Birla Institute of Technology & Science, Pilani
Hyderabad Campus

FIRST SEMESTER 2019-2020

Course Handout Part II

Date: 02-08-2019 In addition to Part-I (General Handout for all courses appended to the time table) this portion gives further specific details regarding the course.

Course No. : *CE G619*
Course Title : Finite Element Analysis
Instructor-in-Charge : P N Rao

Scope and Objective of the Course:

Finite element method is one of the most powerful numerical methods widely used for solving problems in different branches of engineering specially Civil Engineering. This method can be used to solve even complex and difficult problems such as nonhomogeneous 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 advanced concept of finite element method and its application to Civil Engineering.

Textbook:

1. R. D. Cook, D.S. Malkus, M.E. Plesha and R.J. Witt, Concepts and Applications of Finite Element Analysis, John Wiley India Pvt. Ltd., Fourth Edition, 2010.

Reference books

1. J. N. Reddy, An introduction to the finite element method, Third edition, Mc Graw Hill, 2015.
2. C.S. Krishnamurthy, Finite Element Analysis: Theory and programming, Second edition, McGraw Hill, 2017.
3. D.V. Hutton, Fundamentals of Finite Element Analysis, McGraw Hill,2014.
4. D.L. Logan, A first Course in the Finite Element Method, Fifth edition, Cengage,2015.
5. O. C. Zienkiewicz, R.L. Taylor and J.Z. Jhu, The Finite Element Method-Its Basis and Fundamentals,6th ed ition, Elsevier, 2012.

Course Plan:

Lecture No.	Learning objectives	Topics to be covered	Chapter in the Text Book
1-5	Fundamentals of Finite element method	Introduction of FEA, Modeling, Discretization, Interpolation, Elements, Nodes and DOF, Example applications	T1 – Ch-1
6-12	Basic formulations of FEM	Formulation techniques: variational methods, Galerkin and weighted residual methods	T1 – Ch-4,5 & Class Notes
13-16	Assembly of elements, solution techniques	Introduction to bar elements, beam elements, Numerical examples	T1 – Ch-2, 5 & Class Notes
17-23	2D and 3D Problems	Area Coordinate system, Plane stress and Plane strain Problems, Volume Coordinate system and axisymmetric problems	T1 – Ch-3, 6, 7 & Class Notes
24-28	Review of the Isoparametric elements	Isoparametric bar element, plane bilinear element, quadratic plane element, triangular element, hexahedral element, numerical integration.	T1 – Ch-6, 7 & Class Notes
29-30	Thin and thick plate elements	Plate Bending Theory, Plate Elements.	T1 – Ch-15 & Class Notes
31-32	Introduction to shell formulations.	Shell Theory and shell elements.	T1 – Ch-16 & Class Notes
33-34	Use of newly developed elements	Newly developed elements.	Research papers & Material
35-37	Mixed finite element method	Mixed Finite elements.	Research papers & Material
38-40	Material and geometric nonlinear problems	Solution methods, small-strain plasticity relation, elastic-plastic analysis procedure, nonlinear dynamic, problems, geometric nonlinear problems.	T1 – Ch-17 & Class Notes
41-43	Application of FEM to Civil Engineering problems,	Structural and Civil Engineering, Fluid flow problems, Modeling and Programming in FEM	Class Notes

	programming FEM		

Evaluation Scheme:

Component	Duration	Weightage (%)	Date & Time	Nature of Component
Mid Semester Test	90 Min	25%	30/9; 9.00 to 10.30 pm	CB
Comprehensive Exam	180 Min	35%	4/12 FN	CB
Assignments	-	15%	-	OB
Project	-	25%	-	OB

Chamber Consultation Hour: To be announced in the class.

Notices: Notices concerning this course will be displayed on CMS/Notice Board of Civil Engg. Department.

Make-up Policy: Make-up would be granted only for genuine cases with prior permission.

Academic Honesty and Integrity Policy: Academic honesty and integrity are to be maintained by all the students throughout the semester and no type of academic dishonesty is acceptable.

INSTRUCTOR-IN-CHARGE
CE G619