UNIVERSITY OF CALICUT

SCHEME AND SYLLABI

FOR

SEVENTH SEMESTER

OF

BACHELOR OF TECHNOLOGY

IN

CIVIL ENGINEERING

FROM 2004 ADMISSION ONWARDS

CALICUT UNIVERSITY (P.O), THENHIPALAM

SEVENTH SEMESTER

Code	Subject	Hours/week			Internal Marks	University Examination	
		L	T	P/D		Hours	Marks
CE04 701	STRUCTURAL DESIGN II	3	1	-	50	3	100
CE04 702	DESIGN OF HYDRAULIC STRUCTURES	2	2	-	50	3	100
CE04 703	ENVIRONMENTAL ENGINEERING I	3	1	-	50	3	100
CE04 704	COMPUTATINAL METHODS AND OPERATIONS RESEARCH	3	1	-	50	3	100
CE04 705	ELECTIVE I	3	1	-	50	3	100
CE04 706 (P)	**CAD LAB**	-	-	3	50	3	100
CE04 707 (P)	**SEMINAR**	-	1	3	50	-	-
CE04 708 (P)	**PROJECT**	-	-	3	50	-	-
	TOTAL	**14**	**7**	**9**	**400**		**600**

ELECTIVES – I

CE04 705A OOP AND SOFTWARE ENGINEERING
CE04 705B ADVANCED STRUCTURAL DESIGN I
CE04 705C ADVANCED MECHANICS OF MATERIALS
CE04 705D GROUND IMPROVEMENT TECHNIQUES
CE04 705E GROUND WATER HYDROLOGY
CE04 705F MAINTENANCE AND REPAIR OF BUILDINGS

SYLLABI OF SEVENTH SEMESTER

CE04 701 STRUCTURAL DESIGN III

3 hours lecture and 1 hour tutorial per week

Objective :
To study the structural design of some advanced structures

Part A Reinforced Concrete

Module I (14hours)
Design of columns subjected to axial load, uni-axial and bi-axial eccentrically loaded short and slender columns using SP 16 by limit state method.
Different types of foundations-design of isolated footing for axially loaded and eccentrically loaded columns, combined footing, design principles of strap/cantilever footings
Design of cantilever and counter fort retaining walls

Module II (12 hours)
Design of R.C.C. Slab Bridge for IRC loading –Detailing
Design of rectangular water tanks using IS code coefficients (IS 3370) -Design of circular water tanks-staging-design of spherical and conical domes-detailing

Module III (13 hours)
Prestressed Concrete fundamentals-materials, principles –methods of prestressing (pre and post tensioning) -losses of prestress. Analysis of stresses in pre and post tensioned beams (rectangular and I sections) at stages of transfer and service-cable profiles (principles only)

Part B Steel

Module IV (13 hours)
Design of plate girders-design of section for flexure, shear and deflection-connections-horizontal and vertical stiffeners-curtailment of flange plates, bearing stiffener, web splices. Plate girder Railway Bridges-assessment of loads and stresses, design of sections, bearings (design principles only). Design of self standing chimney.

Note:
All designs shall be done as per current I.S. specifications
Special importance shall be given to detailing in designs
S.I. units shall be followed
Limit state design shall be practiced wherever possible as per codes
Use of IS 3370 (1 to 4), IRC 21(1, 2,3,7,9) , IS 1343, IS 800, IS 875 , SP 6 and SP 16 are permitted in the examination

Text Books:
1. Pillai S.U. and Menon D .,Reinforced Concrete Design ..Tata Mcgraw Hill
2. D.Johnson and Victor ..Essentials of Bridge Engineering.,Oxford and IBH
3. Krishnaraju.,Prestressed Concrete.. Tata Mcgraw Hill
4. Ram Chandra.,Design of steel Structures.,Standard Book House
5. Jain and Jaikrishna Plain and Reinforced Concrete Vol I and II ,Nemchand

Reference Books:

1. Park and Paulay , Reinforced Concrete structures, McGraw Hill.
2. Varghese P.C. Limit State Design of Reinforced Concrete, Prentice Hall of India
3. Mallick S.K. and Gupta A.K. Reinforced Concrete. Oxford and IBH
4. Jain.A.K. Reinforced Concrete-Limit state Design, Standard Book House
5. Winter and Nelson.,Design of concrete Structures.. Tata Mcgraw Hill
6. Lin.T.Y. and Burns.,Design of Prestressed Concrete Structures.,John Wiley
7. Arya and Ajmani.,Design of Steel Structures., Nemchand
8. Lin and Bresler.,Design in Structural Steel.,John Wiley
9. T.R.Jagadeesh and M.A.Jayaram.,Design of Bridge Structures., Prentice-Hall
10. Libby J. Prestressed concrete structures, CBS publishers.
11. Purushothaman – Reinforced Concrete Elements- Behaviour, analysis and design., Tata Mcgraw Hill
12. Gaylord and Stallmeyer, Steel structures, McGraw Hill.

Internal assessment:

2 Tests		2x15=30 marks
Assignments	(minimum two)	15 marks

One assignment may be a case study of any one of the following (i) existing commercial buildings, (ii) industrial buildings (iii) building failures (iv) buliding under construction (v) bridges (vi) towers etc. The study may contain analysis, design, construction or rehabilitation activities (detailed calculations are not necessary)

Regularity	5marks
Total marks	50 marks

University Examination Pattern:

Use of IS 3370 (1 to 4), IRC 21(1, 2,3,5,6,7,9) , IS 1343, IS 800, IS 875 , SP 6 and SP 16 are permitted in the examination hall.

Q I -8 short type questions of 5 marks, 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 702 DESIGN OF HYDRAULIC STRUCTURES

2 hours lecture and 2 hour drawing per week

Objective:

Students are expected to know the details of major and minor irrigation structures and their design. A student, who successfully completes the course, should be able to carry out design of various hydraulic structures in the given field conditions. Also to make the students familiarise with the relevant I.S codes and to enhance the capability of reading working drawings.

Module I (13 hours)

Storage Head Works;

Types of dams - gravity dam - selection of site - forces acting on dams - drainage gallery - joints in dams - elementary profile - limiting height of gravity dam - high and low dam - practical profile of a high gravity dam- design methods and design by gravity analysis only- arch dam – design methods – design by cylinder theory only. spillways and their types

Module II (13 hours)

Tank structures

Surplus works – types of surplus works- surplus weir –surplus escapes, core wall type – flush escape

Outlet works - tank sluice with tower head

Canal structures

Canal outlets-requirements –types-modular, semi modular, non-modular outlets- direct sluice

(Detailed design and drawing of surplus weir, tank sluice and direct sluice are expected)

Module III (13 hours)

Diversion head works- Types – site selection- design of barrages and weirs - design of regulator cum Road Bridge

Canal escapes – Location and selection

Canal falls- necessity and selection criteria - design of trapezoidal notch canal fall - design of syphon well drop-

(Detailed designs and drawings of canal regulator cum road bridge, trapezoidal notch fall and syphon well drop are expected.)

Module IV (13 hours)

Cross drainage works - necessity - types of cross drainage works - selection of suitable type of cross drainage works - types of aqueducts- design of aqueduct - syphon aqueduct (type ii and iii) super passage and canal syphon

(Detailed designs and drawings of aqueduct and syphon aqueduct (Type II) are expected).

Text books:

Asawa, Irrigation Engineering, Wiley eastern publications.

Sathyanarayana Murthy, Water Resources Engineering, Wiley eastern

Reference books:

1. Varshney R.S., *Theory and Design of Irrig. Structures*, Nem Chand
2. Punmia B.C., *Irrigation and Waterpower Engg.*, Laxmi Publications
3. Serge Liliavsky, *Irrigation and Hydraulic Design*, Chapman and Hall
4. IS: 6512 (1984) – Criteria for design of storage gravity dams
5. IS 7784 (Part I (1993), Part II Section 1 to 5 (1995)) *Design of cross drainage works – Code of Practice*
6. IS: 6966 Part I (1989) – *Hydraulic design of barrages and weirs – Guidelines*
7. IS: 11130 (1984) – *Criteria for structural design of barrages and weirs*
8. IS:6531 (1972) – *Criteria for design of canal head regulator*
9. IS:7114(1973) – *Criteria for hydraulic design of cross regulator for canal*
10. IS:6936 (1992) – *Guide for location ,selection and hydraulic design of canal escapes*
11. IS:12331 – *General requirement of canal outlets*

Internal assessment:		
2 Tests	2 x 10	= 20 marks
Design and Drawing		= 25 marks
Regularity		= 5 marks
Total marks		= 50 marks

University examination pattern:

Q I -8 short type questions of 5 marks each (3,1,2 and 2 questions respectively from Modules 1, 2, 3 and 4)

Q II -A detailed design and drawing from listed designs with a choice (30 marks for design and 30 marks for drawing)

CE04 703 ENVIRONMENTAL ENGINEERING I

3 hour lectures and 1 hour tutorial per week

Objective:

The subject should provide a detailed understanding regarding usage of water for drinking purpose - from identification of source, planning the treatment systems, distribution of treated water with development of distribution of layout and necessity of maintenance.

Module I (13 hours)

Hydrologic cycle – rainfall – runoff (brief) – abstraction from precipitation – Evaporation – measurement and control of evaporation – evapotranspiration (ET) –measurement of ET -infiltration process – measurement using infiltrometer – infiltration capacity – infiltration indices.

Sources of water – surface water sources – suitability of the source with respect to quantity and quality – intakes of various surface water sources – design of intakes – groundwater sources - development and protection of groundwater sources – estimation of yield from groundwater sources- open and tube well – construction of tube wells – maintenance.

Module II (13 hours)

Water supply Engineering – Importance and necessity of community water supply schemes – essentials of water supply engineering – quantity of water – forecasting population – rate of consumption for various purposes – factors affecting consumption – fluctuations in demand.

Quality of water – drinking water standards – physical, chemical and bacteriological analysis of water.

Water harvesting – types and methods – water conservation techniques.

Module III (13 hours)

Treatment of water – screening –sedimentation -aeration – coagulation – flocculation –filtration – disinfection – design of all the units – miscellaneous treatments – removal of colour, taste and odour, iron and manganese, and hardness – fluoridation and deflouridation.

Module IV (13 hours)

Water supply schemes – gravitational, pumping and combined schemes – pumps – classification, efficiency and operation of pumps –choice of prime movers - hand pumps – well pumps – pumping stations and selection of equipment - transmission of water – classification of conduits – shape and strength of conduits – location of conduits – materials of conduits – design of gravity and pumping main - distribution systems – different layout of pipe networks – analysis of pipe networks-equivalent pipe method- hardy cross method – house connection from mains – laying and joining of pipes – appurtenances – different valves – meters and hydrants – detection and prevention of leaks in distribution system – cleaning and maintenance of distribution system.

Text Books:

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

Reference Books:

1. Mark J Hammer and Mark J Hammer Jr., *Water and Waste Water Technology*, Prentice Hall of India Pvt Ltd.
2. Fair, Gayer and Okun, *Water and Waste water Engineering*, John Wiley.
3. Ernest W Steel, *Water Supply and sewerage*, McGraw Hill.
4. Ministry of Urban Development, Govt. of India, Manual of water supply and treatment 1999

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 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 704 COMPUTATIONAL METHODS AND OPERATIONS RESEARCH

3 hours lecture and 1 hour tutorial per week

Objectives:
To enable the students to familiarize with mathematical models and numerical tools for solving and optimizing engineering problems.

A.Numerical methods in civil engineering

Module I (14 hours)

Introduction to numerical methods in civil engineering: importance of numerical methods in civil engineering - sources of errors in numerical methods - number representations - fixed and floating point numbers - significant digits - round off errors - development of computer algorithms - pseudo code

Solution of algebraic and transcendental equations in one variable: bisection method - method of false position - Newton-Raphson method - successive approximation method - development of computer algorithms for each of the above methods

System of linear algebraic equations: solution of linear algebraic equations using Gauss elimination method and LU decomposition method - solution by iterative method - conditions of convergence-ill conditioned system of equations - applications in civil engineering problems – matrix structural analysis

Module II (13 hours)

Eigen value problems: examples of formulation of structural stability and structural dynamics problems as Eigen value problems in civil engineering - principal stresses and strains - free vibration of multi degree of freedom systems - determination of Eigen values and Eigen vectors by power method and Jacobi's method

Interpolation: Newton's formulae - Gauss' formulae - lagrangian interpolation - cubic spline interpolation

Module III (12 hours)

Numerical differentiation and integration: numerical differentiation using Newton's and Gauss' formulae - maximum and minimum values of tabulated functions - Newton Cote's integration formulae - numerical integration using trapezoidal formula - Simpson's formulae and Gauss quadrature - development of computer algorithms for numerical integration

Numerical solution of ordinary differential equations: Taylor's series method - Euler's method - Runge-Kutta method - finite difference method for the solution of boundary value problems

B.Optimisation methods in civil engineering

Module IV (13 hours)

Linear programming problems: statement of an optimisation problem - linear and nonlinear programming problems (description of non-linear programming only-no numerical examples expected)- standard form of linear programming problems - simplex algorithm - degeneracy, duality, transportation problem, assignment problem- applications of linear programming problems in civil engineering - limit design of steel portal frames

Text books

1. Sastry S.S., *Introductory Methods of Numerical Analysis*, Prentice Hall of India
2. Scarborough J.B., *Numerical Mathematical Analysis*, Oxford and IBH
3. Rao S.S., *Engineering Optimization - Theory and Application* New Age International Publishers

Reference books:

1. Krishnamoorthy E.V. and Sen S.K., *Numerical Algorithms*, Affiliated East West Press
2. Kirsch U., *Optimum Structural Design*, McGraw Hill
3. Fox R.L., *Optimization Methods for Engineering Design*, Addison Wesley
4. Singiresu S. Rao, Engineering Optimization (Theory and Practice) 3rd Edition, New Age International (P) Ltd.
5. Press, W. H., et. al. Numerical recipes in C-The art of computation, Cambridge press

Internal assessment:

Assignments (minimum 2) = 15 marks (practical problems in Civil Engineering should be taken by the students for the application of numerical tools)
2 Tests 2x15 = 30 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 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 705A OOP AND SOFTWARE ENGINEERING

3 hours lecture and 1 hour tutorial per week

Objective:

To familiarise the students with the modern high level languages and IT related subjects.

Module 1 [12 hours]

OOP and C++

Introduction to OOPS, basic concepts, benefits, principles, object oriented languages-differences between C and C++. Objects, classes, data type, data hiding-private and public, concepts of overloading, polymorphism inheritance, templates, I/O functions.

Module II [11 hours]

Derived classes, protected classes, public and private inheritance, multiple inheritance, Virtual function, friend function, static function, disc files-streams,

Module III [15 hours]

DBMS

Database concept and Architecture, Data Models, Database design, Normalization, SQL queries, Views, Report Generation, Database connectivity , RDBMS design- case study.

Fundamentals of Internet/Web applications, HTML and XML, Graphics and Media Objects, E-Commerce, Web application design – case study.

Module 4 [14 hours]

Software Engineering Fundamentals

Definitions and terminology, Software Engineering processes, Process models, Requirements Analysis, Design, System models, Validation, Automated processes-CASE tools, Testing, Software Project management-definition, planning, scheduling, risk management , resource management, cost estimation techniques(Fundamentals only)Maintenance and Re usability, Object oriented design-case study,

References

1. Balaguruswamy E, Object Oriented programming, Tata McGraw Hill.
2. Nathan Gurewich and Ori Gurewich, Mastering C++: from C to C++ in two weeks, BPB Publications, 1994
3. Bjarne Stroustrup, The C++ programming language, Addisson Wesley,1991.
4. Ian Sommervile, Software Engineering , International computer science series.
5. Sharma.V. and Sharma.R., Developing e-Commerce Sites: An Integrated Approach, Addison Wesley.
6. Elmasri and Navathe, Fundamentals of Database System, Addison Wesley.

Internal assessment:

2 Tests	2 x 15	= 30 marks
assignments		= 15 marks
Regularity		= 5 marks
Total		= 50 marks

Assignment can be a software term project for a small problem , following the steps involved in the software development

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.

CE 04 705 B ADVANCED STRUCTURAL DESIGN I

3 hours lecture and 1 hour tutorial per week

Objective :

1. To equip the students to independently assess the Loads on Buildings and choose the method of analysis according to the situation
2. To give a practical awareness to students about the field problems

Module-1 (19 Hours)

Design of Deep beams and Corbels

Design of Ribbed Slabs

Yield line theory of slabs – Design of square, rectangular and circular slabs for UDL and point load at centre

Design of flat slabs by direct design methods as per IS 456- Introduction of equivalent frame method.

Module –II (14 Hours)

Design of multibay multi storied portal frames for gravity loads, Pattern loading - Use of SP 16 (Substitute Frame method of analysis may be followed)

Design of Light Gauge steel members – compression and flexural members

Module – III (19 Hours)

Basic principles of Analysis of base excited single and multi degree of freedom systems- modes- modal superposition-CQC (introduction only) -SRSS - spectral values – participatory masses – rigid and flexible systems- concept of design spectrum for earthquake- use of IS-1893.

Design of Multistoried framed structures for wind and Earthquake Loads

Ductility detailing for earthquake forces

Note

1. All designs shall be done as per current I.S. specifications.
2. Special importance shall be given to detailing in designs.
3. S.I. Units shall be followed.
4. Limit state design shall be practiced wherever possible
5. Use of I.S. codes IS-456-2000, IS-801, IS-811, IS1893 and SP16 (Design Aids) are permitted in the examination hall.

Text books

1. Varghese P.C., *Advanced Reinforced Concrete Design* , PHI
2. Winter and Nelson, *Design of Concrete Structures*, Tata McGraw Hill
3. Arya and Ajmani, *Design of Steel Structures*, Nemchand and Bros.
4. Anil K.Chopra, Dynamics of structures, Pearson

Reference books

1. Krishnaraju.N., Advanced Reinforced Concrete Design, CBS Publishers
2. Mallick S.K. and Gupta A.P., *Reinforced Concrete*, Oxford and IBH Publishing Co.
3. Jain and Jaikrishna, *Plain and Reinforced Concrete Vol.I and 11*, Nem Chand
5. Ferguson, *Reinforced Concrete*, Wiley Eastern
6. Ramchandra, *Design of Steel Structures Vol. II*, Standard Book House
7. Park and Paulay, Reinforced Concrete Structures, McGraw Hill

Internal assessment

2 Tests	2x15	= 30 marks
Assignments		= 15 marks
1. Load Calculation of an actual multistory Building		
2 Report of a site visit with photographs and description of practical Problems		
Regularity		= 5 marks
total marks		= 50 marks

University examination pattern

Use of I.S. codes IS-456-2000, IS-801, IS-811, IS1893 and SP16 (Design Aids) 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

CE04 705C ADVANCED MECHANICS OF MATERIALS

3 hours lecture and 1 hour tutorial per week

Objective:

1. To review and make more useful the methods and results presented in the first course on Mechanics of Materials.
2. To show the limitations of the ordinary formulas of Strength of Materials, to consider the conditions under which these limitations are significant and to extend the subject to include a variety of important topics more complex than those usually involved in a first course.

Module 1 (16 hrs)

Stress, Principal stresses, Strain energy:

Stress at a point – stress on an arbitrarily oriented plane-stress transformations- strain theory-principal stresses and strains (2d and 3d)- Generalized Hooke's law-Equations of thermoelasticity for isotropic materials-strain energy density- stress concentration.

Failure and Failure criteria:

Modes of failure –yield failure criteria-introduction to fracture mechanics-cracks and brittle fracture-fatigue-elastic and inelastic buckling.

Module II (14 hrs)

Beams on elastic foundation:

Basic equations-Winkler foundations- semi-infinite beams with concentrated loads-infinite beams with concentrated loads-uniformly distributed load-beams of finite length.

Curved Beams:

Circumferential stresses-radial stress and shear stress in curved beams-sections having thin flanges-closed sections with thin walls-deflections of sharply curved beams.

Module III (10 hrs)

Elements of theory of elasticity

Displacements-strains and compatibility-equilibrium equations and boundary conditions-stress field solutions for plane stress problems-polynomial solutions in Cartesian coordinates-displacements calculated from stresses-plane stress problems in polar coordinates.

Module IV (12 hrs)

Torsion

Torsion of a cylindrical bar of circular cross section- St. Venant's semi inverse method-stress function approach-elliptical, equilateral triangle and narrow rectangular cross sections-Prandtl's membrane analogy-Hollow thin wall torsion members-multiply connected cross sections- thin wall torsion members with restrained ends.

Text books:

1. R.D.Cook and W.C.Young, Advanced Mechanics of Materials,2nd edition, Prentice Hall Intl,Inc.1999.
2. A.P.Boresi and Schmidt, Advanced Mechanics of Materials, 5th edition, John Wiley and Sons,Inc.

References:

1. Timoshenko S.P and Goodier J.N, Theory of elasticity, Mc Graw Hill.
2. Srinath L.S, Advanced Mechanics of Solids, Tata Mc Graw Hill.
3. S P Timoshenko, Strength of Materials Vol II ,CBS Publishers
4. Shames,E.H , Mechanics of Deformable solids. Prentice Hall of India

Internal assessment:		
2 Tests	2x15	= 30 marks
Assignments		= 15
Application/Numerical problems based on the concepts discussed in the syllabus shall be provided as assignments (minimum 2)		
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 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 04 705 D PAVEMENT DESIGN

3 hours lecture and 1 hour tutorial per week

Objective:

To equip the students to carry out design and evaluation of flexible and rigid pavements in varied field conditions.

Note: IRC 37 2001 and 58-2002 and design charts are permitted for University Examinations

Module I (13 hours)

Introduction: types and component parts of pavements - factors effecting design and performance of pavements - comparison between highway and airport pavements - functions and significance of sub grade properties - various methods of assessment of sub grade soil strength for pavement design - cause and effects of variations in moisture content and temperature - depth of frost penetration - design of bituminous mixes by Marshall, Hubbard - field and Hveem's methods

Module II (13 hours)

Stress analyses and methods of flexible pavement design: stresses and deflections in homogeneous masses - burmister 2 layer and 3 layer theories - wheel load stresses - ESWL of multiple wheels - repeated loads and EWL factors - empirical, semi - empirical and theoretical approaches for flexible pavement design - group index, CBR, triaxial, mcleod and burmister layered system methods

Module III (13 hours)

Stresses analyses and methods of rigid pavement design: types of stresses and causes - factors influencing stresses, general conditions in rigid pavement analysis - ESWL- wheel load stresses - warping stresses - friction stresses - combined stresses - functions of various types of joints in cement concrete pavements - design and detailing of slab thickness ; longitudinal, contraction and expansion joints by IRC recommendations

Module IV (13 hours)

Pavement evaluation: structural and functional requirements of flexible and rigid pavements - pavement distress - evaluation of pavement structural condition by Benkelman beam rebound deflection and plate load tests - introduction to design of pavement overlays

Problems of highway rehabilitation –pavement rehabilitation programming.

Text:

Khanna S.K. and Justo, CEG, *Highway Engineering*, NemChand and bros.

References:

1. Yoder and WNitezak, *'Principles of Pavement Design'*, John Wiley
2. Yang, *'Design of Functional Pavements'*, McGraw Hill
3. IRC: 37 - 2001, *'Guidelines for the Design of Flexible Pavements'*
4. IRC: 58 - 2002, *'Guidelines for the Design of Rigid Pavements'*
5. David Croney, *'The Design and Performance of Road pavements'*, HMSO publications
6. Hass and Hudson, *'Pavement Management System*', McGraw Hill Book Co.
7. IRC 81-1981- *'Tentative Guidelines for Strengthening of Flexible Pavements by Benklman Beam Deflections Techniques'*.

Internal assessment:

Test	2 x 5	= 30 marks
Assignment(minimum 2)		= 15 marks (One must be field oriented)
Regularity		= 5 marks
Total marks		= 50 marks

University Examination Pattern:

Note: IRC 37 2001 and 58-2002 and design charts are permitted for University Examinations

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.

CE 04 705E GROUNDWATER HYDROLOGY

3 hours lecture and 1 hour tutorial per week

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

Module I (14 hours)
Occurrence of ground water: origin - rock properties affecting ground water vertical distribution - geologic formations as aquifers -types of aquifers - aquifer parameters-ground water basins - springs - Laplace equation - potential flow lines - flow net – flownet for anisotropic soils- seepage under a dam -groundwater contours- determination of flow direction- steady unidirectional flows in aquifers- confined and unconfined -aquifer with percolation- steady radial flow towards a well- well in uniform flow - steady flow with uniform discharge- partially penetrating wells- steady flow in leaky aquifer.

Module II (13 hours)
Unsteady flow-general equation- Cartesian and polar coordinate- unsteady radial flow in to a well - confined, unconfined and leaky aquifers -–multiple well system - pumping tests - non equilibrium equation for pumping tests - Thies' method - Jacob method - Chow's method -characteristics well losses –step draw down test- well near aquifer boundaries -determination of boundaries from pumping test .Image wells. for various boundary conditions-
Cavity well and open well- yield tests-pumping and recuperation test.

Module III (14 hours)
Tube wells: design - screened wells - gravel packed wells - well loss-selection of screen size - yield of a well - test holes - well logs - methods of construction - dug wells -shallow tube wells - deep wells - gravity wells - drilling in rocks - screen installation - well completion - well development - testing wells for yield - collector - or radial wells - infiltration galleries - well point system - failure of tube wells

Module 1V (11 hours)
Quality of ground water: ground water sampling - assessment of water quality- chemical, physical and bacterial analysis - quality for domestic use - quality for agricultural use - pumps - shallow well pumps - ground water investigation - geographical investigation - electrical resistivity method - seismic refraction method - gravity and magnetic method - test drilling - resistivity logging - potential logging - artificial recharge - recharge by water spreading - - recharge through pits, shafts and wells.

Text book
1. Raghunath H.M., *Ground Water Hydrology*, Wiely

Reference books:
1. Todd D.K., *Ground Water Hydrology*, John Wiley
2. Garg S.P., *Ground Water and Tube wells*, Oxford and IBH
3. Raghunath H.M., *Hydrology*, Wiely Eastern

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 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 705F MAINTENANCE AND REPAIR OF BUILDINGS

3 hours lecture and 1 hour tutorial per week

Objective: To make the students aware of the factors which warrant repair and maintanance, methods of repair and strenthening measures.

Module I (13 Hours)

Durability: Life expectancy of different types of buildings –influence of environmental elements such as heat, moisture, precipitation and frost on buildings- Effect of biological agents like fungus, moss, plants, trees, algae, - termite control and prevention - chemical attack on building materials and components- - Aspects of fire and fire prevention on buildings- Impact of pollution on buildings.

Module II (13 hours)

Performance of building materials in service -maintenance philosophy - phases of maintenance – routine preventive and curative maintenance – methods specification cost analysis – common defects in buildings and measures to prevent and control the same- building failures – causes and effects- cracks in buildings – types, classification ,investigation

Module III (13 hours)

Non destructive testing methods - materials for repair - special mortar and concretes, concrete chemicals, special cements and high grade concrete – admixtures of latest origin

Techniques for repair - surface repair – material selection – surface preparation - rust eliminators and polymers coating for rebars during repair – repair of cracks in concrete and masonry-methods of repair - epoxy injection, mortar repair for cracks - guniting and shotcreting

Waterproofing of concrete roofs

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Module IV (13 hours)

Strengthening measures- flexural strengthening, beam shear capacity strengthening, column strengthening,shoring, under pinning and jacketing

Conservation movement-materials and methods for conservation work- examples

Recycling of building components and materials - adaptive reuse of buildings and its advantages- examples

Demolition of buildings – introduction – planning, precautions and protective measures in demolition work-sequence of operations- demolition of structural elements.

Text Books:

1. Champion, S. -Failure and repair of concrete structures
2. Sidney M. Johnson – Deterioration, Maintenance and Repair of Structures, McGraw Hill

References:

1. Peter H. Emmons, Concrete Repair and Maintenance – Galgotia Publishers
2. Jacob Feld –Construction failure,
3. Mckaig T.M, Building failures, Applied science publications
4. SP : 25, BIS Causes and prevention of cracks in buildings ,.
5. Shetty , M.S. Concrete Technology, S Chand and company.
6. SP : 62 (S and T) 1997 – Hand book on Building Construction Practices, BIS, pp. 457 – 465.(for topic on demolition)
7. Philip.H.Perkins , Concrete Structures – Repair water proofing and Protection
8. Raikar, Durable Structures – Through planning for preventive maintenance ,R and D Centre Structural Designers and Consultants Pvt. Ltd. Vashi, New Bombay 400703
9. Raikar, Diagnosis and Treatment of Structures in Distress R and D Centre Structural Designers and Consultants Pvt. Ltd. Vashi, New Bombay 400703

Internal assessment:		
Assignments and term project		= 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 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 04 706(P) COMPUTER AIDED DESIGN LAB

3 hours practicals per week

Objective :
To familiarize and give hands-on training to students in at least five of the following areas of civil engineering.

1. **Surveying** - Terrain mapping, computation of areas and volumes – Estimation of earth work
2. **Structural engineering –** Plane and space frames (steel and R.C.C), Structural analysis and design spread sheet development
3. **Hydaulics and Water resources** – Computation of back water surface profiles, Circular Pipe Analysis / Trapezoidal Channel Analysis
4. **Geotechnical engineering –** slope stability analysis, computation of foundation settlement and stresses on layered soils, Geotechnical design of anchored and free retaining walls, Analysis and design of pile foundations.
5. **Road/railway system –** Fixation of vertical / horizontal alignment of highways, Design of rigid and flexible pavements.
6. **Environmental engineering**- Pipe Network Analysis
7. **Estimation and costing -** Use spread sheet / any standard software for estimation.
8. **Project management -** Promote the use of standard software for project scheduling and documentation Network analysis.

Note : Students are supposed to document each tutorial with drafting after each session.
Recommended packages: The following packages or their equivalent are recommended for solving the above list of problems

- AutoCAD, Microstation, MS-Office, Matlab, Grapher/Sigmaplot
- Autocivil, SAP, Staad, ANSYS, NISA, GTSTRUDL
- FlowMaster, EPANET, Geo4, Inroads
- MS-Project, Any estimation software

Internal assessment	
Laboratory practical and record	= 25 marks
Test/s	= 20 marks
Regularity	= 5 marks
Total marks	= 50 marks

CE 04 707(P) SEMINAR

4 hours per week

NOTE: The topic of the seminar should be finalised before the commencement of the seventh semester class.

Individual students should be asked to choose a topic in any field of civil engineering (the topic preferably selected as an extended one of the contents of B.Tech syllabus), and give a seminar on that topic for about thirty minutes. The presentation of seminar to be assessed by a committee consisting of at least three faculty members (preferably specialised in different fields of Civil Engineering). Each student should submit copies of seminar paper. One copy to be returned to the student after duly certifying it by the chairman of the assessing committee and one copy kept in the departmental library

Internal assessment	
Guide (technical content, involvement, report)	: 15 marks
Assessment committee (technical content, report, presentation)	: 30 marks
Regularity / Participation	: 5 marks
Total marks	: 50 marks

CE 04 708(P) PROJECT

3 hours per week

The project work can be a design project - experimental project - field surveying or computer oriented on any of the topics of civil engineering interest - it can be allotted us a group project consisting of a maximum number of four students - the topic of the project for any student should be different from his/her mini project.

The assessment of project progress to be done at the end of the semester by a committee consisting of three or four faculty members specialised in the various fields of civil engineering. The students shall present the progress made in the project before the committee. The complete project report is not expected at the end of the seventh semester. However a brief (3 or 4 pages) report should be submitted by the students to the assessing committee.

Internal assessment	
Guide (technical content, involvement, report)	: 30 marks
Assessment committee (technical content, progress, presentation)	: 20 marks
Total	: 50 marks