UNIVERSITY OF CALIFORNIA
Mechanical Engineering Department

E 26 Three Dimensional Modeling for Design Spring 2015

Faculty: Dr. Ken Youssefi
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Office Hours: Tu 9:00 – 11:00
Class website: http://bcourse.berkeley.edu (use CalNet ID and password to login)

Course Description:

Three-dimensional modeling for engineering design. This course will emphasize the use of CAD on computer workstations as a major graphical analysis and design tool. Students develop design skills, and practice applying these skills. A group design project is required. Hands-on creativity, teamwork, and effective communication are emphasized. 2 units, no prerequisite

Lecture: Tu 8:00 – 9:00, 105 North Gate

Laboratory:	section 101	Wed.	9:00 – 11:00	2107 Etcheverry Hall	GSI - Miho
	section 102:	Th.	9:00 – 11:00	2107 Etcheverry Hall	GSI - Qiuchen
	section 103	Th.	11:00 – 1:00	2107 Etcheverry Hall	GSI - Qiuchen
	section 105	F	9:00 – 11:00	2107 Etcheverry Hall	GSI - Miho

Graduate Student Instructors (GSI): Miho Kitagawa, mkitagaw@berkeley.edu and Qiuchen Guo, qiuchen@berkeley.edu

Textbooks:

Required,
Lieu, D.K., and Sorby, S.A., Visualization, Modeling, and Graphics for Engineering Design, Cengage Publishers, 2009.

Recommended,
SolidWorks 2015, free download with the SDK ID, will be provided in the class

Course Objective
Introduce computer-based solid, parametric, and assembly modeling as a tool for engineering design; enhance critical thinking and design skills; emphasize communication skills, both written and oral; develop teamwork skills; offer experience in hands-on, creative engineering projects; reinforce the societal context of engineering practice; develop early abilities in identifying, formulating, and solving engineering problems.

Semester Project
Wind turbine project: rotor blade and tower design and fabrication (3D print). See project description.

Grading: The final course grade will be based on a normal distribution curve.
- 20% Homework and Laboratory
- 30% Design Project
- 20% Midterm Examination
- 30% Final Examination

Student Learning Objectives

Upon completion of the course, students shall be able to:

- Create a 3D solid model of a complicated object with high degree of confidence.
- Extract 2D orthographic views from the 3D model for fabrication.
- Specify the proper dimensions, according to industry standards, for parts to be fabricated
- Extract section and auxiliary views.
- Understand the basics of assembly and associative constraints.
- Understand the basics of rapid prototyping, in particular 3D printing
- Understand the engineering design process and the implementation of different design phases.
- Work effectively as a member of a design team.

Weekly laboratory and homework assignments

All labs will be held in room 2107 in Etcheverry Hall. The lab period is 2 hours. During the labs, students will start by doing step-by-step solid modeling tutorials to learn different functionality. Then they will be given the lab assignment where they will apply what they've learned to model new geometries, assemblies, and products. There will be a focus on learning how to build a solid model to capture design intent and meaningful dependencies for ease of subsequent editing. You should be able to finish the lab assignment during the lab. If not, you must finish it before coming to the lab the following week. Students will also learn how to set up for a 3D-print build, and 3D-print a geometry they design themselves. Homework problems will cover the theory behind the software, such as constraints and Booleans, and additional modeling problems that build on skills acquired during lab.

Lab assignments are due on Tuesdays by 5 pm. The due dates are indicated in the course syllabus. Hard copies of completed assignments are to be submitted in the labeled box located on the south wall of the 3rd floor of Etcheverry Hall. Write your lab section number on the first page of your homework, upper right corner.

Academic Honesty

All students should be familiar with the Code of Student Conduct and know that the general rules and students rights stated in the document apply to this class (see http://uga.berkeley.edu/SAS/osc.htm). With regard to laboratory work and homework assignments, not only are you allowed, but you are encouraged, to discuss the problems and techniques with other students; but each student must do his or her version of the solution. Submitting someone else's work as your own or knowingly allowing someone else to turn in your work as their own will result in a zero grade for the assignment for all involved and will be reported to the Office of Student Conduct. Cheating on the examinations will result in a failing grade in the course and your action will be reported to the Office of Student Conduct for administrative review.

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Course Schedule

Week	Dates	Topics	HW & Lab. Assignments
1	1/20	Introduction to the course Introduction to design project	
2	1/27	Introduction to 3D modeling Parametric modeling, feature-based modeling	Lab. work #1 – due Tu. 2/3 by 5:00 pm Sketching & Extrusion
3	2/3	Design Intent Sketching, Extrusion and Revolve	Lab. work #2 – due Tu. 2/10 by 5:00 pm Sketching & Extrusion
4	2/10	Solid Modeling: reference geometry Sweeps and Lofts	Lab. work #3 – due Tu. 2/17 by 5:00 pm Extrusion & Revolve
5	2/17	More solid modeling techniques Rendering, Arrays, Shell, Ribs, fillet, Chamfer, ….	Lab. work #4 – due Tu. 2/24 by 5:00 pm Revolve & Sweep
6	2/24	Aerodynamics of wind turbine Introduction to Rapid Prototyping	Lab. work #5 – due Tu. 3/3 by 5:00 pm Loft & Pattern
7	3/3	Wind turbine tower structure design considerations. Rotor blade design: blade profile, angle of attack, number of blades, ..	Lab. work #6 – due Tu. 3/10 by 5:00 pm Wheel & Screwdriver
8	**3/10**	Engineering Design Process; Concurrent engineering **Midterm Examination #1 (SolidWorks) during the lab.**	
9	3/17	Extracting 2D views from the 3D solid model Dimensioning standards	Lab. work #7 – due Tu. 3/31 by 5:00 pm 2D drawings & dimensioning
10	**3/23 – 3/27**	**Spring Recess**	
11	3/31	Rapid Prototyping: Stereolithography, laser, .. Material: liquid and solid polymer, powder, paper, metal, ceramic,…	Lab. work #8 – due Tu. 4/7 by 5:00 pm Spring assembly design
12	4/7	Rapid Prototyping: Fused Deposition Modeling (FDM) 3D printing design consideration	Digital model oral presentation
13	4/14	Assembly modeling; Top-down and bottom-up assembly modeling Mates in assembly, exploded view	Lab. work #9 – due Tu. 4/21 by 5:00 pm Vise assembly
14	4/21	Review of orthographic projection, 2D standard views Section and auxiliary views	Lab. work #10 – due Tu. 4/28 by 5:00 pm 2D views: section & auxiliary
15	4/28	Engineering analysis with SolidWorks Simulation using SolidWorks	Work on the project
16	5/5	Reading/Review/Recitation (RRR) week Final project oral presentation after the testing, location and time will be announced in the class.	**Wind turbine demo and test**

<u>Final Exam (SolidWorks) – Thursday May 14, 7:00 – 9:30 and 10:00 – 12:30 pm</u>

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