

| 21GGE509T - FINITE ELEMENT METHODS AND APPLICATIONS (ELECTIVE) | | | | | | | | | | |
|--|---|---|---|------------|--------------------|----|----|-----------|---------|-------------|
| Teaching Scheme | | | | | Examination Scheme | | | | | |
| L | T | P | C | Hours/Week | Theory | | | Practical | | Total Marks |
| | | | | | MS | ES | IA | LW | LE/Viva | |
| 3 | 0 | 0 | 3 | 3 | 25 | 50 | 25 | - | - | 100 |

Unit I

Hours: 08

Introduction to theory of elasticity, Stress at a point. Rectangular stress components in 3D problems, Strain components in 3D Problems. Equilibrium Equations, Cauchy's stress formulae, Strain-Displacement Relations, stress-strain relations, stress / strain transformations, Plane stress/ Plane strain Problems.

Unit II

Hours: 12

Introduction to FEM, Brief history of the Development, Advantages and Disadvantages of finite element method, Finite element procedure, displacement model, convergence, compatibility, geometric invariance requirements, degrees of freedom, Shape functions, Types of finite elements in FEM Library. One dimensional element: FEM formulation for bar, beam elements in local and global coordinate system, stiffness matrices, and related problems.

Unit III

Hours: 12

Two-dimensional FE formations for Constant strain triangular element (CST), Linear Strain Triangle (LST), rectangular plane elements. Natural Coordinate system. Iso-parametric, sub-parametric and super-parametric concept FE formulation concept. Isoparametric formulations for triangular and quadrilateral elements, Jacobian matrix, related problems, Consistent and lumped load vector concept.

Unit IV

Hours: 08

Thin Plate Finite element formulation, Introduction to three-dimensional problem, types 3D finite elements, Introduction to Dynamic consideration in FEM, mass matrix, Introduction to material and geometrical nonlinearity.

MAX <40 Hrs>

TEXT / REFERENCE BOOKS

1. R D Cook, D S. Malkus, M E Plesha and R J Witt, "Concept and applications of finite element analysis.", Forth Edition, Wiley Student Edition publication, Delhi.
2. T.K. Chadrupatla and A D Belegundu, Introduction to Finite Elements in Engineering", Prentice Hall of India Publications New Delhi.
3. J.N.Reddy, "An introduction to non linear finite element analysis", Oxford University Press, New Delhi.
4. C S Krishnamoorthy, "Finite Element Analysis, Second Edition, Tata McGraw Hill Publications New Delhi.