Syllabi of

Seventh Semester B.Tech Degree Programme in

CIVIL ENGINEERING

CE4001 COMPUTER APPLICATIONS IN CIVIL ENGINEERING

L	T	P	C
3	0	0	3

Prerequisite: All subjects upto and including 4th semester

Total hours: 42

A. Numerical Methods in Civil Engineering

Module 1 (12 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-III conditioned system of equations.
Applications in Civil Engineering Problems

Module 2 (10 hours)

Eigen Value Problems: 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
Applications in Civil Engineering Problems

Module 3 (10 hours)

Numerical differentiation and integration: numerical differentiation using Newton's formula - maximum and minimum values of tabulated functions - numerical integration - 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
Applications in Civil Engineering Problems

B. Optimisation Methods in Civil Engineering

Module 4 (10 hours)
Linear programming problems: statement of an optimisation problem - linear and nonlinear programming problems - standard form of linear programming problems - applications of linear programming in civil engineering
Introduction to nonlinear programming problems: (outline only - descriptive questions only are expected) - difficulties in nonlinear programming problems - unconstrained optimization problems - unimodal function - search methods - one dimensional minimization methods - Fibonacci and golden section methods - examples of one dimensional minimization problems in civil engineering.

References

1. Sastry, S. S., Introductory Methods of Numerical Analysis, Prentice Hall of India, 2003.
2. Scarborough, J. B., Numerical Mathematical Analysis, Oxford and IBH, 1971
3. Chapra, S. C., and Canale, R. P., Numerical Methods for Engineers, McGraw Hill, Inc., 2007
4. Rao S. S., Engineering Optimization - Theory and Applications, New Age International Publishers, 2007.

CE4002 STRUCTURAL ANALYSIS - III

L	T	P	C
3	0	0	3

Prerequisite: CE3001 Structural Analysis - II

Total hours: 42

Module 1 (8 hours)

Approximate methods of analysis of multi-storey frames
Analysis for vertical load - substitute frames - loading condition for maximum positive and negative bending moment in beams and maximum bending moment in columns - analysis for lateral load - portal method - cantilever method.

Module 2 (15 hours)

Matrix analysis of structures
Review of Static and kinematic indeterminacy - force and displacement methods of analysis - definition of flexibility and stiffness influence coefficients - development of flexibility matrices by physical approach

Flexibility method
Flexibility matrices for truss and frame elements - load transformation matrix - development of total flexibility matrix of the structure - analysis of simple structures - plane truss and plane frame - nodal loads and element loads - lack of fit and temperature effects

Module 3 (11 hours)

Stiffness method
Development of stiffness matrices by physical approach - stiffness matrices for truss and frame elements - displacement transformation matrix - development of total stiffness matrix - analysis of simple structures - plane truss and plane frame - nodal loads and element loads - lack of fit and temperature effects

Module 4 (8 hours)

Cables, suspension bridges and arches
Analysis of forces in cables - suspension bridges with three-hinged and two-hinged stiffening girders - theory of arches - Eddy's theorem - analysis of three-hinged and two-hinged arches - settlement and temperature effects.

References

1. Menon, D., Advanced Structural Analysis, Narosa publishers, 2008.
2. Weaver, W., and Gere, J.M., Matrix Analysis of Framed Structures, CBS Publishers, 2004.
3. Reddy, C. S., Basic Structural Analysis, Tata McGraw-Hill, 2007.
4. Negi, L. S., and Jangid, R. S., Structural Analysis, Tata McGraw-Hill, 2006.
5. Wang, C. K., Intermediate Structural Analysis, McGraw-Hill, 1989.
6. Wilbur, J. B., Norris, C. H., and Utku, S., Elementary Structural Analysis, McGraw-Hill, 2006.
7. Hibbler, R. C., Structural Analysis, Pearson Education, 2006
8. Rajasekaran, S., and Sankarasubramanian, G., Computational Structural Mechanics, PHI

CE4003 WATER RESOURCES ENGINEERING - II

L	T	P	C
3	0	0	3

Prerequisite: CE3003 Water Resources Engineering - I

Total hours: 42

Module 1 (16 hours)

Reservoirs and Dams
Reservoirs - Types of reservoirs, Investigations for reservoir planning, Site selection, Zones of storage, Reservoir yield, Mass curve, Determination of reservoir capacity and safe yield from a reservoir, single and multipurpose projects, reservoir losses and control, reservoir sedimentation and control, useful life of a reservoir.
Dams - Types of dams, Factors influencing selection of the type of dam and site, investigations.
Gravity dams – forces and load combinations for design, modes of failure and stability requirements, elementary and practical profiles, joints, keys, water stops, openings and galleries, temperature control and foundation treatment.
Arch dams – types, forces, and preliminary design.

Module 2 (10 hours)

Hydropower
Conventional and non-conventional energy sources, Classification of hydroelectric power plants, Comparison of hydropower with other sources of power, Status of hydroelectric power development in the world and in India, Terminology, Components of a typical hydropower plant, Storage and pondage, Flow duration curve, Firm and secondary power, Load factor and capacity factor, Water hammer and cavitation, Penstock, Surge tanks, Turbines and generators, Selection of suitable types of turbines, Major hydroelectric power plants in the world and in India.

Module 3 (8 hours)

Floods and Water Excess Management
Determination of the design storm and the design flood hydrograph, Estimation of flood peak by rational and empirical methods, Flood frequency analysis, Standard Project Flood and Probable Maximum Flood, Hydraulics of excess water management, Approximate models, Flow routing –storage and channel routing, dam break problem.

Module 4 (8 hours)

River Engineering and Drainage
Classification of rivers, objectives of river training, classification of river training works, methods of river training.
Flood control- Structural and non-structural methods of flood control.
Water logging and its control, Land drainage, Canal lining and maintenance. Design of lined canals.

References

1. Modi, P. N., Irrigation, Water Resources, and Water Power Engineering, Standard Book House, 2008.
2. Garg, S. K., Irrigation Engineering and Hydraulic Structures, Khanna Publishers, 2004.
3. Dandekar, M. M., Water Power Engineering, Vikas Publishing House, 2002.
4. Ven Te Chow et. al., Applied Hydrology, Mc Graw-Hill Book Co, New York, 1988.
5. Subramanya, K., Engineering Hydrology, Tata Mc Graw Hill Publishers, New Delhi, 2008.
6. Linsley et. al, Water Resources Engineering, Mc Graw-Hill International Edition, 1992.
7. Mays, L. W., Water Resources Handbook, Mc Graw Hill International Edition, 1996.

CE**** ELECTVE III

L	T	P	C
3	0	0	3

--**** ELECTVE IV (Global)

L	T	P	C
3	0	0	3

CE4091 COMPUTER APPLICATIONS LABORATORY

L	T	P	C
0	0	3	2

Prerequisite: All subjects upto and including 4th semester

Total hours: 42

Objective: To familiarize and give hands on training to students in the following areas of Civil Engineering Application software

1. Drafting and documentation
2. Surveying – terrain mapping, computation of areas and volumes
3. Structural Analysis and Design
4. Water resources
5. Geotechnical Engineering
6. Road/Railway system
7. Environmental Engineering
8. Estimation and costing
9. Project management

Recommended packages

1. Auto CAD, Microstation, MS Office, Matlab, Grapher/Sigma plot
2. Moss, AutoCivil, Intergraph
3. SAP2000, STAADPRO
4. Water CAD, Flow master
5. Win log, Geoslope, Beurcap
6. InRoads
7. MS – Project

CE4092 SEMINAR

L	T	P	C
0	0	2	1

Prerequisite: Nil

Total hours : 28

Individual students will be asked to choose a topic in any field of Civil Engineering, preferably from outside the B.Tech syllabus and give seminar on the topic for about thirty minutes. A committee consisting of at least three faculty members specialized on different fields of engineering will assess the presentation of the seminars and award the marks to the students. Each student will be asked to submit two copies of a write up of the seminar talk – one copy will be returned to the student after duly certifying by the Chairman of the assessing committee and the other copy will be kept in the departmental library.

CE4098 PROJECT

L	T	P	C
0	0	6	3

Prerequisite: All subjects upto and including 6th semester

Total hours: 84

The project work will be a design project – experimental project – field surveying or computer oriented on any of the topics of civil engineering interest.

The assessment of the project will be done at the end of the semester by a committee consisting of three or four faculty members specialized in various fields of Civil Engineering. The students will present their project work before the committee. The complete project report is not expected at the end this semester. However a six to ten page typed report based on the work done will have to be submitted by the students to the assessing committee. The project guides will award the grades to the individual students depending on the group average awarded by the committee.

CE4001 COMPUTER APPLICATIONS IN CIVIL ENGINEERING

L	T	P	C
3	0	0	3

Prerequisite: All subjects upto and including 4th semester

Introduction to Numerical Methods in Civil Engineering, sources of errors in computation, number representation, development of algorithms and pseudo code. Solution of Algebraic and Transcendental Equations in One Variable – Bisection, regular falsi, Newton – Raphson and successive approximation methods. Solution of a system of Linear Algebraic Equations – Gauss elimination and LU decomposition methods, Iterative methods, ill conditioned system of equations. Eigen value problems - Power method and Jacobi's method. Interpolation – Newton's, Gauss' , Lagrangian and Cubic spline. Numerical differentiation and integration. Numerical solution of ordinary differential equations – Taylor series, Euler's, and Runge-Kutta methods for initial value problems, finite difference methods for boundary value problems. Application of the above methods in civil engineering. Statement of an optimization problem - Linear programming problems and applications. Introduction to nonlinear programming, search methods.

Total hours: 42

CE4002 STRUCTURAL ANALYSIS - III

L	T	P	C
3	0	0	3

Prerequisite: CE3001 Structural Analysis - II

Approximate methods of analysis of multi-storey frames for vertical load and for lateral load - substitute frames - portal method - cantilever method, matrix analysis of structures - flexibility and stiffness influence coefficients, physical approach - analysis of simple plane truss and plane frame, stiffness method - stiffness matrices for truss and frame elements – physical approach - analysis of simple plane truss and plane frame, cables, suspension bridges and arches - three-hinged and two-hinged stiffening girders - analysis of three-hinged and two-hinged arches - settlement and temperature effects.

Total hours: 42

CE4003 WATER RESOURCES ENGINEERING - II

L	T	P	C
3	0	0	3

Prerequisite: CE3003 Water Resources Engineering - I

Dams and Reservoirs- Planning and Selection of type –gravity and Arch dams, Hydroelectric power plants-components of a plant, Flood and water excess management, Hydraulics of water excess management-SPF and PMF, Dam break problem-River engineering and drainage.

Total hours: 42

CE4091 COMPUTER APPLICATIONS LABORATORY

L	T	P	C
0	0	3	2

Prerequisite: All subjects upto and including 4th semester

To familiarize and give hands on training to students in the different areas of Civil Engineering Application software like Drafting and documentation, Surveying – terrain mapping, computation of areas and volumes, Structural Analysis and Design, Water resources, Geotechnical Engineering, Road/Railway system, Environmental Engineering, Estimation and costing, Project management.

Total hours: 42

CE4092 SEMINAR

L	T	P	C
0	0	2	1

Prerequisite: Nil

Individual students will be asked to choose a topic in any field of Civil Engineering, preferably from outside the B.Tech syllabus and give seminar on the topic for about thirty minutes.

Total hours : 28

CE4098 PROJECT

L	T	P	C
0	0	6	3

Prerequisite: All subjects upto and including 6th semester

The project work will be a design project – experimental project – field surveying or computer oriented on any of the topics of civil engineering interest.

Total hours: 84