Course Number and Name

BCE077 - FINITE ELEMENT ANALYSIS

Credits and Contact Hours

3 & 45

Course Coordinator's Name

Dr.S.J.Mohan

Text Books and References

REFERENCES :

- Bathe, K.J. Finite Elements Procedures in Engineering analysis. Prentice Hall Inc., 1995.
- Zienkicwicz, O.C. Arid Taylor, R.L. The Finite Elements Method, McGraw Hill, 1987.
- Chandrupatla, R.T. and Belegunda. A.D, Introduction to Finite Elements in Engineering, 2nd Edition, Prentice Hall of India, 1997.
- Moaveni.S., Finite Element Analysis: Theory and Application with ANSYS, Prentice Hall Inc., 1999.

Course Description

- To study the energy principles, finite element concept, stress analysis, meshing, linear problems and applications

Prerequisites	Co-requisites
Structural Analysis – II	NIL

required, elective, or selected elective (as per Table 5-1)

Course Outcomes (COs)

CO1	To learn concepts of piecewise Approximation and Finite Elements
CO2	To know about two dimensional problems in stress analysis.
CO3	Tounderstand the meshing and solution problems
CO4	To know about thenonlinear and vibration problems
CO5	To understand the Application to Thermal Analysis Problems.

Student Outcomes (SOs) from Criterion 3 covered by this Course

COs/SOs	a	b	c	d	e	f	g	h	i	j	k
CO1	H			H	H						
CO2	H			H	H						
CO3	H			H	H	M					
CO4	H			H	H						
CO5	H			H	H						

List of Topics Covered

UNIT I INTRODUCTION 10

Boundary Value problem – Approximate Solution - Variational and Weighted Residual Methods – Ritz and Galerkin Formulations – Concepts of piecewise Approximation and Finite Elements - Displacement

and Shape Functions Weak formulation Minimum Potential Energy. Generation of Stiffness Matrix and Load Vector.

UNIT II STRESS ANALYSIS 10

Two dimensional problems – Plane Stress, Plane Strain and Axisymetric problems – Triangular and Quadrilateral Elements – Natural Coordinates –Isoparametric Formulation – Numerical Integration – Plate Bending and Shell Elements Brick elements for Fracture Analysis.

UNIT III MESHING AND SOLUTION PROBLEMS 10

Higher Order Elements – P & H methods of refinement – III conditional Elements – Discretisation Errors – Auto and Adaptive Mesh Generation Techniques – Error Evaluation.

UNIT IV NONLINEAR AND VIBRATION PROBLEMS 10

Material and Geometric Nonlinearity Methods of Treatment consistent System, Matrice Dynamic Condensation – Eigen Value Extraction.

UNIT V THERMAL ANALYSIS 5

Application to Thermal Analysis Problems.