7CE159 Finite Element Methods

L-T-P: 3-0-0-3

Theory: 1. Module 1: Introduction to Finite Element Analysis, Introduction, Basic Concepts of Finite Element Analysis, Introduction to Elasticity, Steps in Finite Element Analysis. 4 Lectures

2. Module 2: Finite Element Formulation Techniques, Virtual Work and Variational Principle, Galerkin Method, Finite Element Method: Displacement Approach, Stiffness Matrix and Boundary Conditions 4 Lectures

3. Module 3: Element Properties, Natural Coordinates, Triangular Elements, Rectangular Elements, Lagrange and Serendipity Elements, Solid Elements, Isoparametric Formulation, Stiffness Matrix of Isoparametric Elements, Numerical Integration: One Dimensional Numerical Integration: Two and Three Dimensional 9 Lectures

4. Module 4: Analysis of Frame Structures Stiffness of Truss Members, Analysis of Truss, Stiffness of Beam Members, Finite Element Analysis of Continuous Beam, Plane Frame Analysis, Analysis of Grid and Space Frame. 6 Lectures

5. Module 5: FEM for Two and Three Dimensional Solids Constant Strain Triangle, Linear Strain Triangle, Rectangular Elements, Numerical Evaluation of Element Stiffness, Computation of Stresses, Geometric Non linearity and Static Condensation, Ax symmetric Element, Finite Element Formulation of Ax symmetric Element, Finite Element Formulation of Ax symmetric Element, Finite Element Formulation for 3 Dimensional Elements 8 Lectures

6. Module 6: FEM for Plates and Shells, Introduction to Plate Bending Problems, Finite Element Analysis of Thin Plate, Finite Element Analysis of Thick Plate, Finite Element Analysis of Skew Plate, Introduction to Finite Strip Method 5 Lectures 7. Module 7: Additional Applications of FEM, Finite Elements for Elastic Stability, Finite Elements in Civil Engineering, Dynamic Analysis. 3 Lectures

References: 1. S. Krishnamoorty, Finite Element Analysis, Tata Mc Graw-Hill 2. David V. Hutton, Fundamentals of Finite Element Analysis, Mc GrawHill 1. Maity, Computer Analysis of Framed Structures, I. K. International Pvt. Ltd. New Delhi 2. Erik G. Thompson, Introduction to the Finite

Element Method: Theory, Programming and Applications, John Wiley 3. H. C. Martin and G. F. Carey, Introduction to Finite Element Analysis-Theory and Application, New York, McGraw-Hill 4. Irving H. Shames, CliveL. Dym, Energy and Finite Element Methods in Structural Mechanics; New Age International 5. K. J. Bathe, Finite Element Procedures, Prentice-Hall of India, New Delhi, India 6. M. Mukhopadhyay, Matrix, Finite Element, Computer and Structural Analysis, Oxford and IBH Publishing Co. Pvt. Ltd. New Delhi, India 7. C. Zienkiewicz and Y. K. Cheung, The Finite Element Method in Structural and Soild Mechanics, Mc Graw Hill, London 8. E. Ceruzzi, A History of Modern Computing, The MIT Press, Cambridge, MA, 1998. 9. D. Cook, Concepts and Applications of Finite Element Analysis, Wiley 10. S. Rao, Finite Element Analysis, Elsevier Butterworth-Heinemann 11. W. Weaver Jr. and J. M. Gere, Matrix Analysis of Framed Structure, CBS Publishers & Distributors, New Delhi, India