FINITE ELEMENT METHODS

Sub Code	**: 10ME 64**	**IA Marks**	**: 25**
Hrs/week	**: 04**	**Exam Hours**	**: 03**
Total Lecture Hrs	**: 52**	**Exam Marks**	**: 100**

PART-A

UNIT-1

Introduction: Equilibrium equations in elasticity subjected to body force, traction forces, and stress-strain relations for plane stress and plane strains. General description of Finite Element Method, Application and limitations. Types of elements based on geometry. Node numbering, Half band width.

UNIT-2 **07 Hrs**

Basic Procedure: Euler - Lagrauge equation for bar, beam (cantilever / simply supported fixed) Principle of virtual work, principle of minimum potential energy, Raleigh's Ritz method. Direct approach for stiffness matrix formulation of bar element. Galerkin's method.

UNIT-3 **07 Hrs**

Interpolation Models: Interpolation polynomials- Linear, quadratic and cubic. Simplex complex and multiplex elements. 2D PASCAL's triangle. CST elements-Shape functions and Nodal load vector, Strain displacement matrix and Jacobian for triangular and rectangular element.

UNIT-4 **07 Hrs**

Solution of 1-D Bars: Solutions of bars and stepped bars for displacements, reactions and stresses by using penalty approach and elimination approach. Guass-elimination technique.

06 Hrs

PART-B

UNIT-5

Higher Order Elements: Langrange's interpolation, Higher order one dimensional elements-Quadratic and cubic element and their shape functions. Shape function of 2-D quadrilateral element-linear, quadric element Iso-parametric, Sub parametric and Super parametric elements. numerical integration : 1, 2 and 3 gauge point for 1D and 2D cases.

UNIT-6 **06 Hrs**

Trusses: Stiffness matrix of Truss element. Numerical problems.

UNIT-7 **06 Hrs**

Beams: Hermite shape functions for beam element, Derivation of stiffness matrix. Numerical problems of beams carrying concentrated, UDL and linearly varying loads.

06 Hrs

H. O. D.

Dept. Of Mechanical Engineering
Alva's Institute of Engg. & Technology
Mijar, MOODBIDRI - 574 225

UNIT-8

Heat Transfer: Steady state heat transfer, 1D heat conduction governing equations. Functional approach for heat conduction. Galerkin's approach for heat conduction. 1D heat transfer in thin fins.

07 Hrs

TEXT BOOKS:

1. **Finite Elements in Engineering**, T.R.Chandrupatla, A.D Belegunde, 3rd Ed PHI.
2. **Finite Element Method in Engineering**, S.S. Rao, 4th Edition, Elsevier, 2006.

REFERENCE BOOKS:

1. **"Finite Element Methods for Engineers"** U.S. Dixit, Cengage Learning, 2009
2. **Concepts and applications of Finite Element Analysis**, R.D. Cook D.S Maltus, M.E Plesha, R.J.Witt, Wiley 4th Ed, 2009
3. **Finite Element Methods**, Daryl. L. Logon, Thomson Learning 3rd edition, 2001.
4. **Finite Element Method**, J.N.Reddy, McGraw -Hill International Edition.

MECHATRONICS & MICROPROCESSOR

Sub Code	**: 10ME 65**	**IA Marks**	**: 25**
Hrs/week	**: 04**	**Exam Hours**	**: 03**
Total Lecture Hrs	**: 52**	**Exam Marks**	**: 100**

PART - A

UNIT - 1

Introduction to Mechatronic Systems: Measurement and control systems Their elements and functions, Microprocessor based controllers.

06 Hours

UNIT - 2

Review of Transducers and Sensors: Definition and classification of transducers. Definition and classification of sensors. Principle of working and applications of light sensors, proximity sensors and Hall effect sensors.

07 Hours

H.O.D.
Dept. Of Mechanical Engineering
Alva's Institute of Engg. & Technology
Mijar, MOODBIDRI - 574 225