## **Course Information**

Fall 2011 MECH6303.501.11F **Computer Aided Design** Monday & Wednesday: 7:00pm-8:15pm Room: ECSS 2.201

# **Professor contact Information**

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*Course Pre-requisites co-requisites and/or restrictions* 

Prerequisite: MECH 3305 or equivalent. (3-0)

### **Description:**

**MECH 6303 - Computer Aided Design** (3 semester hours) This course provides an introduction to design principles and methodologies for geometrical modeling, curve and surface fitting in an automated environment, CAD/CAM simulation of manufacturing, and computer-aided solid modeling.

### **Student Learning Objectives/Outcomes**

(1)Students will gain a fundamental understanding of CAD/CAM system including the principles and practice of computer aided solid modeling and its applications to manufacturing.

(2) The course is taught by lectures, tutorials, and presentations of CAD software (SolidWorks and ProE).(3)Students can describe various standards pertaining to CAD/CAM software.

(4)Students will be able to explain the mathematical formulations and properties of parametric modeling of curves and surfaces.

(5) By the end of the course, students will be able to construct parts and assembly models of a system using SolidWorks and ProE software and be able to carry out all phase of design, analysis and manufacturing.

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### Topics

### (1) Introduction to computer-aided design

• Motivation, general design philosophies, CAD/CAM software, coordinate systems, sketches, orthographic and isometric views, exploded view, rendering.

### (2) Principles of 3D geometrical modeling

- Basic features of solid modeling, part drawing, standard dimensioning and tolerance, constraint relationships in solid modeling.
- Basic modeling tools in CAD (layers, colors, selection, transformation, offset, array, and etc).
- Standard engineering drawing, standard machine elements (gear, shaft, springs, bearings).

### (3) Curve and surface fitting in an automated environment

- Parametric and non parametric representation of curves with example using ProE and SolidWorks.
- Synthetic, analytic, implicit and explicit methods of curves.
- Surface representation in CAD, synthetic (splines and bezier), and analytic (plane, ruled, revolution, tabulated), orthogonality, tangency.
- Solid modeling, regularization, boolean operation, half space operations, boundary representation (B-rep), constructive solid geometry (CSG)

#### (4) Programming

• Relation database, objects, class, inheritance, parametric modeling in: AutoCAD, ProE and SolidWorks.

#### (5) CAD/CAM simulation of manufacturing

- Animation: basics, implementation in CAD software.
- Filter Assembly, using web resource for standard parts, fittings, bolts nuts, creating assembly and subassembly drawing.
- Product data exchange, file types (IEGS, STEP, ACIS, DXF, PARASOLID, STL, etc)

# (6) Computer-aided solid model analysis and rapid prototyping

- Simulation program for solving problems is COMSOL and SolidWorks Simulation.
- Computational Fluid Dynamics (CFD), Structural Mechanics Analysis, Finite Element Analysis(FEM) using CAD software,( pre-processing, meshing , apply boundary condition, solve, post processing).
- Tolerance: perpendicularity, parallelism, eccentricity, surface finish, angularity, flatness, position tolerance, clearance and interferences, using these features in CAD software.
- Basics of rapid prototyping, hardware and software, molding, design for manufacturing, reverse engineering and data capture techniques.

#### **Grading policy**

Midterm Exam	20%
Project	25%
Homework	35%
Final Exam	20%

#### **Textbook, References and Materials**

Lecture notes and online tutorial

### **Reference books:**

- Mastering CAD/CAM, by Ibrahim Zeid, ISBN: 0072868457
- Mastering SolidWorks, by Ibrahim Zeid, ISBN-10: 0135046092
- Pro Engineer Wildfire 5.0 Tutorial and Multimedia CD, Roger Toogood, ISBN 1585035351

### Tutorial:

SolidWorks <u>http://www.solidworks.com/sw/resources/solidworks-tutorials.htm</u> ProE: http://www.ptc.com/products/tutorials/wf4/toc/intro\_tutorial.htm

### **Policies and Procedures for Students**

The University of Texas at Dallas provides a number of policies and procedures designed to provide students with a safe and supportive learning environment. Brief summaries of the policies and procedures are provided for you at <a href="http://provost.utdallas.edu/home/index.php/syllabuspolicies-">http://provost.utdallas.edu/home/index.php/syllabuspolicies-</a> and procedures-text and include information about technical support, field trip policies, off-campus activities, student conduct and discipline, academic integrity, copyright infringement, email use, withdrawal from class, student grievance procedures, incomplete grades, access to Disability Services, and religious holy days. You may also seek further information at these

Websites:

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