ENG ME 407 Computer-Aided Design and Manufacture

2008-2009 Catalog Data:
ENG ME 407 Computer-Aided Design and Manufacture Prereq: CAS MA 226; junior or senior standing or consent of instructor. Manufacturability of high-tech products has grown and excelled in the present digital era due to enormous advances in computation, communication, control, and software. Computer-integrated design and manufacturing (CIM) concepts are first introduced, followed by a heavy emphasis on computer-aided design (CAD), manufacturing (CAM), and engineering (CAE) tools. Topics include geometrical tolerancing and specification, transformation and manipulation of objects, description of curves and surfaces, solid modeling, tooling and fixturing, computer numerical-control (CNC) of machine tools, rapid prototyping technologies, optimization of designs, introduction of finite element methods (FEM) and application to stress/strain, deformations, and thermal engineering problems, and testing of parts while incorporating CAD/CAE methods. Projects are selected from a variety of engineering areas. The course includes a lab with extensive use of Pro/Engineer and SolidWorks, plus exposure to COSMOSWorks and COMSOL. (Formerly ENG EK 406.) 4 cr.

Class/Lab Schedule: 4 lecture hours per week

Status in Curriculum: Elective, Required in Manufacturing Program

Required Textbook: "Fundamentals of Geometric Dimensioning and Tolerancing," by Alex Krulikowski, 2nd edition, 1997

Reference: "Computer-Aided Manufacturing" (3rd Edition) (Prentice Hall International Series on Industrial and Systems Engineering) by Tien-Chien Chang, Richard A. Wysk (Author), and Hsu-Pin Wang.

Coordinator: Daniel Cole, Associate Professor, Mechanical Engineering

Goals:
To cover state of the art in CAD/CAM, to learn geometrical tolerancing and dimensioning, relationship to machining, and to learn and gain skill in correctly applying FEA software to analyze aspects of designed parts.

Prerequisites by topic:
1. Vector mechanics
2. Differential equations and multivariate calculus

Computer Usage:
1. SolidWorks
2. COSMOSWorks
3. COMSOL

Course Learning Outcomes:
As an outcome of completing this course, students will:

i. Have an overview of the state-of-the-art In CAD/CAM
ii. Become competent in the use of SolidWorks, COSMOSWorks, and obtain a beginning familiarity with COMSOL
iii. Learn about geometrical tolerancing and dimensioning (GD&T)
iv. Complete a major design problem on a team using tools learned in class. Present results to class.
v. Learn the importance and scope of documentation in manufacturing
vi. Understand the basics of applying FEA software to engineering problems

Course Outcomes mapped on to Program Outcomes

Program:	A	B	C	D	E	F	G	H	I	J	K	L	M	N
Course:	i,ii, iii,vi		iv	iv	iv,vi	v	iv,v		i-vi	i	iv			v
Emphasis:	3	1	5	4	3	2	3	1	3	2	3	1	1	2

Topics (time spent in weeks):
1. Overview CAD/CAM (0.5)
2. GD&T, while also learning and applying SolidWorks on homework (6)
3. FEA and applying software to problems (4)
4. Project (3.5)

Contribution of Course to Meeting the Professional Component:
Engineering topics: 100%

Status of Continuous Improvement Review of this Course:
Date Last Reviewed: Spring 2009   **Reviewed By:** Design Comm.
Prepared by: Assoc. Prof. Daniel Cole   **Date:** 5/23/2009