Course Syllabus
MECH 6303, Computer Aided Design

Course Information:

MECH 6303, 3 semester hours   Fall 2016
Tuesday & Thursday: 5:30pm-6:45pm   Lecture Room: ML2 1.218
Starts: August 22, 2016   Ends: December 15, 2016

Professor Contact Information:

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TA Contact Information

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Description:

This course provides an introduction to design principles and methodologies for geometric modeling of curves and surfaces, in addition to basic and advanced computer-aided solid modeling, simulation and analysis, and creation of manufacturing-ready fabrication packages representing innovative new products.

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

Prerequisite: MECH 3305 Computer Aided Design or equivalent (3 undergraduate semester hours)

Course Learning Outcome (CLO):

1. Demonstrate basic and advanced solid modeling skills required to create detailed and complex parts and assemblies

2. Explain CAD methodologies used by various software packages (boundary representation, half space, constructive solid geometry, and sweeps)

3. Formulate mathematical representations of parametric curves and surfaces

4. Apply CAD software to design and analyze innovative new products, and create complete fabrication packages ready for manufacture

Topics:

1) Introduction to computer-aided design
- Motivation, general design philosophies, CAD 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, 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/Creo 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)
- Writing scripts (programs) using MATLAB for curves, surfaces and solids.

4) Programming
- Relation database, objects, class, inheritance, parametric modeling in: AutoCAD, ProE, and SolidWorks.

- Macro and Application Programming Interface (API).

5) CAD/CAM simulation of manufacturing
- Animation: basics, implementation in CAD software
- Standard parts, fittings, bolts nuts, creating assembly and subassembly drawings
- 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 such as SolidWorks Simulation
- Basics of computational techniques, Finite Element Analysis (FEM) using CAD software (pre-processing, meshing , apply boundary condition, solve, post processing)
- Geometric 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:
- 30%   Homework
- 15%   Midterm Exam
- 5%   In-class presentation
- 30%   Project (Proposal, In-class presentation, Overall CAD performance)
- 20%   Final Exam

References and Materials:
- Lecture notes and online tutorial (UTD login ID and password required)
- https://elearning.utdallas.edu/webapps/portal/frameset.jsp
- You can access from off campus via VPN (see http://www.utdallas.edu/ir/howto/utd-vpn/)

Reference Textbooks:
- Mastering CAD/CAM, by Ibrahim Zeid, ISBN: 0072868457
- Mastering SolidWorks, by Ibrahim Zeid, ISBN-10: 0135046092
- Geometric modeling, by Michael E. Mortenson, ISBN 0831132981, 9780831132989
- Computer Graphics and Geometric Modeling for Engineers, by Vera B. Anand, ISBN: 0471157317, 9780471157311
- CREO Parametric 2.0 Tutorial and Multimedia CD: Roger Toogood and Jack Zecher, ISBN-13: 978-1585038152

Tutorials:
- SolidWorks http://www.solidworks.com/sw/resources/solidworks-tutorials.htm
- ProE/Creo http://www.ptc.com/product/demos-and-tips

Software:
- SolidWorks and CREO are available in the CAD Lab (CN 1.304)
- CREO Student version can be downloaded for free from the following link: http://support.ptc.com/appserver/wcms/forms/index.jsp?&im_dbkey=86840&icg_dbkey=482
- SolidWorks trial version and other free CAD tools are available from: http://www.solidworks.com/sw/products/free-cad-software-downloads.htm
- DraftSight can be downloaded from the following link: http://www.3ds.com/products-services/draftsight/download-draftsight/

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 http://provost.utdallas.edu/home/index.php/syllabuspolicies- 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.

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