AME 410: ENGINEERING DESIGN THEORY AND METHODOLOGY FALL 2010

Course Objectives

The following objectives have been set for this course:

- To have a general and systematic understanding of how engineering design process is carried out in practice and how it is described and prescribed in different design models and methodologies. This general understanding of the basic concepts of design and different types of design processes is important for students to have a general idea of what is the state of knowledge of design practice and research.
- To understand specific issues of engineering design and the systematic methods to deal with these issues. Engineering design is not carried out in a completely free space. It must meet customer needs, conform with the principles of physics, deal with various information uncertainties, and satisfy limits of of time and cost. Students will learn how these issues will manifest themselves in the design process and what methods can be applied to address them.
- To learn and master systematic approaches to solving various design problems. To solve large and complex design problems, one needs to know how to approach the problem and how to proceed when there are options. This course will teach a systematic approach to design that is built on both practical design experiences and fundamental physical and decision-making principles.
- To understand the value of design in a broader context. Engineering design is part of a product development process which includes both design and manufacturing. Furthermore, it is part of a business process which competes with other business processes. To develop a competitive product for the market requires a good sense of value of design. Students will learn such topics as design for manufacturing, utility theory for design decision making and other quality and efficiency related topics.
- To practice learned methodologies through real design projects. Students will be given small design problems as homework and relatively large design problems as term projects. The design problems will be carefully selected to allow students practice learned design theory and methods.

Prerequisite

Junior standing is required for taking this course.

Course Work

Homework includes solutions to the queries and design problems. Each homework assignment has 2-3 short questions or one small design problem intended to help students (1) assimilate the reading material and organize their thoughts about it, and (2) digest key concepts learned from the lectures. Clarity, conciseness and incisiveness are required.

Mid-term exam will be open-book. Problems of the exam will be similar to, and more comprehensive than, the homework questions.

Final projects will be carried out throughout the course by student teams of 4-5 members. Each team will bid for its engineering design project and develop a specific design solution for their design problem. By doing the project, students will digest and apply the theories and methodologies learned from the class and develop the experience of solving close-to-real engineering design problems. Student teams will give project briefings in the class, submit Project Progress Reports and Final Project Report.

Course Materials

Required: David Ullman, *The Mechanical Design Process, 4th Edition*

NOTE: You should finish reading the assigned pages BEFORE the class of the assigned date.

Grading Requirements

Homework: 30%, Mid-term exam: 30%; Final project: 40%.

Course Schedule

Week	Lecture	Project	Readings	Assgmnt Due
8/25	Course introduction & Introduction to Engineering Design		Textbook: pp.1-22	.
9/1	Engineering Design: Problems and Processes	.	Textbook: pp.23-45	Homework1
9/8	Overview of Engineering Design Process	Form project teams	Textbook: pp.81-110	Homework2 Project topics
9/15	Product Planning and Specification	Project assignment	Textbook: pp:111-170	Project bid
9/22	Develop Function Structures	Progress Report I assignment	Textbook: pp.171-201	Homework3
9/29	Generate Design Concepts	**Briefing1** : Task Planning & Specification	Textbook: pp.204-211	
10/6	Evaluate Design Concepts	.	Textbook: pp.213-240	Homework4
10/13	More Methods for Conceptual Design & Conceptual Design Recap	**Briefing2** : Concept Generation 1 - Function Structure	Handout#1 Textbook & Course notes	Homework5
10/20	**Midterm exam**	.	.	**Progress Report I**
10/27	Product Generation	Progress Report II assignment	Textbook: pp.241-278	
11/3	Product Generation: An Example		Textbook: pp.241-278 Handout#2	.
11/10	Product Evaluation	**Briefing3** :Concept& Product Generation	Textbook: pp.279-314	
11/17	Design for X	Final Report assignment	Textbook: pp.315-362	**Progress Report II**
11/24	Lifecycle Engineering		Handout#3	
12/1	Engineering Design: Recap	**Final Briefing: Overall Project Report**	Textbook & Course Notes	.
12/8	**Final Project Report Due 5pm by Email to yjin@usc.edu**			