UNIVERSITY OF CALIFORNIA
Mechanical Engineering Department

E26 **Three Dimensional Modeling for Design** **Fall 2015**

Faculty: Prof. Ken Youssefi
Office: 5106 Etcheverry Hall, phone: (510)642-4483, email: kyoussefi@aol.com
Office Hours: TuTh 11:00 – 12:30
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, 277 Cory

Laboratory:	section 101	Wed. 9:00 – 11:00	CAD lab Jacobs Hall	GSI - Qiuchen
	section 102	Wed. 12:00 – 2:00	1171 Etcheverry Hall	GSI - Qiuchen
	section 103	Th. 9:00 – 11:00	1171 Etcheverry Hall	GSI - Yeojun
	section 104	F 9:00 – 11:00	CAD lab Jacobs Hall	GSI - Yeojun

Graduate Student Instructors (GSI): Yeojun Kim, yk4938@berkeley.edu and Qiuchen Guo, qiuchen@berkeley.edu

Textbooks:

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

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; develop early abilities in identifying, formulating, and solving engineering problems. Emphasize communication skills, both written and oral, and develop teamwork skills. Project teams will have opportunities to learn about team dynamics and how to make a successful team; they will also have access to team coaching. Offers experience in hands-on, creative engineering projects and reinforces the societal context of engineering practice.

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.

5%	Homework and class participation
20%	Laboratory work
30%	Design Project
20%	Midterm Examination
25%	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.
- Learn about team dynamics and how to make a successful team
- Work effectively as a member of a design team.

Weekly laboratory assignments

The labs are located in 1171Etcheverry and Jacob halls. 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 assignments

There are 5 homework assignments that are related to the design project teams. The first homework deals with gathering individual profiles used to form the teams. The second homework is about forming a collaborative plan. The third homework is the mid-semester assessment. The 4th homework requires students to meet as a team and review their survey feedback, and make appropriate revisions to their collaborative plan. For the last homework, students will complete an abbreviated version of the team survey that focuses only on overall team performance and two general questions about teammates.

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.

****

Course Schedule

Week	Dates	Topics	**Lab. work** Assignments
1	9/1	Introduction to the course Introduction to the design project **Homework #1 (individual) – due Tu. 9/13 by 11 pm**	No Labs
2	9/8	Introduction to 3D modeling Parametric modeling, feature-based modeling, Design Intent	Lab. work #1 – due Tu. 9/15 by 5:00 pm Sketching & Extrusion
3	9/15	Reviewing Sketch, Extrusion and Revolve commands **Design groups formed**	Lab. work #2 – due Tu. 9/22 by 5:00 pm Extrusion & Revolve
4	9/22	Solid Modeling: reference geometry Sweeps and Lofts	Lab. work #3 – due Tu. 9/29 by 5:00 pm Sweep
5	9/29	Aerodynamics of wind turbine Rotor blade design **Homework #2 (Team) – due Sunday 10/4 by 11:00 pm**	Lab. work #4 – due Tu. 10/6 by 5:00 pm Loft
6	10/6	Wind turbine tower structure design Stiffness and strength consideration	Work on the blade design (group)
7	10/13	Assembly modeling; Top-down and bottom-up Mates in assembly, exploded view	Work on the tower design (group)
8	10/20	Extracting 2D views from the 3D solid model Dimensioning standards **Homework #3 (individual) – due 10/27 by 5:00 p.m.** **Midterm Examination #1 (SolidWorks) during the lab.**	Lab. work #5 – due Tu. 10/27 by 5:00 pm Vise assembly Blade design due this week
9	10/27	Introduction to Rapid Prototyping 3D printing **Homework #4 (Team) – due 11/3 by 5:00 p.m.**	Lab. work #6 – due Tu. 11/3 by 5:00 pm Shop drawings (2D) & dimensioning
10	11/3	Rapid Prototyping: Stereolithography, laser, .. Material: liquid and solid polymer, powder, paper, metal, ceramic,…	Lab. work #7 – due Tu. 11/10 by 5:00 pm Wheel and screw driver design
11	11/10	Rapid Prototyping: Fused Deposition Modeling 3D printing design consideration and limitations Project discussion	Wind turbine tower design due this week
12	11/17	Engineering analysis with SolidWorks Finite element analysis	Lab. work #8 – due Tu. 11/24 by 5:00 pm Pattern, Spring design
13	11/24	Stress and deflection of the wind turbine tower Simulation using SolidWorks	Lab. work #9 – due Tu. 12/1 by 5:00 pm Finite Element Analysis
14	12/1	Engineering Design Process; Concurrent engineering	Work on the project
15	12/8	Reading/Review/Recitation (RRR) week **Wind turbine testing is scheduled for Tu Dec. 8 from 9-12 and 1-4 in Hesse Hall basement**	

Final Exam (SolidWorks) – Wed. Dec. 16, 3:00 – 6:00 and 6:30 – 9:30 pm

Project Report (One report per team) – Due Tuesday Dec. 15 between 10-12 am (5106)

Individual Teaming Homework #5 – Due Friday, Dec. 11 by noon

ky