

IF558 : Applied Finite Element Method for Industries**CREDITS = 5 (L=3, T=2)****M. Tech First year, 2nd Semester****Teaching and Assessment Scheme:**

Teaching Scheme			Credits	Assessment Scheme				
L	T	P		Theory		Practical		Total Marks
			ESE	CE	ESE	CE		
3	2	0	5	70	30	30	20	150

Course Contents:

Unit No.	Topics	Teaching Hours
1	<u>Introduction:</u> : Continuum Mechanics, Conservation laws, Riemannian Geometry and stress- strain tensors, Constitutive equation, Potential-, Strain-, and Kinetic energies, Functionals and variational formulation, mathematical programming and weak solutions; Displacement method of FEM analyses	10
2	<u>Field equations:</u> Elasticity, Structural Dynamics, Fluid Mechanics, electromagnetic fields.	8
3	<u>Alternative approaches:</u> Hybrid FEM, Mixed FEM, Boundary Element Method, Boundary Error Element, Mesh-less methods, Galerkin's approach of error orthogonalization.	6
4	<u>Error analyses:</u> Algebraic and Integral inequalities; estimate of error; error bounds; Convergence, super-convergence.	4
5	<u>Computer Packaging:</u> Pre-, Post-processing and Turbo C, Analysis Programs in FRORTAN.	4
6	<u>Applications (as per request):</u> Rigid-flexible assembly (ME and Bio-Mechanics); Two-phase flow (ME & CE); Electro-magnetic application to wave-guides, MOSFET analyses (ECE); magnetic levitation (electrical), Vibration and control of quartz substrate using smart material; Stochastic FEM, etc.	10
TOTAL HOURS		42

Reference books:

- The Finite Element Method: Its Basis and Fundamentals, C. Zienkiewicz, R. L. Taylor, J.Z. Zhu; 6th Edition, 2005.
- Concepts and applications of finite element analysis, Robert Davis Cook.