SE506: Finite Element Method in Structural Engineering

Teaching Scheme			Credits	Marks Distribution				Total Marks
				Theory Marks		Practical Marks		
L	T	P	C	ESE	CE	ESE	CE	
3	2	0	5	70	30	30	20	150

Course Content:

Sr. No	Topics	Teaching Hrs.
1	**Introduction:** Principles of discretization, Element stiffness mass formulation based on direct, variational and weighted residual techniques.	05
2	**Finite Element Displacement Approach:** Shape functions convergence criteria, Computation of element properties, plane stress, plane strain Problems.	04
3	**Computations of Element Properties:** bar elements, beam elements, truss elements, constant strain triangle, linear strain triangle and quadrilateral elements using generalized coordinates.	08
4	**Numerical Integration Gauss Quadrature Technique:**	02
5	**Computations of Element Properties:** bar elements, beam elements, truss elements, constant strain triangle and quadrilateral elements using Iso-parametric formulation.	08
6	**Analysis of Plate Bending Problems:**	05
7	**Dynamic Analysis:** Free vibration analysis of truss bars with two D.O.F.- considering lumped mass and consistent mass formulations. Flexural vibration of beam elements.	05

8	**FEA Software:**	03
	Pre-processors for FEA modelling. FEA software packages and Applications.	
9	**Solid Element:**	02
	Tetrahedral element.	
	Total Hrs.	**42**

Reference Books:

1. K. J. Bathe, "*Finite Elements Procedures in Engineering analysis*", Prentice-Hall Inc.
2. J. W. Weaver and P. R. Johnston, "*Finite Element for Structural Analysis*", Prentice-Hall Inc.
3. O. C. Zienkiewicz and Robert L. Taylor, "*The Finite Element Method: Its Basis and Fundamentals*", Butterworth-Heinemann Ltd.
4. T. R. Chandrupatla and A. D. Belegundu, *"Introduction to Finite Elements in Engineering*", Pearson Higher Education.
5. E. Hinton and D. R. J. Owen, "*Finite Element Programming*", Academic Press Inc.
6. C.S.Krishnamurthy, "*Finite Elements Methods*", Tata McGraw-Hill Publishing Company Ltd.
7. D. L. Logan, "*A First Course in the Finite Element Method*", C. L. Engineering
8. C. S. Desai and J. F. Abel, "*Introduction to the Finite Element Method: A Numerical Method for Engineering Analysis*", CBS Publisher.