



K.S. SCHOOL OF ENGINEERING AND MANAGEMENT, BENGALURU - 560109

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

SESSION: 2022-2023 (EVEN SEMESTER)

LESSON PLAN

NAME OF THE STAFF : SANTOSH KUMAR K J  
COURSE CODE/TITLE : 18ME61/ FINITE ELEMENT METHOD  
SEMESTER/YEAR : VI / III

Sl. No.	Topic to be covered	Mode of Delivery	Teaching Aid	No. of Periods	Cumulative No. of Periods	Proposed Date	Execution Date
<b>MODULE 1</b>							
1	Introduction to Finite Element Method: General description of the finite element method. Engineering applications of finite element method	L+D	BB	1	1	20/3/2023	20/3/23
2	Boundary conditions: homogeneous and nonhomogeneous for structural, heat transfer and fluid flow problems	L+D	BB	1	2	21/3/2023	21/3/23
3	Potential energy method	L+D	BB	1	3	23/3/2023	23/3/23
4	Problems on Potential energy method	L+D	BB	1	4	24/3/2023	24/3/23
5	Problems on Potential energy method	L+D	BB	1	5	25/3/2023	25/3/23
6	Rayleigh Ritz method, Galerkin's method and Displacement method of finite element formulation	L+D	BB	1	6	27/3/2023	29/3/23
7	Problems	L+D	PS	1	7	28/3/2023	29/3/23
8	Problems	L+D	PS	1	8	29/3/2023	29/3/23
9	Convergence criteria, Discretization process, Types of elements: 1D, 2D and 3D, Node numbering, Location of nodes	L+D	PS	1	9	30/3/2023	31/3/23
10	Strain displacement relations, Stress strain relations, Plain stress and Plain strain conditions, temperature effects	L+D	BB	1	10	31/3/2023	31/4/23

11	Tutorial	L+D	BB	1	10	1/4/2023	3/4/23
<b>MODULE 2</b>							
12	One-Dimensional Elements-Analysis of Bars Trusses: Linear interpolation polynomials in terms of local coordinate's for 1D, 2D elements	L+D	BB	1	11	4/4/2023	5/4/23
13	Higher order interpolation functions for 1D quadratic and cubic elements in natural coordinates	L+D	BB	1	12	5/4/2023	6/4/23
14	Constant strain triangle, Four-Nodded Tetrahedral Element (TET 4), Eight-Nodded Hexahedral Element (HEXA 8)	L+D	BB	1	13	6/4/2023	10/4/23
15	2D isoperimetric element, Lagrange interpolation functions, Numerical integration: Gaussian quadrature one point, two point formulae, 2D integrals,	L+D	BB	1	14	10/4/2023	11/4/23
16	Solution for displacement, stress and strain in 1D straight bars, stepped bars and tapered bars using elimination approach and penalty approach	L+D	BB	1	15	11/4/2023	11/4/23
17	Solution for displacement, stress and strain in 1D straight bars, stepped bars and tapered bars using elimination approach and penalty approach	L+D	BB	1	16	12/4/2023	12/4/23
18	Solution for displacement, stress and strain in 1D straight bars, stepped bars and tapered bars using elimination approach and penalty approach	L+D	BB	1	17	13/4/2023	13/4/23
19	Tutorial	L+D	BB	1	17	15/4/2023	17/4/23
20	Analysis of trusses	L+D	PS	1	18	20/4/2023	18/4/23
21	Analysis of trusses	L+D	PS	1	19	21/4/2023	18/4/23
22	Analysis of trusses	L+D	PS	1	20	24/4/2023	18/4/23
<b>MODULE 3</b>							
23	<b>Beams and Shafts:</b> Boundary conditions, Load vector,	L+D	BB	1	21	25/4/2023	18/5/23
24	Hermite shape functions, Beam stiffness matrix based on Euler-Bernoulli beam theory	L+D	BB	1	22	26/4/2023	18/5/23
25	Examples on cantilever beams, propped cantilever beams,	L+D	BB	1	23	27/4/2023	19/5/23
26	Numerical problems on simply supported, fixed straight and stepped beams using direct stiffness method with concentrated and uniformly distributed load.	L+D	PS	1	24	28/4/2023	19/5/23
27	Tutorial	L+D	PS	1	24	29/4/2023	19/5/23
28	Numerical problems on simply supported, fixed straight	L+D	BB	1	25	2/5/2023	18/5/23



	and stepped beams using direct stiffness method with concentrated and uniformly distributed load.						1
29	<b>Torsion of Shafts:</b> Finite element formulation of shafts	L+D	BB	1	26	3/5/2023	18/5/23
30	Finite element formulation of shafts	L+D	PS	1	27	4/5/2023	23/5/23
31	Determination of stress and twists in circular shafts.	L+D	PS	1	28	5/5/2023	23/5/23
32	Determination of stress and twists in circular shafts.	L+D	PS	1	29	8/5/2023	23/5/23
33	Determination of stress and twists in circular shafts.	L+D	PS	1	30	9/5/2023	23/5/23
<b>MODULE 4</b>							
34	<b>Heat Transfer:</b> Basic equations of heat transfer	L+D	BB	1	31	10/5/2023	24/5/23
35	Energy balance equation,	L+D	BB	1	32	11/5/2023	24/5/23
36	Rate equation: conduction, convection, radiation	L+D	BB	1	33	12/5/2023	24/5/23
37	Tutorial	L+D	BB	1	33	13/5/2023	25/5/23
38	1D finite element formulation using vibration method	L+D	BB	1	34	15/5/2023	25/5/23
39	Problems with temperature gradient and heat fluxes	L+D	BB	1	35	16/5/2023	2/6/23
40	Problems with temperature gradient and heat fluxes	L+D	BB	1	36	17/5/2023	5/6/23
41	Heat transfer in composite sections, straight fins	L+D	BB+PS	1	37	18/5/2023	7/6/23
42	Problems on Fins	L+D	BB	1	38	19/5/2023	13/6/23
43	<b>Fluid Flow:</b> Flow through a porous medium, Flow through pipes of uniform and stepped sections	L+D	BB+PS	1	39	22/5/2023	15/6/23
44	Flow through hydraulic networks	L+D	BB	1	40	23/5/2023	16/6/23
<b>MODULE 5</b>							
45	<b>Axi-symmetric Solid Elements:</b> Derivation of stiffness matrix of axisymmetric bodies with triangular elements,	L+D	BB	1	41	24/5/2023	15/6/23
46	Numerical solution of axisymmetric triangular element(s) subjected to surface forces, point loads, angular velocity, pressure vessels	L+D	BB+PS	1	42	25/5/2023	15/6/23
47	Numerical solution of axisymmetric triangular element(s) subjected to surface forces, point loads, angular velocity, pressure vessels	L+D	BB+PS	1	43	26/5/2023	21/6/23
48	Tutorial	L+D	BB+PS	1	43	27/5/2023	21/6/23
49	<b>Dynamic Considerations:</b> Formulation for point mass and distributed masses,	L+D	BB	1	44	1/6/2023	22/6/23
50	Consistent element mass matrix of one-dimensional bar element, truss element, axisymmetric triangular element, quadrilateral element, beam element	L+D	BB	1	45	2/6/2023	22/6/23
51	Lumped mass matrix of bar element, truss element	L+D	BB	1	46	5/6/2023	23/6/23
52	Evaluation of eigen values and eigen vectors, Applications	L+D	BB	1	47	6/6/2023	26/6/23

	to bars, stepped bars, and beams						
53	Evaluation of eigen values and eigen vectors, Applications to bars, stepped bars, and beams	L+D	PS	1	48	7/6/2023	26/6/23
54	Evaluation of eigen values and eigen vectors, Applications to bars, stepped bars, and beams	L+D	BB	1	49	8/6/2023	27/6/23
55	Evaluation of eigen values and eigen vectors, Applications to bars, stepped bars, and beams	L+D	BB	1	50	9/6/2023	28/6/23
56	Tutorial	L+D	BB	1	50	10/6/2023	29/6/23
<b>REVISION</b>							
57	Module 1	L+D	BB+PS	1	50	12/6/2023 13/6/2023	
58	Module 2	L+D	BB+PS	1	50	14/6/2023 15/6/2023	
59	Module 3	L+D	BB+PS	1	50	16/6/2023 19/6/2023	
60	Module 4	L+D	BB+PS	1	50	20/6/2023 21/6/2023	
61	Module 5	L+D	BB+PS	1	50	22/6/2023 23/6/2023	

**Total No. of Lecture Hours = 50**

**Total No. of Tutorial Hours = 05**

**Total No. of Revision Hours = 10**

*Santhosh K R*

**Course In charge**

*Chandrasekhar*

**Head of the Department**

*I. T. Rana*

**Principal**