GUJARAT TECHNOLOGICAL UNIVERSITY

B.E. SEMESTER : VI

MANUFACTURING ENGINEERING

Subject Name: FINITE ELEMENT ANALYSIS IN MANUFACTURING ENGINEERING

Subject Code:163401

Teaching Scheme				Evaluation Scheme		
Theory	**Tutorial**	**Practical**	**Total**	**University Exam(E)**	**Mid Sem Exam(Theory) (M)**	**Practical (Internal)**
3	0	3	6	70	30	50

Sr No	Course Contents
1	**Introduction** General field problems in engineering-Discrete and continuous models-Characteristics-the relevance and place of finite element method-Variational calculus-Variational formulation of boundary value problems-The method of weighted residuals-Rayleigh-Ritz and Galerkin methods-Solution of large system of equations-Choleski Decomposition-Gaussian elimination procedures.
2	**General Procedure of FET** Discretization of Domain selection of interpolation polynomials-Convergence requirements-Formulation of element characteristics matrices and load vectors – Assembly of element characteristics matrices-Solution of finite element equations-Post processing of results.
3	**Finite elements analysis of One Dimensional and 2D problems** One dimensional finite element analysis-Linear bar element-Quadratic bar element-Beam element-Frame elements-One dimensional heat transfer-Two dimensional finite element analysis approximation of geometry and field variables-Three nodded triangular element-Four nodded rectangular element-Six nodded triangular element-Natural coordinates and coordinate transformation – Numerical integration-Incorporation of boundary conditions
4	**ISO Parametric Elements** Iso-parametric elements-Dynamic analysis-Equations of motion using Lagrange's approach-Consistent and Lumped mass matrices-Formulation of FE equations for vibration problems-Solution of Eigen value problems-Transient vibration analysis- Thermal transients.
5	**Application of finite element Analysis** Finite element analysis of Machine elements - Axi-symmetric FEA of a pressure vessel-Application of FEM in various metal forming processes – Solid formulation and flow formulation – FEA simulation of Metal cutting, Solidification of castings and Weldments.

TEXT BOOKS:

1. Chandraputla T.R., and Belegundu A.D., “Introduction of Finite Element in Engineering”, Prentice Hall of India.

2. Reddy.J.N., “An Introduction to Finite Element Method” McGraw Hill, International Student Edition.

REFERENCES:

1. Seshu.P., “Text Book of Finite Element Analysis”, Prentice Hall of India

2. Segarland. L.J., “Applied Finite Element Analysis”, John Wiley and Sons, Inc.

3. Rao.S.S., “The Finite Element Method in Engineering”, Pergamon Press

4. Rajasekaran.S., “Numerical Methods for Initial and Boundary Value Problems”, Wheeler and Co., Pvt. Ltd.

5. Lewis R.W., Morgan K., Thomas H.R. and Seetharamu K.N., The Finite Element Method in Heat Transfer Analysis, John Wiley & Sons Ltd.