University Of California, Berkeley
Department of Mechanical Engineering

ME 110: Introduction to Product Development (3 units)

Elective Course

Syllabus

CATALOG DESCRIPTION

The course provides project-based learning experience in innovative new product development, with a focus on mechanical engineering systems. Design concepts and techniques are introduced, and the student's design ability is developed in a design or feasibility study chosen to emphasize ingenuity and provide wide coverage of engineering topics. Relevant software will be integrated into studio sessions, including solid modeling and environmental life cycle analysis. Design optimization and social, economic, and political implications are included. All product ideas will be evaluated against the "triple bottom line": economic, societal and environmental. Both individual and group oral presentations are made, and participation in a final tradeshow-type presentation is required.

COURSE PREREQUISITES

Junior or higher standing.

TEXTBOOK(S) AND/OR OTHER REQUIRED MATERIAL

Junior or Senior standing. Graduate students need permission of instructor as graduate students are encouraged to take ME290P instead. Students from all disciplines of engineering, business or design are welcome.

Expectations: Each student is expected to prepare for and attend all of the class sessions (lectures and studios) and to participate fully on a project team. Some of the studio sessions will provide in-class time for your project as well. The workload for the course has been designed so that it is relatively constant throughout the semester, and all requirements are clearly spelled out in this syllabus so that you can readily plan ahead.

Academic Integrity: Full group and class collaboration is expected in all aspects of this course. It is almost impossible to share too much information in product development. We do expect that all team members will contribute substantially to the project efforts, although some students will choose to devote themselves to the projects beyond what is required for the course. Students will be asked to critique and contribute to the development projects of others in the class in a cooperative, supportive environment, and will be asked to submit critiques of their own group and group members during the course of the semester.

Reading Materials: The primary reading material for the class is the textbook Product Design and Development (Second Edition) written by Karl Ulrich and Steve Eppinger. This book is a very basic text that provides a step by step view of how new product development processes are to be conducted. Supplemental required course reading materials will also be available on bSpace.

COURSE OBJECTIVES

This course provides an operational experience in the development of innovative and realistic customer-driven engineered products. Design concepts and techniques are introduced, and the student's design ability is developed in a design or feasibility study chosen to emphasize ingenuity and provide wide coverage of engineering and business topics. Innovative thinking is nurtured. Students will be expected to use tools and methods of professional practice (e.g., optimal design, solid modeling, life cycle analysis) and use these tools to consider the social, economic, environmental and political implications of their products. Both individual and group oral presentations will be required.

DESIRED COURSE OUTCOMES

Students can expect to depart the semester understanding new product development processes as well as useful tools, techniques and organizational structures that support new product development practice in the context of the “triple bottom line” – economic, environmental and societal.

TOPICS COVERED

Product development processes and organizations, product planning, high functioning teamwork, CAD, customer/user needs assessment, personas and empathic design, translating the "voice of the customer", concept generation, concept selection, concept development, decision analysis, concept testing, taguchi method and experimental design, product architectures, design for variety, design for environment, design for assembly/manufacture, prototyping, design costing, information technologies, design optimization, ethics case study, universal design and entrepreneurship, innovation and intellectual property.

CLASS/LABORATORY SCHEDULE

Three hours of lecture and one hour of discussion (optional) per week

CONTRIBUTION OF THE COURSE TO MEETING THE PROFESSIONAL COMPONENT

New Product Development Project:
The goal of this exercise is to learn principles and methodologies of product development in a realistic context. Most product development professionals work under tremendous time pressure and do not have an opportunity to reflect on the development process. In this course, the stress level will be low enough to allow time to experiment and learn. Students are asked to form project teams of 4 to 5 students. They have opportunities during the first two weeks of class to scope out the possible projects and get to know potential teammates.

Project Background:
The challenge in the project portion of this course is to design a new product, test it on a consumer group, and produce a prototype version of it. The goal of this exercise is to learn principles and methodologies of product development in a realistic context.

Journal:
Each individual in the class is required to maintain a design journal throughout the semester to be turned in at the final project presentation. The journal will be returned at the end of the semester. This journal should include a student's individual thinking (both imagery and words) pertaining to her/his project. Students may include sketch pictures, paste in pictures, write words, or choose any other approach that works for to capture their ideas, thoughts, and reflections about their product and project. The journal should be used both to capture ideas about the product itself as they move through the

process, but also to document thoughts and insights on the process of product development, group dynamics, project process, etc. Inventors do this as it helps to document when they came up with an original idea (useful in the patenting process); engineers do this to work out complex technical details; and designers do this to generate lots of ideas (as ideas feed off of one another); project managers use journals as a management tool to generate "lessons learned" and "best practices" to help run future product development projects more effectively.

Guidelines for Students: Working with Your Team

For some students, this will be their first experience in working on a collaborative, cross-functional team. Part of the learning in this course is to assess patterns of cooperation and team dynamics and to reflect on both the behavioral and organizational challenges your team faces. While teams vary from semester to semester, we find that good organizational practices always benefit the entire team. Here are a few suggestions: Set regular meeting times. One hour of the class will be devoted to team activities so as to minimize the time you need to meet outside of class. Even so, you should schedule another hour during the week for regular meetings with your design group. Use the provided team e-mail "listserv" to communicate with your team. It will also archive and thread your e-mails so that you can review past conversations. Store shared documents on the group page on the website. Work together not separately. Get to know each other's strengths, e.g., who knows PowerPoint, who is good at drawing, graphics or CAD, who's good at running meetings, who's good at eliciting feedback from customers, etc. There are many decisions you must make as a team. Attempt as much open communication as possible. Discuss the means by which you wish to resolve problems as a group, and what escalation process you will use if problems persist. Decide, for example, when you want to involve the faculty or TA in helping you resolve problems. Use your mission statement to create a shared vision among the team members that will allow you to stay focused and on target.

RELATIONSHIP OF THE COURSE TO ABET PR OGRAM OUTCOMES

(c) an ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability
(d) an ability to function on multi-disciplinary teams
(e) an ability to identify, formulate, and solve engineering problems
(f) an understanding of professional and ethical responsibility
(g) an ability to communicate effectively
(h) the broad education necessary to understand the impact of engineering solutions in global, economic, environmental, and societal context
(j) a knowledge of contemporary issues
(k) an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice

ASSESSMENT OF STUDENT PROGRESS TOWARD COURSE OBJECTIVES

Much of the course is built around a student team's design project, which is evaluated with a midterm and final evaluation. The final evaluation draws on input from academic and industry judges. Students are also given a midterm and final team peer evaluation to judge their perceptions of program along several dimensions of teamwork and leadership.

ASSESSMENT OF STUDENT PROGRESS TOWARD COURSE OBJECTIVES (Cont.)

Grading:

The course grade is determined as follows:

10% on the quality of the student's preparation for and participation in class discussions; 30% on the quality of your individual assignment solutions; 50% on the quality of the team's work on project-related assignments and presentations; 10% on the quality of the student's individual final project deliverables (lessons learned and design journal)

PERSON(S) WHO PREPARED THIS DESCRIPTION: Alice Merner Agogino November 12, 2009.

ABBREVIATED TRANSCRIPT TITLE (19 SPACES MAXIMUM): Intro Product Dev
TIE CODE: LECT
GRADING: Letter
SEMESTER OFFERED: Spring
COURSES THAT WILL RESTRICT CREDIT: NONE
INSTRUCTORS: Professor Alice Agogino
DURATION OF COURSE: 15 Weeks
EST. TOTAL NUMBER OF REQUIRED HRS OF STUDENT WORK PER WEEK: 9
IS COURSE REPEATABLE FOR CREDIT? No
CROSSLIST: None