BIRLA INSTITUTE OF TECHNOLOGY AND SCIENCE, PILANI
INSTRUCTION DIVISION
FIRST SEMESTER 2016-2017
Course Handout (Part II)

Date: 01/08/2016

In addition to part-I (General Handout for all courses appended to the time table) this portion gives further details regarding the course.

Course No. : CE F435
Course Title : INTRODUCTION TO FEM
Instructor-in-charge : Jagadeesh Anmala

1**. Scope and Objective of the Course**:

Finite element method is the most powerful numerical method widely used for solving problems in different branches of engineering especially in Civil Engineering. This method can be used to solve even complex and difficult problems such as non-homogeneous material, complex loading and complicated boundary conditions, material and geometric nonlinear problems, dynamics including earthquake analysis. The course is aimed to enable students to understand the concept of finite element method and its application to Civil and structural Engineering.

2. Text Book

Daryl L Logan, A first course in Finite Element Method, Fifth Edition, Cengage Learning, New Delhi.

3. Reference Books:

1. C.S. Krishnamurthy, Finite Element Analysis: Theory and programming, Second Edition, Tata Mc-Graw Hill, New Delhi, 1994
2. K. J. Bathe, Finite Element Procedures, PHI Pvt Ltd, 2008.
3. R. D. Cook, D. Malkus, M.E. Plesa, Concepts and Applications of Finite Element Analysis, John Wiley & Sons Fourth Edition, 2003.
4. C. S. Desai and J.F. Abel, Introduction to Finite Element Method, CBS Publishers, New Delhi, 1972.
5. T.R. Chandrupatla and A.D.Belegundu, Introduction to Finite Elements in Engineering, Third Edition, PHI Learning Private Limited, 2008.

4. Course Plan:

Sl No	Learning Objectives	Topics To be Covered	No. of Lect.	Reference to Chap. of TB
1.	General concepts of FEM	Introduction, Basic steps in Finite Element Analysis and its usage.	3	TB-Chap 1
2.	One-dimensional element	Formulation for 2-node and 3-node one-dimensional element, Analysis of Truss structures	4	TB-Chap 2&3
3.	Two-dimensional Plane stress and Plane strain elements	3-Noded (CST) and 6-node (LST) triangular elements, 4-node and 8-node Rectangular Element and quadrilateral element, 8-node rectangular Element, axi-symmetric elements	6	TB-Chap 6&8
4.	Two-dimensional bending elements	2-node and 3-node Beam Elements, Analysis of framed structures	4	TB-Chap 4, R1-Chap 7

5.	Natural Coordinates and Shape Functions	Natural coordinates and Lagrangian and Serendipity shape functions for one- and two-dimensional elements, convergence and compatibility requirements	4	R1-Chap 3
6.	Element formulation	Iso-parametric formulation for bar element, linear and quadratic triangular elements and Rectangular Elements, Numerical Integration, axi-symmetric element	6	TB-Chap 9,10&11
7.	Plate Elements	Plate Bending Theory, Formulation of Plate elements	4	TB-Chap 12, R1-Chap 10
8.	Shell Elements	Shell theory, Formulation of shell elements	3	R1-Chap 11
9.	Programming Aspects	Assembling of global stiffness matrix and load vectors, equation solvers.	4	R1-Chap 6

5. **Evaluation Scheme**:

SN. No.	Evaluation Component	Duration	Weightage (% age)	Date, Time	Venue	Nature of Component
1.	Test-I	1 Hour	20%	10/9, 1.00--2.00 PM	–	CB
2.	Test-II	1 Hour	20%	22/10, 1.00--2.00 PM	–	CB
3.	Projects /Home Assignments	–	20%		–	OB
4.	Comprehensive Exam.	3 Hours	40%	01/12 FN	–	CB

6. Chamber Consultation Hour: To be announced in the class.

7. Notices: All notices concerning the course will be displayed on Notice Board of Civil Engineering Department.

Make up policy: Makeup will be given only to the genuine cases provided prior permission is taken.

Instructor-In-Charge