – day light factor – sky component – internal reflected component – external reflected component – design of windows for lighting – effect of orientation – evaluation of lighting by windows, skylights – artificial lighting – illumination requirements for various buildings – measurement – lux meter – lamps and luminaries – polar distribution curves – design of artificial lighting – lumen method – point by point method – coefficient of utilisation – room index – maintenance factor – room reflectance – glare – flood lighting of building exteriors – street lighting of building neighbourhood.

Module III (15 Hours)

Climatic elements: Climate on a global scale – solar radiation – radiation at earth's surface – earth's thermal balance – winds – trade winds – westerlies – polar winds – wind data measurement at site – air pressure – atmospheric humidity – meaurement – psychrometric chart – condensation and precipitation – climatic graph – temperature inversion – influence of topography – urban climates – comparison and classification of climates.

Thermal comfort: Human body's heat production – body's heat loss – thermal balance of a body – heat loss in various environments – effect of prolonged thermal exposure –subjective variables – thermal comfort indices – effective temperature – psychometric chart – ET and its use – effect of radiation – mean radiant temperature – ET nomograms – finding CET – comfort zone

Thermo physical properties of building materials: Thermal quantities – heat flow – thermal conductivity – resistance and transmittance and surface coefficient – cavities – periodic heat flow – time lag and decrement factor.

Sun's movement and building: Solar radiation – absorbed, reflected and transmitted – direct, diffused and reflected radiation – measurement of solar radiation – combined effect of solar radiation and ambient air temperature – sol air temperature concept- solar gain factor – apparent movement of sun – solar charts and its use.

Heat flow and thermal insulation: Heat flow through buildings – thermal transmittance of structural elements – thermal gradients – insulating materials – properties – thermal insulation of roofs- exposed walls – openings.

Module IV (11 Hours)

Design criteria for control of climate – passive and active building design – passive approach by orientation, glazing, shading, choice of building materials etc. – shading devices – shadow angles – internal blinds and curtains – heat absorbing glasses – effect of orientation on incident solar radiation and internal temperature – active systems – low energy cooling – shelters suiting different climates.

Integration of building subsystems (like thermal, visual, acoustical etc.) for functional efficiency. Introduction to Ergonomics – principles of ergonomic design-

Intelligent buildings – introduction.

Text Book:

1. Koenigseberger, Manual of tropical Housing and Building Part I – Climatic design, Orient Longman

Reference Books:

1. Ajitha Simha, D. Building Environment, Tata McGraw Hill Publishing Co., New Delhi
2. Givoni B. Man, Climate and Architecture, Applied Science Publication.
3. Knudsen V.O. and Harris C.M., Acoustical Design in Architecture, John Wiley
4. Bureau of Indian Standards, National Building Code of India 1983
5. Bureau of Indian standards, Handbook on Functional Requirement of Buildings – SP:41(S and T) – 1987
6. Narasimham V., An Introduction to Building Physics
7. Krishnan, Climate responsive architecture, Tata McGraw Hill.

Internal assessment:

Assignments (minimum 2)		= 15 marks
2 Tests	2 x 15	= 30 marks
Regularity		= 5 marks
Total marks		= 50 marks

University examination pattern:

Q I -8 short type questions of 5 marks each, 2 from each module
Q II -2 questions of 15 marks each from module I with choice to answer any one
Q III -2 questions of 15 marks each from module II with choice to answer anyone
Q IV -2 questions of 15 marks each from module III with choice to answer anyone
Q V -2 questions of 15 marks each from module IV with choice to answer any one

CE 04 804 F REMOTE SENSING AND GIS

(3hours lecture and 1 hour tutorial per week)

Objective : To make the student aware of the technological developments in the geographical data base management and its advantages.

Module I(13 hours)

Remote Sensing: definition – components of remote sensing – energy, sensor, interacting body - active and passive remote sensing – platforms – aerial and space platforms – balloons, helicopters, aircraft and satellites – synoptivity and repetivity – Electro Magnetic Radiation (EMR) – EMR spectrum –visible, Infra Red (IR), Near IR, Middle IR, Thermal IR and microwave – black body radiation –Planck's law – Stefan-Boltzman law.
Atmospheric Characteristics - scattering of EMR – Raleigh, Mie, Non-selective and Raman Scattering – EMR interaction with water vapour and ozone – atmospheric windows – significance of atmosphgeric windows, EMR interaction with earth surface materials radiance, irradiance, incident, reflected, absorbed and transmitted energy – reflectance – specular and diffuse reflection surfaces – spectral signature – spectral signature curves – EMR interaction with water, soil and earth surface.

Module II (13 hours)
Optical and Microwave Remote Sensing
satellites – classification – based on orbits – sun synchronous and geo synchronous -based on purpose – earth resources satellites, communication satellites, weather satellites, spy satellites – satellite sensors – resolution – spectral, spatial, radiometric and temporal resolution – description of multi spectral scanning – along and across track scanners – description of sensors in Landsat, SPOT, IRS series – current satellites – radar – speckle – back scattering – side looking airborne radar – synthetic aperture radar – radiometer – geometrical characteristics. Principles of thermal remote sensing. Principles of microwave remote sensing.

Module III (13 hours)
Geographic Information System: Components of GIS – hardware, software and organisational context – data – spatial and non-spatial – maps – types of maps – projection – types of projection – data input – digitizer, scanner – editing – raster and vector data structures- comparison of raster and vector data structure – analysis using raster and vector data – retrieval, reclassification, overlaying, buffering – data output – printers and plotters

Module IV (13 hours)
Miscellaneous Topics: Interpretation of satellite images – elements of interpretation - visual interpretation – digital interpretation -digital image processing techniques Image enhancement- filtering– image classification – supervised – unsupervised integration of GIS and remote sensing – application of remote sensing and GIS – urban applications – water resources – urban analysis – watershed management – resources information systems.

Text Books:

1. Anji Reddy, Remote Sensing and Geographical Information Systems, BS Publications 2201
2. M.G Srinivas (Edited By), Remote Sensing Applications, Narosa Publishing House, 2001
3. Lillesand .T.M and Kuefer, R. W. Remote sensing and Image Iterpretation, john Wiley and Sons, Inc. New York.1987.
4. Jensan, J. R. Introductory digital Image processing , Pretice hall of india
5. Sabins, Flyod, F., Remote sensing principles and interpretation, W H. Freman and company, New York

References:

1) Janza. F.J., Blue, H.M., and Johnston, J.E., "Manual of Remote Sensing Vol.I., American Society of Photogrammetry, Virginia, U.S.A., 1975
2) Burrough P.A, Priciple of GIS for land resource assessment, Oxford, 1990
3) Star Jeffrey, L (Ed.) Estes Joh E. and McGwire Kenneth, Integration of Geographical Systems and remote sensing , Cambridge University, 1997.
4) De Merse, Michael N. Fundamentals of geographic Information system, Second ed. New York, John Wiley and sons, 2000.

Internal assessment:

2 Tests	2 x 15	= 30 marks
2 Assignments (minimum 2)		= 15 marks
Regularity		= 5 marks
Total marks		= 50 marks

University examination pattern:

Q I -8 short type questions of 5 marks each, 2 from each module
Q II -2 questions of 15 marks each from module I with choice to answer any one
Q III -2 questions of 15 marks each from module II with choice to answer anyone
Q IV -2 questions of 15 marks each from module III with choice to answer anyone
Q V -2 questions of 15 marks each from module IV with choice to answer any one

CE 04 805A INDUSTRIAL STRUCTURES

3 hours lecture and 1 Hour tutorial

Objective:

1. To familiarize with the design of special structures widely used in industrial plants.
2. To reinforce the fundamental courses in structural design in the perspective of industrial applications.

Module 1 (13hrs)

Functional design of industrial buildings: (7 hrs)

Classification of industrial structures-layout planning requirements –Guidelines from factories act – Lighting- Illumination levels – Principles of day lighting /artificial lighting design – Natural / Mechanical ventilation – Fire safety requirements – Corrosion protection – Protection against noise – Cladding systems- vibration isolation techniques - Industrial floors.

Introduction to diverse types of industrial structures: (6 hrs)

General overview of Thermal power plant/Nuclear power plant structures/Process plant steelwork – conveyor structures – Boiler supporting structures-Substation structures.

Module 2 (13 hrs)

Structural Design of Industrial Buildings:

Braced Industrial buildings – Unbraced Industrial frames – Gantry girders –Design of steel beam connections-Flexible and Rigid (Bolted and welded types)

Module 3 (13 hrs)

Special Industrial Structures:

Machine foundations – Types-Design Requirements-Analysis and design of block type machine foundations (IS 2974 method)– Design of Reinforced concrete bunkers and silos as per IS:4995–Tall Chimneys –Types-Chimney sizing parameters- Overview of wind and temperature effects-Design principles of Reinforced concrete chimneys as per IS: 4998.

Module 4 (13 hrs)

Tower Structures:

Cooling Towers –Types and functions- Design principles of RC natural draught cooling towers as per IS: 11504 - Transmission line Towers- Types-Design loadings-Analysis and design concepts- Description of TL tower foundations.

Textbooks:

1. Proceedings of an advanced course on industrial structures, SERC – 1982.
2. S.N.Manohar, Tall Chimneys-Design and Construction, Tata Mc Graw Hill.
3. P.Dayaratnam, Design of steel structures, Wheeler Publishing Co.
4. Ramchandra, Design of steel structures, Vol1 and 2, Standard Book house Delhi.
5. Srinivasulu and Vaidyanathan, Handbook of machine foundations-Tata McGraw Hill.
6. Murthy and Santhakumar, Transmission Line structures, McGraw Hill -Singapore

References:

1. SP: 32–1986,Handbook on functional requirements of Industrial buildings (Lighting and ventilation).
2. G.W.Owens, P.R.Knowles and P.J.Dowling- Steel Designers' manual – 5th edition – Blackwell scientific publications.
3. V.Kalayanaraman, Advances in steel structures. Tata McGraw Hill publishing Co.
4. Krishnaraju, Advanced Reinforced concrete design, CBS Publishers.
5. K.K.Mc Kelvey and Maxey Brooke, The Industrial Cooling Tower, Elsevier Publishing Co.

Internal assessment:

Assignments	(minimum 2)	= 15 marks
	1.Students shall be directed to take up industrial visits to study the items referred to in Module I.	
	2.Preparation of drawings for detailing of the various designs dealt in the course work.	
2 Tests		2x15 = 30 marks
Regularity		= 5 marks
Total marks		= 50 marks

University examination pattern:

Use of IS-800, SP6(4), IS 2974, IS 4995, IS 4998, IS 11504 may be permitted in the examination hall.

Q I -8 short type questions of 5 marks each, 2 from each module

Q II -2 questions of 15 marks each from module I with choice to answer any one

Q III -2 questions of 15 marks each from module II with choice to answer any one

Q IV -2 questions of 15 marks each from module III with choice to answer any one

Q V -2 questions of 15 marks each from module IV with choice to answer any one

CE04 805B STRUCTURAL DYNAMICS AND SEISMIC DESIGN

3 hours lecture and 1 hour tutorial per week

Module I(13 hours)

Overview of structural dynamics – Fundamental objective of structural dynamic analysis – types of prescribed loadings – essential characteristics of a dynamic problem – method of discretization, lumped mass procedure – generalized displacements – Single degree of freedom system – Components of the basic dynamic system – formulation of the equation of motion – D Alembert's principle –influence of gravitational forces-generalized SDOF system- Rigid body assemblage-expression for generalized system properties.

Module II(13 hours)

Solution of the equation of motion- undamped free vibration- damped free vibration- critical damping- under damped system- over damped system- negative damping-concept of Coulomb damping. Response to harmonic loading - Undamped system- complementary solutions- particular solution- general solution- response ratio – Viscously damped system- resonant response-dynamic amplification factor- vibration isolation.

Response to periodic loading - Fourier series expression of the loading- Response to the Fourier series loading - Exponential form of Fourier series solutions – concept of four way logarithmic graph paper

Module III(13 hours)

Base-excited SDOF system - formulation of basic equation– concepts of pseudo acceleration, velocity and displacement - Earthquake response spectra (concept only).

Lumped mass modeling of multistory shear building and modes of vibration (concepts only)

Performance of building and structures under earthquakes- Main Causes of Damage- Intensity of earth quake forces, lack of strength and integrity of buildings, quasi resonance – lack of ductility, lack of detailing.

Earth quake effects- On buildings, structures, power plants, switch yards, equipments or other life line structures, soil liquefaction- Assessment of damage.

Philosophy and Principles of earthquake.-resistant design- Strength and stiffness- ductility

Design and detailing, concepts of seismic isolation and seismic active control, Building forms and architectural design concepts- Horizontal and vertical eccentricities due to mass and stiffness distribution (Numerical exercises not expected).

Module IV(13 hours)

Equivalent Static Method- Seismic zones and coefficients – response reduction factors - Estimations of fundamental time period, base shear and its distributions using IS: 1893 for multistory buildings (regular shape only).

Use of codes like IS: 4326, IS: 13828, IS: 13827, IS13920, SP:22 with reference to masonry, RCC and steel building Detailing of reinforcement and joints.

Restoration and retrofitting - Methodologies for restoration and retrofitting – For walls, roofs, slabs, columns and foundation of building in stones, brick or reinforced concrete structures

Text books

1. Anil K Chopra, Dynamics of structures-theory and applications to earthquake engineering, Pearson Education
2. R W Clough and J Penzien, Dynamics of structures, McGraw Hill
3. Jaykrishna, Elements of earthquake engineering, Saritha Prakasan, Naunchandi, Meerut.

References

1. Anil K.Chopra, Dynamics of structures, Pearson Education.
2. Pillai and Menon, Reinforced concrete design, Tata McGraw Hill
3. Park and Paulay, Reinforced Concrete, McGraw Hill
4. IS 1893 (part-I):2002 Criteria for Earthquake Resistant structures: General Provisions and Building
5. IS –13935, 1993, Repair and Seismic Strengthening of Buildings,
6. IS-4326-1993, Earthquake Resistant Design and Construction of Building
7. IS-13827 –1993, Improving Earthquake Resistance of Earthen Buildings – Guidelines
8. IS –13828-1993, Improving Earthquake Resistance of Low Strength Masonry Building Guidelines.
9. IS-13920-1993, Ductile Detailing of Reinforced Concrete Structures Subjected to Seismic Forces – Code of Practice.
10. ATC –40 Seismic Evaluation And Retrofit Of Concrete Buildings vol.I, Report No.SSC, 96-01, Nov. 1996.
11. James, L. Strata, Manual of Seismic Design, Pearson Education
12. Paulay, T and Priestley, Seismic Design of Reinforced Concrete And Masonry Building, John Wiley and Sons.
13. National Programme for Capacity Building of Engineers in Earthquake Risk Management., organised by Ministry for Human Affairs at IIT Madras, Feb 21- march 18, 2005.
14. Guidelines for Earthquake Resistant Non-Engineered Construction published by International Associaation for Earthquake Engineering and National Information Centre of Earthquake Engineering, 2004.
15. Steven, L. Kraimer, Geotechnical Earthquake Engineering, Pearson Education.
16. Earthquake Spectra- Bhuj,India , Earthquake of Jan 26, 2001, Reconnaissance Report, Earthquake Engineering Research Institute

Internal assessment:

Assignments	(minimum 2)		= 15 marks
2 Tests		2x15	= 30 marks
Regularity			= 5 marks
Total marks			= 50 marks

University examination pattern:

Use of IS-456, SP16, IS 1893, IS4326, IS13920 may be permitted in the examination hall.

Q I -8 short type questions of 5 marks each, 2 from each module

Q II -2 questions of 15 marks each from module I with choice to answer any one

Q III -2 questions of 15 marks each from module II with choice to answer any one

Q IV -2 questions of 15 marks each from module III with choice to answer any one

Q V -2 questions of 15 marks each from module IV with choice to answer any one

CE 04 805C SOIL EXPLORATION, TESTING AND EVALUATION

3 hours lecture and 1 hour tutorial per week

Module I (14 hours)

Soil Exploration: objectives- methods-depth, spacing, size and number of boreholes-different methods of boring-boring logs-sample requirements-sampling methods and equipments-handling, preservation and transporting of samples-rock core recovery- rock quality designation-geophysical and seismic methods-preparation of soil investigation reports(Students are expected to know how to choose the type of exploration for different type of works, how to carryout the exploration and must be able to prepare soil investigation reports)

Module II (14 hours)

Laboratory Testing of Soil:

water content, Specific gravity, Grain size analysis, Atterberg's limits and indices, Permeability: constant head and variable head, Compaction: light and heavy, Consolidation: time-settlement, e-log(p) curve-preconsolidation pressure

Shear tests: direct shear, triaxial, unconfined compression, vane shear-pore pressure measurement

(Students are expected to know the test procedures, computation of properties from observations and correlations and interpretation of results . Theoretical treatment-derivations etc is not required)

Module III (10 hours)

Field Testing of soil:

Plate load test, Standard penetration test, static cone penetration test, Dynamic cone penetration test

Pressure meter test, Field vane shear test, Field permeability test.

(Students are expected to know the test procedures, computation of properties from observations, correlation and interpretation of results. Theoretical treatment-derivations etc. are not required)

Module IV (14 hours)

Laboratory and Field Testing of rocks:

Laboratory tests: Tension-shear and flexure tests- Elastic modulus by Brazilian and bending tests.

Insitu tests: Tests for deformability, shear tests, strength tests and tests for internal stresses.

Reference books:

1. Lambe, Soil testing for Engineers, John Willey, New York
2. Goodman R E , Rock Mechanics, John Wiley , New York
3. Terzaghi K. and Peck R.B., *Soil Mechanics in Engineering Practice, John Wiley*
4. Murthy V.N.S., *Soil Mechanics and Foundation Engineering*, Dhanpat Rai
5. Alam Singh, *Soil Engineering-Theory and Practice*, Asia Pub.
6. Coduto, *Geotechnical Engineering Principles and Practices*, Pearson Education
7. Joseph E. and Bowles, *Foundation Analysis and Design*, McGraw Hill
8. Tomlinson M.J., *Foundation Design and Construction*, Pitman

Internal assessment:

Site visit and preparation of soil investigation report	= 15 marks
2 Tests	= 30 marks
Regularity	= 5 marks
Total marks	= 50 marks

University examination pattern:

Q 1 -2 questions of 25 marks each from module I with choice to answer any one
Q 2 -2 questions of 25 marks each from module II with choice to answer anyone
Q 3 -2 questions of 25 marks each from module III with choice to answer anyone
Q 4 -2 questions of 25 marks each from module IV with choice to answer any one

CE 04 805D ENVIRONMENTAL POLLUTION CONTROL ENGINEERING

3 hour lecture and 1 hour tutorial per week

Objective:
It should provide balanced information regarding different elements of pollution and its control measures. It also exposes the students into various aspects of industrial pollution and treatment.

Module I (13 Hours)
Environmental pollution – interrelationship between various forms of pollution – surface water pollution surveys – integrated river basin water management – restoration of water bodies – water quality parameters and optimization of treatment – water quality changes by domestic use – radioactive materials – thermal pollution and underground disposal – types of water pollutants and their effects – instrumentation for water quality and treatment – role of wastewater treatment as pollution control measure.

Module II (13 Hours)
Land pollution – pollution cycle – ecological factors in plant site selection – ecological aspects of vegetation control – noise pollution – the physics of sound and hearing – effects of noise – sources – instruments and techniques for noise measurements – light and glare pollution – light and its characteristics - glare – outdoor lighting and glare sources – corrective procedures.

Module III (13 Hours)

Industrial waste engineering – study of origin - characteristics, process and treatment of major type of industrial wastes- textile industry –paper industry – dairy –fertilizer industry –Thermal power plants – site selection of industries.

Module IV (13 Hours)
Damages caused by industrial pollution – study of some typical problems in Kerala and India
Environmental impact assessment of major industries- textile industry –paper industry – dairy –fertilizer industry –Thermal power plants.

Reference Books:

1. Rao C S, Environmental Pollution Control Engineering, New Age International (P) Ltd.
2. Goel P K, Water Pollution Causes, Effects and Control, New age International (P) Ltd.
3. Birdie G.S and Birdie J.S, Water Supply and Sanitary Engineering, Dhanpat Rai and Sons.
4. Flintoff F, Management of solid waste in developing countries, WHO.
5. Liptek Bela G and Bouis P.A., Environmental Engineers Handbook Vols I, II, III, Chilton Book Company.
6. Water Pollution Act (1974) passed by Govt. of India.
7. Relevant Indian Standards and factory Acts.
8. Rau, J. G. and Wooten, D. S. Environmental Impact analysis Handbook, McGraw Hill Inc..
9. Nemerow, Theories and Practices of Industrial Waste Treatment, Addison wesley
10. Guruham, C.B. Principles of Industrial Waste Engineering.
11. Edmund Besselivere, Treatment of Industrial Wastes, Tata McGraw hill.

Internal Assessment:

2 Tests -	2 X 15	= 30 marks
Assignments (minimum 2)		= 15 marks
Regularity		= 5 marks
Total marks		= 50 marks

Assignment 1 should help the student to understand the interrelationships of pollution, E.g. - industry discharging waste streams to neighboring water source and letting out fumes and smokes into atmosphere - documentation of different treatment and measurement systems installed for controlling pollution.

Assignment 2 should provide an exposure to places of noise and light pollution and control measures adopted.

University Examination Pattern:

QI – 8 short answer type questions of 5 marks each, 2 from each module.
QII – 2 questions of 15 marks each from module I with choice to answer any one.
QIII - 2 questions of 15 marks each from module II with choice to answer any one.
QIV- 2 questions of 15 marks each from module III with choice to answer any one
QV - 2 questions of 15 marks each from module IV with choice to answer any one.

CE04 805E SURFACE HYDROLOGY AND WATER POWER

3 hours lecture and 1 hour tutorial per week

Objective: To make the students aware of the importance of surface water resources and strategic background information for its effective and wise utilisation

Module I (13 hours)

Introduction: hydrologic cycle - application of hydrology in engineering - water balance equation - water resources of India- Review of rainfall measurement and analysis.

Abstractions from precipitation - evaporation - measurement, estimation and control of evaporation - evapo transpiration(ET)- estimation of evapo-transpiration – evapo-transpiration and consumptive use - measurement of ET- lysimeters and field plots - potential ET and its computation - pan evaporation - Penman method - Blaney Criddle method - reference crop ET and Crop coefficient - interception and depression storage - infiltration process - measurement using infiltrometers - infiltration capacity - infiltration indices- Hortan's model of infiltration.

Rain Water harvesting- water scarcity in Kerala – reasons –manmade alterations in hydrologic cycle – methods of water conservation

Module II (13 hours)

Runoff - Characteristics of runoff - factors affecting runoff - components of hydrograph - base flow separation - rainfall- run off relations - unit hydrograph theory - derivation of unit hydrograph - applications and limitations of unit hydrograph - S hydrograph - instantaneous unit hydrograph – unit hydrograph for ungauged catchments- synthetic hydrograph - Conceptual elements –linear reservoirs - Nash model. Yield from a catchment - flow duration curves - flow mass curve-

Module III (13 hours)

Floods - estimation of peak discharge - rational method - unit hydrograph method

Probabilistic and statistical methods –Basic concept of probability and frequency distribution- skewness coefficient -return period –discrete distribution –binomial distribution –continuous distribution- Flood frequency analysis- Normal, lognormal Gumbel's and -Log-Pearson Type III methods.

Flood routing- reservoir routing –Modified pulse method –channel routing- Muskinghum method.

Module IV (13 hours)

Water Power – Types of hydro power schemes – Run off river plant – pumped storage plant – tidal power plants – Hydro power potentials of India – Economic considerations of water power

Estimates of available water power – Gross and Net head – available power – Power duration curve – Assessment of water power potential – load factor, capacity factor, utilisation factor

General Layout of Hydro power scheme -Elements of hydro power scheme- Intakes – functions – types – Tail race.

Penstocks – Location – types – economical diameter – Penstock accessories – Anchor blocks – water hammer – water hammer equations - Cavitation -Surge tanks – functions and types

Turbines – Review of basics – Characteristic curves – Draft tubes – Governing of turbines.

Text books

1. Subramanya K., *Engineering Hydrology,* Tata McGraw Hill
2. Regunath H.M., *Hydrology,* Prentice Hall
3. Duggal, K.N and J.P. Soni Elements of Water Resources Engineering, New Age International publishers,

References:

1. Chow , V.T., D.R. Maidment and L.W. Mays, *Applied Hydrology*, McGraw Hill Book company, Singapore, 1988.
2. McCuen, R. H. *Hydrologic analysis and design*, Prentice Hall, Eaglewood Cliffs, New Jersey, 1989
3. Singh, V.P**.** *Elementary Hydrology.* Prentice Hall of India, New Delhi, 1994
4. Veissman, W., Jr., G.L. Lewis and J.W. Knapp *Introduction to Hydrology.* Harper and Row, New York, 3 rd edition, 1989
5. K.L.Rao, Water Resources of India

Internal assessment		
2 Assignments (minimum 2)		= 15 marks
2 Tests	2 x15	= 30 marks
Regularity		= 5 marks
Total marks		= 50 marks

University examination pattern

Q I -8 short type questions of 5 marks each, 2 from each module
Q II -2 questions of 15 marks each from module I with choice to answer any one
Q III -2 questions of 15 marks each from module II with choice to answer anyone
Q IV -2 questions of 15 marks each from module III with choice to answer anyone
Q V -2 questions of 15 marks each from module IV with choice to answer any one

CE04 805F URBAN TRANSPORTATION PLANNING

3 hours lecture and 1 hour tutorial per week

Module I (13 hours)
Urban transportation planning process and concepts: Role of transportation - transportation problems - urban travel characteristics - evolution of transportation planning process - concept of travel demand - demand function - independent variables - travel attributes - assumptions in demand estimation - sequential, recursive and simultaneous process

Module II (13 hours)
Trip generation analysis: Definition of study area - zoning - types and sources of data - road side interviews - home interview surveys - expansion factors - accuracy checks. Trip generation models - zonal models - category analysis - household models - trip attractions of work centres

Module III (13 hours)
Trip distribution analysis: trip distribution models - growth factor models - gravity models - opportunity models

Module IV (13 hours)
Mode split and route split analysis: mode split analysis - mode choice behaviour - completing modes - mode split curves - probabilistic models - route split analysis - elements of transportation networks - coding - minimum path trees - all-or-nothing assignment - capacity restrained assignment

Text book
1 Khanna.S.K and Justo.C.E.G., Highway Engineering, Nemchand and Bros.
2 Kadiyali.L.R., Traffic Engineering and Transportation planning, Khanna Publishers, New Delhi.

References books
1. Hutchinson B.G., *Principles of Urban Transportation System Planning*, McGraw Hill
2. Khisty C.J., *Transportation Engineering - An Introduction*, Prentice Hall
3. Bruton M.J., *Introduction to Transportation Planning*, Hutchinson of London.
4. Papacostar, *Fundamentals of Transportation Planning*, Tata McGraw Hill
5. Dicky J.W., *Metropolitan Transportation Planning*, Tata McGraw Hill

Internal assessment

2 Tests	2 x15	= 30 marks
Assignments	(minimum2)	= 15 marks
Regularity		= 5 marks
Total marks		= 50 marks

University examination pattern
Q I -8 short type questions of 5 marks each, 2 from each module
Q II -2 questions of 15 marks each from module I with choice to answer any one
Q III -2 questions of 15 marks each from module II with choice to answer any one
Q IV -2 questions of 15 marks each from module III with choice to answer any one
Q V -2 questions of 15 marks each from module IV with choice to answer any one

CE 04 806(P) ENVIRONMENTAL ENGINEERING LAB

3 Hours Practical per week.

1. Determination of Solids (Total, dissolved and suspended) in water.
2. Alkalinity of water.
3. Hardness of water by EDTA titrimetric method.
4. Chlorides in water.
5. Iron and manganese in water
6. Sulphates and sulphides in water.
7. Turbidity of water and estimation of optimum coagulant dosage by jar test.
8. Dissolved oxygen in water.
9. Available chlorine in bleaching powder and test for residual chlorine.
10. Determination of pH of water (by various methods).
11. B.O.D and C.O.D of wastewater sample.
12. Determination of MPN

Reference Books:

1. Standard methods for the examination of water and wastewater, 1995, ALPHA, AWWA, WPCF Publication.
2. Sawer and McCarty, Chemistry for Environmental Engineering, McGraw Hill.

Internal assessment:

Laboratory practical and record	= 25 marks.
Test	= 20 marks.
Regularity	= 5 marks
Total Marks.	= 50 marks

CE 04 - 807(P) : PROJECT

7 hours per week

The project work started in the seventh semester will continue in this semester -the students should complete the project work in this semester and present it before the assessment committee

The assessment of all the projects should be done at the end of the eight semester by a committee consisting of three or four faculty members specialised in the various fields of civil engineering - the students will present their project work before the committee. Complete project report should be submitted before the evaluation.

Internal assessment	
Guide (technical content, involvement, report)	: 60 marks
Assessment committee (technical content, report, presentation)	: 40 marks
Total	: 100 marks

CE 04 - 808 : VIVA VOCE

There is only university examination for this - the university will appoint examiners for conducting the viva voce examination. The examiners will ask questions from subjects studied for the B.Tech course, mini project, project and seminar reports of the student. The relative weightages shall be as follows

Evaluation scheme for viva-voce examination	
Subjects	: 70 marks
Projects and seminar	: 30 marks
Total	: 100 marks