



Mechanical Engineering Dept. Department

Syllabus

ME 489: Finite Element Anal:Mech Desgn (3-0-3)

Course Catalog Description:

Introduction to Finite element Method and its applications in different mechanical problems including static loading of beams and beam structures, free vibration of beam and beam structures, 2-D plane stress and plane strain elasticity, and 2-D steady-state heat conduction. Using commercial FE software, in solving various design problems.

Course Pre-requisites:

- ME 307: Machine Design I

Course Objectives:

1. Teach students the basic concepts in the finite element method (FEM) as related to solving engineering problems in solids and heat transfer.
2. Provide students with a working knowledge of finite element analysis tools and their use in mechanical design.

Course Learning Outcomes:

- CLO1. Develop and solve stiffness equations for truss, beam and plane elements
- CLO2. Develop 1-D FE elements equations for heat transfer and thermal stress analysis.
- CLO3. Develop 1-D structural dynamics equations.
- CLO4. Form global matrices, apply boundary conditions and solve for nodal solution variables
- CLO5. Post-process data to obtain secondary parameters such as stress and heat flux.

Learning Resources:

- Logan, Daryl L.: A First Course in the Finite element Method, 5th Edition, Cengage Learning Publishing, 2012.
- Chen, X and Yijun, Liu, Finite Element Modeling and Simulation with ANSYS Workbench, CRC Press, 2019.
- Cook, Robert D.: Finite Element Modelling for Stress Analysis, 1st Edition, John Wiley, 1995.
- Bathe, K. Finite Element Procedures, Prentice Hall, 1996.

Lecture Assessment Plan:

Assessment Task	Week Due	Weight
Mid-Term Exam	10	20.0%
Final Exam	15	30.0%
Assignments and HWs	3,7,9,11,13	15.0%
Computer-based Projects	3,7,9,11,13	20.0%
IBL assignments	3,7,9,11,13	15.0%

Lecture Weekly Schedule:

Week#	Topics
1	3
2	3 (Continue)
3	3 (Continue)
4	3 (Continue)
5	3 (Continue)
6	3 (Continue)
7	3 (Continue)
8	3 (Continue)
9	3 (Continue)
10	3 (Continue)
11	3 (Continue)
12	3 (Continue)
13	3 (Continue)
14	3 (Continue)
15	3 (Continue)