AE8601 FINITE ELEMENT METHODS

DETAILED SYLLABUS

OBJECTIVE:

To give exposure various methods of solution and in particular the finite element method. Gives exposure to the formulation and the procedure of the finite element method and its application to varieties of problems.

UNIT I INTRODUCTION

Review of various approximate methods – variational approach and weighted residual approach application to structural mechanics problems. finite difference methods- governing equation and convergence criteria of finite element method.

UNIT II DISCRETE ELEMENTS

Bar elements, uniform section, mechanical and thermal loading, varying section, 2D and 3D truss element. Beam element - problems for various loadings and boundary conditions – 2D and 3D Frame elements - longitudinal and lateral vibration. Use of local and natural coordinates.

UNIT III CONTINUUM ELEMENTS

Plane stress, plane strain and axisymmetric problems. Derivation of element matrices for constant and linear strain triangular elements and axisymmetric element.

UNIT IV ISOPARAMETRIC ELEMENTS

Definitions, Shape function for 4, 8 and 9 nodal quadrilateral elements, stiffness matrix and consistent load vector, evaluation of element matrices using numerical integration.

UNIT V FIELD PROBLEM AND METHODS OF SOLUTIONS

Heat transfer problems, steady state fin problems, derivation of element matrices for two dimensional problems, torsion problems. bandwidth- elimination method and method of factorization for solving simultaneous algebraic equations – Features of software packages, sources of error.

TEXT BOOKS:

1. Reddy J.N., "An Introduction to Finite Element Method", McGraw Hill, third edition, 2005.

2. Tirupathi.R. Chandrapatha and Ashok D. Belegundu, "Introduction to Finite Elements in Engineering", Prentice Hall India, Fourth edition, 2012.

REFERENCES:

1. Bathe, K.J. and Wilson, E.L., "Numerical Methods in Finite Elements Analysis", Prentice Hall of India, 1985.

2. Krishnamurthy, C.S., "Finite Element Analysis", Tata McGraw Hill, 2000.

3. Rao. S.S., "Finite Element Methods in Engineering," Butterworth and Heinemann, 2001.