

MAE 152 INTRODUCTION TO COMPUTER-AIDED ENGINEERING

(Elective for AE, ME and MSE)

- Catalog Data:** **MAE 152: Introduction to Computer-Aided Engineering (Credit Units: 4) F.** Elements and principles of computer-aided engineering with modern hardware and software are presented with a design focus. Case studies are used to assist in finite-element method techniques.
Prerequisites: ENGR150, MAE120. Formerly MAE152A. (Design units: 2). *Not offered every year.*
- Textbook:** Cook, Robert. *Finite Element Modeling for Stress Analysis, 1995.*
- References:** <http://www.mscsoftware.com>
- Coordinator:** J. Michael McCarthy
- Course Outcomes:** Students will:
Model physical designs and understand the limitation of using finite element analysis.
Use these models to perform linear static structural analysis.
Perform modal and modal transient dynamics analysis.
Understand how to use the commercial FEA programs NASTRAN and PATRAN.
- Prerequisites By Topic:** Heat Transfer
Mechanics of Materials
- Lecture Topics:** Introduction to Finite Element Analysis (Week 1)
Direct Determination of Stiffness Matrix, Finite Element Types (Week 2)
3 Min Oral Discussion of Projects (Week 3)
Beams and Bars (Week 4)
Stress-Strain relations (Week 5)
Isoparametric Elements, Gauss Quadrature, Symmetry (Week 6)
Sources of Error (Week 7)
Finite element Modeling (Week 8)
Plates/Shells (Week 9)
Modal Analysis (Week 10)
- Class Schedule:** Meets for 4 hours of lecture and 1 hour of discussion each week for 10 weeks.
- Computer Usage:** The MSC Nastran and Patran software system is used for all assignments.
- Laboratory Projects:** Several computer projects
- Professional Component:** Contributes toward the Engineering Topics and/or Design experience for both Mechanical and Aerospace Engineering majors.
- Relationship to Program Outcomes:** This course relates to Program Outcomes a, c, e, and k; with additional Mechanical Engineering outcomes 2, 3, and 4 as stated at: <http://undergraduate.eng.uci.edu/degreeprograms/mechanical/mission>

Design Content Description

Approach: Students form groups and perform analysis to guide the design of their choice usually their senior projects. Students must decide what design issues need to be further investigated using analysis. The students must use the results of the analysis to improve their design. Several oral and written reports are required as is a final comprehensive report. Discussion of modeling methodology, review of related industrial examples, choice of projects and specific guidance on modeling and analysis, proposal, organization of design groups, discussion of project requirements, class project progress presentations. Perform several example problems to develop modeling skills and familiarity with software tools (Patran and Nastran), Perform project modeling and analysis.

Lectures: 40%

Laboratory Portion: 60%

Grading Criteria:

Midterm:	20%
Final 1:	30%
Homework:	20%
Computer File Maintenance:	5%
Final 2:	<u>25%</u>
	100%

Estimated ABET Category Content:

Mathematics and Basic Science: ___ credit units or ___%

Engineering Science: 2 credit units or 50 %

Engineering Design: 2 credit units or 50 %

Prepared by: J. Michael McCarthy (faculty), Dave Dimas (Lecturer) **Date:** July 2007

CEP Approved: Fall 2005