ME 305 COURSE PROFILE

DEGREE PROGRAM: Mechanical Engineering

COURSE NUMBER: ME 305	**COURSE TITLE:** Introduction to Finite Elements in Mechanical Engineering
REQUIRED COURSE OR ELECTIVE COURSE: Elective	**TERMS OFFERED:** Fall, Winter
TEXTBOOK / REQUIRED MATERIAL: Course Pack	**PRE / CO-REQUISITES:** MECHENG 211, Math 216. I, II (3 credits)
COGNIZANT FACULTY: X. Huan	**COURSE TOPICS:** 1. Anatomy of Finite Element Analysis 2. Uniaxial rod element: rod stiffness matrix 3. Finite element assembly process 4. Finite element solution techniques 5. Truss elements 6. Beam/Frame elements 7. Plate/shell elements 8. Structural analysis 9. Selected analysis types: static analysis, modal analysis, buckling analysis 10. Introduction to design optimization using finite elements 11. Use and application of commercial finite element software
BULLETIN DESCRIPTION: Introduction to theory and practice of the finite element method. One-dimensional, two-dimensional, and three dimensional elements are studied, including structural elements. Primary fields of applications are strength of materials (deformation and stress analysis) and dynamics and vibrations. Extensive use of commercial finite element software packages, through computer labs and graded assignments. Two hour lecture and one hour lab.	
COURSE STRUCTURE/SCHEDULE: Lecture: 3 days per week at 1.0 hour	

COURSE OBJECTIVES: for each course objective, links to the Program Outcomes are identified in brackets.	1. To teach students how to model and analyze mechanical systems using finite element analysis [1, 2, 6] 2. To teach students the underlying concepts of finite element analysis and finite element software [1] 3. To teach students the basic skills in using commercial finite element software and effective presentation of their analysis results [1, 2, 3, 6] 4. To reinforce students' understanding of engineering through the analysis of real-world problems [1]
COURSE OUTCOMES: for each course outcome, links to the Course Objectives are identified in brackets.	1. Given a structural engineering problem, identify the necessary information required to conduct a structural analysis using finite element software [1, 2, 3] 2. Assess the quality of finite element models of mechanical systems [1, 2, 4] 3. Use finite element software to develop models of mechanical systems [1, 3, 4] 4. Interpret the solutions obtained from finite element analyses [3, 4] 5. Using finite element software, conduct structural analyses and selected other analysis classes, e.g., normal modes/natural frequency analysis, buckling analysis, design optimization [1, 3, 4] 6. Recommend finite element software based upon company/client needs [2, 3, 4]
ASSESSMENT TOOLS: for each assessment tool, links to the course outcomes are identified	1. Regular, weekly in-class homework exercises 2. Out-of-class homework problems for realistic mechanical systems

PREPARED BY: G. Hulbert

LAST UPDATED: 06/08/2023 by K. Oldham, reviewed by X. Huan