L	T	P	Credit	Area		CWS	PRS	MTE	ETE	PRE
3	0/1	2/0	4	DEC/GEC		15/25	25	20/25	40/50	-

Objective: To familiarize the students with basics of FEM, formulation of stiffness, load matrix and solution of bar, truss, beam, frames two-dimensional plane problems axisymmetric solids, numerical integration, three dimensional solids, dynamic problem, heat transfer and fluid problems. To impart in-depth knowledge of software MATLAB, ABAQUS & ANSIS to solve real life application.

Syllabus		**Contact Hours**
Unit-1	Fundamental concepts of the Finite Element Method. One Dimensional Problem (Bar of uniform and variable cross sections), The Galerkin Approach, The potential –Energy Approach, shape Functions, Derivation of stiffness matrix and load vector for the element and for the entire domain. Evaluation of displacement, stresses and reaction forces.	8
Unit-2	Trusses: Introduction, Plane Trusses, Local and Global coordinate Systems, Element Stiffness Matrix and Stress calculations	6
Unit-3	Beam Elements-Analysis of Beams and Frames: Beam elements, Reduced integration, Elements based on Bernoulli and Timoshenko theory of beams Two –Dimensional problem using Constant strain triangles (CST), Two dimensional isoparametric elements and numerical integration, element stiffness matrix, Force vector. Three dimensional element.	8
Unit-4	Heat Transfer *and* Fluid Flow: Steady state heat transfer, heat conduction governing equation, boundary conditions, Functional approach for heat conduction, Galerkin approach for heat conduction, heat flux boundary condition, Basic differential equation for fluid flow in pipes and around solid bodies.	8
Unit-5	Dynamic analysis: Element mass matrices, Evaluation of Eigenvalues and Eigenvectors.	6
Unit-6	Electromagnetic simulation using FEM. Application of finite element method to electrical systems. Use of Softwares such as MAT LAB/ABAQUS/ANSYS/ NASTRAN/IDEAS. Basic feature of these softwares.	6
	Total	42

Reference Book:	
1	Finite Element Procedures, K.J. Bathe, Prentice Hall of India.
2	Finite Elements in Engineering by Chandrupatla and Belegundu.
3	Finite element Method by J.N.Reddy.
4	Finite element Method,O.C. Zienkiewicz& R.A. Taylor
5	Finite element Analysis,C.S. Krishnamurthy
6	Finite element Method, Kenneth H. Hubener
7	Finite Element Method, Desai & Abel

Course Outcomes

CO1	Apply and understand the basic concepts of Finite element analysis procedure.
CO2	Apply the knowledge of mathematics and engineering in solving the problems related to structural and heat transfer
CO3	Application of finite element method to electrical systems.

CO4	Use of Galerkin Approach, The potential –Energy Approach, shape Functions
CO5	Able to learn Two dimensional isoparametric elements and numerical integration
CO6	Use the commercial FEA packages like ANSYS and modern CAD/CAE tools for solving real life structural problems.

CO-PO/PSO Matrix

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	2	2	0	0	0	0	0	0	2	2	1	1
CO2	3	3	2	3	1	0	0	0	0	0	0	1	2	1	1
CO3	3	3	3	3	1	0	0	0	0	0	0	2	3	3	2
CO4	3	3	3	3	1	0	0	0	0	0	0	1	3	3	2
CO5	2	2	2	2	2	0	0	0	0	0	0	1	2	2	2
CO6	3	3	3	2	2	0	0	0	0	0	0	2	2	1	1