ME 4042 - Interactive Computer-Aided Design and Computer-Aided Engineering

Course Catalog Data: ME 4042 Interactive Computer-Aided Design and Computer-Aided Engineering
Credit: 2-3-3; Prereq: COE 3001 Mechanics of Deformable Bodies; Coreq: ME 3345 Heat Transfer
Catalog Description: Principles of Geometric Modeling and finite-element method; interactive CAD and CAE software tools. CAD and CAE applications in thermal and mechanical design problems. Design projects.

Textbook: *Mastering CAD/CAM*, I. Zeid, McGraw-Hill, 2005

References: Web-based notes; on-line user manual
Geometric Modeling, Michael Mortenson, John Wiley and Sons, 1997
Curves and Surfaces for Computer Graphics, D. Solomon, Springer, 2006
Computer-Aided Design, Dean L. Taylor, Addison-Wesley, 1992
A First Course in Finite-Element Method, Daryl L. Logan, Thomson Inc., 2007
Applied Finite-Element Analysis for Engineers, F. L. Stasa, Saunders/HBJ Publishers, 1985
The Finite-Element Method in Machine Design, E. Zahavi, Prentice-Hall, Inc., 1992
Fundamentals of Interactive Computer Graphics, J. D. Foley and A. Van-Dam, Addison Wesley

Instructors: Raghuram Pucha, David Rosen, Suresh Sitaraman, and Yan Wang

Objectives: Objective 1: To explain the basics of Geometric Modeling and Computer-Aided Design

Objective 2: To explain the theory behind the Finite Element Method (FEM), and to provide insight into the practical aspects of FEM.

Objective 3: To develop skills in the design and analysis of practical engineering problems through the integration of geometric modeling and FEM

Objective 4: To gain hands-on experience with commercial CAD and CAE packages.

Objective 5: To underscore the importance of validating the results obtained from numerical models

Topics:

I. Introduction
II. Features of CAD/CAE/CAM Systems
III. Geometric Modeling
IV. General Process of Finite-Element Procedure
V. Finite-Element Theory
VI. Practical Aspects of Finite-Element Modeling
VII. Design Projects

Delivery Mode

Lecture	70%
Supervised Lab	30%

Grading Allocation

Homework	20%
Pre-lab assignments	5%
Deliverables completed during the laboratory session	5%
Midterm Exam	25%
Interim Project Presentation	5%
Final Project Presentation and Report	40%

Grading Guidelines

A: 90% and above

B: 80% to 89%
C: 70% to 79%
D: 60% to 69%
F: Less than 60%

Evaluation:

1. Homework
2. Pre-lab assignments
3. Deliverables created during laboratory sessions
4. Midterm Exam
5. Final Project and Report
6. Oral Presentations – Interim Project Presentation and Final Project Presentation

Performance Criteria:

Objective 1:
Performance Criteria[11] :
1.1 Students will demonstrate an understanding of the basic concepts of geometric modeling (1,2,3,4)

Objective 2:
Performance Criteria[1]:
2.1 Students will demonstrate an understanding of the theory and practical aspects of FEM (1,2,3,4,5,6)

Objective 3:
Performance Criteria[1]:
3.1 Students will demonstrate their ability to design and analyze practical engineering problems using geometric modeling and FEM (5,6)

Objective 4:
Performance Criteria[1]:
4.1 Students will demonstrate their expertise in the use of commercial CAD and CAE packages. (2,5,6)

Objective 5:
Performance Criteria[1]:
5.1 Students will demonstrate the validation of the results from numerical models with experimental data and/or other analytical approaches. (5,6)

	ABET Student Outcomes						
Course Outcomes	1	2	3	4	5	6	7
Course Outcome 1.1	X						
Course Outcome 2.1	X						
Course Outcome 3.1	X	X			X		
Course Outcome 4.1	X						
Course Outcome 5.1	X						

ABET Student Outcomes

(1) an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics

[1] Numbers in parentheses refer to evaluation methods used to assess student performance

(2) an ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors
(3) an ability to communicate effectively with a range of audiences
(4) an ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts
(5) an ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives
(6) an ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions
(7) an ability to acquire and apply new knowledge as needed, using appropriate learning strategies

Academic Integrity:
Academic honesty is essential to achieve high-quality education and to maintain the value of a Georgia Tech diploma. While I encourage you to work together and to form study groups, it is important that you take responsibility for the content of all assignments. Cheating on tests and final exams will not be tolerated. When uncovered, violations will be reported to the Dean of Students immediately. A valuable resource for the Georgia Tech Student Code of Conduct and the Academic Honor Code is: http://www.catalog.gatech.edu/rules/18b.php

Class Absences
Students who are absent because of participation in approved Institute activities (such as field trips, professional conferences, and athletic events) will be permitted to make up the work missed during their absences. Approval of such activities will be granted by the Student Academic and Financial Affairs Committee of the Academic Senate, and statements of the approved absence may be obtained from the Office of the Registrar. In the case of medical illness, please work with the Office of VP for Student Life (Dean of Students) with documentation that supports your illness. If the illness is deemed serious enough, the Dean's office will then contact me and your other instructors with recommendations on how to proceed. Students who are absent because of participation in a particular religious observance will be permitted to make up the work missed during their absence with no late penalty, provided the student informs the course instructor of the upcoming absence, in writing, within the first two weeks of class, and provided the student makes up the missed material within the timeframe established by the course instructor. For further information on the Institute rules for absences, please refer to http://www.catalog.gatech.edu/rules/4/

Accommodations for Students with Disabilities
If you are a student with learning needs that require special accommodation, contact the Office of Disability Services at (404)894-2563 or http://disabilityservices.gatech.edu/ , as soon as possible, to make an appointment to discuss your special needs and to obtain an accommodations letter. Please also e-mail me as soon as possible in order to set up a time to discuss your learning needs.