SCHEME OF COURSE WORK

Course Title	FINITE ELEMENT ANALYSIS LAB		
Course Code	19ME2104	L P C	0 3 1.5
Program:	M.Tech.		
Specialization:	CAD/CAM		
Semester	I		

Course Outcomes (COs):

At the end of the course, the student will be able to

1	Generate part models of different mechanical components using modeling packages.
2	Analyze stresses using 1-D and 2-D elements
3	Analyze stresses using 3-D elements.
4	Calculate natural frequencies and mode shapes using dynamic analysis.
5	Solve optimization problems using FEA packages.

Program Outcomes (POs)

At the end of the program, the students in CAD/CAM will be able to

1. acquire fundamentals in the areas of computer aided design and manufacturing
2. apply innovative skills and analyze computer aided design and manufacturing problems critically
3. identify, formulate and solve design and manufacturing problems
4. carry out research related to design and manufacturing
5. use existing and recent CAD/CAM software
6. collaborate with educational institutions, industry and R&D organizations in multidisciplinary teams
7. apply project and finance management principles in engineering projects
8. prepare technical reports and communicate effectively
9. engage in independent and life-long learning and pursue professional practice in their specialized areas of CAD/CAM
10. exhibit accountability to society while adhering to ethical practices
11. act independently and take corrective measures where necessary

Course Outcome versus Program Outcomes:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO-1	S	M		M	S				M		
CO-2	S	M		M	S				M		
CO-3	S	M		M	S				M		
CO-4	S	M		M	S				M		
CO-5	S	M		M	S				M		

S - Strongly correlated, *M* - *Moderately* correlated, *Blank* - *No Correlation*

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Teaching-Learning and Evaluation

WEEK	TOPIC / CONTENTS	COURSE OUTCOMES	SAMPLE VIVA QUESTIONS	TEACHING-LEARNING STRATEGY	ASSESSMENT METHOD & SCHEDULE
1	Modeling of machine components-I	CO1	1. How to create planar entities in CATIA 2. What is extrude operation? 3. What is sweep operation? 4. How to create assembled views in CATIA	Hands on training on CATIA to create solid models and assemblies	Day to day experiments, Record
2	Modeling of machine components-II	CO1			
3	Assembly of machine components-I	CO1			
4	Assembly of machine components-II	CO1			
5	Static analysis with link elements	CO2	1. What are preprocessing, solution and post processing modules in a FEA software 2. What is the interpolation used in CST? 3. How to apply a UDL on beam in ANSYS software? 4. What is the difference between link element and beam element	Hands on training on ANSYS 19.2 to use LINK, BEAM, CST and QUAD elements in ANSYS element library	
6	Static analysis with beam elements	CO2			
7	Static analysis with triangular elements	CO2			
8	Backlog Experiment/ Revision/ Practice	CO1 and CO2			
9	Mid-Test 1	CO-1 and CO-2			Internal Exam-1, Viva voce

10	Static analysis with shell elements	CO3	1. Ares the axi-symmetric elements 2-D or 3-D? 2. What is the difference between static analysis and transient analysis? 3. Differentiate between brick elements and tetrahedron elements 4. How thickness is specified for a shell element?	Hands on training on usage of axi-symmetric, shell and 3-D elements on ANSYS 19.2 Hands on training on static and transient thermal analyses on ANSYS 19.2	Day to day experiments, Record
11	Static analysis with solid elements	CO3			
12	Static analysis with Axi-symmetric triangular elements	CO3			
13	Steady state and Transient thermal analysis of a cylinder	CO3			
14	Modal analysis of shaft	CO4	1. What is modal analysis? 2. What is harmonic analysis? 3. How extract vibration modes	Hands on training on ANSYS 19.2 to perform modal and harmonic analyses of stepped bars and beams	
15	Harmonic analysis of plate	CO4			
16	Size optimization of beam	CO5	1. What is the need of optimization?	Hands on training on ANSYS Workbench to perform shape optimization of a beam	
17	Backlog Experiment/ Revision/ Practice	CO3, CO4 and CO5			

18	Mid-Test 2	CO-3, CO-4 and CO-5			Internal Exam-2, Viva voce
19/20	END EXAM	All Cos			Exercises and Viva voce