ME360 B1: Product Design

Spring 2013

Instructor and Class Information

Instructor: Peter A. Zink, pzink@bu.edu, (617)358-1631
Office, Hours: 730 Commonwealth, EMA209; Tues & Weds, 1-3; or by appointment.
Class Times, Location: Tuesdays and Thursdays 6-8, GCB 205
GTF: Junyue Li, jyl@bu.edu, (617)909-4539
Office, Hours: 110 Cummington Street, RM 229; TBD
TA: Evan Lane, evanlane@bu.edu
Prerequisites: ME359 - Introduction to CAD and Machine Components;
or ME407 - Computer Aided Design and Manufacture. See instructor for exceptions.
Course Website: `http://learn.bu.edu`
Course Description: This course emphasizes the profitable conversion of product ideas to attractive products needed by customers. Course consists of a series of design projects, of increasing complexity, culminating in the development of an operations plan for product manufacture and delivery. Exercises include both product design and product manufacturing considerations. CAD and FEA software is used to design and analyze products. Resources for the exercises are presented in working studio sessions.

Approximate List of Topics to be Covered / Course Outcomes

As an outcome of completing this course, a student will:

1. Understand the process of product design, and the key steps that are required to turn an idea into a commercial product.
2. Develop skills and experience with:
    - incorporating mathematical and physical modeling into the design process,
    - materials selection and process design for a range of materials and manufacutring methods,
    - production and assembly issues and strategies in modern manufacturing operations,
    - creating an operations plan for a manufactured product that specifies both product and process,
    - leveraging CAD systems to aid in engineering design,
    - working confidently and productively in a team environment,
    - producing well-organized and clearly written engineering reports.

Textbooks

No text will be assigned. Most of the course material that will be presented and discussed in class is drawn from the following two textbooks:

- *Engineering Design: A Project Based Introduction*, Clive L. Dym; Patrick Little; Elizabeth J. Orwin; R. Erik Spjut, 3rd ed., 2008, ISBN 9780470225967
- *Materials and design: the art and science of material selection in product design.*, Ashby, M. F., and Kara Johnson. Butterworth-Heinemann, 2010.

Below are a few that you might also find interesting or helpful.

- *Product Design*, Otto and Wood, Pearson, 2001.
- *Engineering Design*, Deiter, G. and Schmidt, L., McGraw-Hill, 2008.
- *Machines and Mechanisms*, David H. Myszka, Prentice Hall, 1999.
- *Design Secrets: Products*, Haller, L. and Cullen, C. D., Rockport Publishers, Inc., 2004.
- *Engineering Drawing and Design*, Jensen, C. , Helsel, J. D. and Short, D. R., (7th Edition), McGraw-Hill, 2008.

Assignments, Notebook, Quizzes and Presentations:

Assignment Topics & Grading: There will be several assignments, some short, and one long. In addition there will be two exams [10% each], plus a sketch notebook [10%]. Below are short descriptions of the assignments (weights subject to change).

1. Rapid prototyping project (widget with a mechanical elements): [40%]
    - Perform initial company research, gather requirements, initial design
    - Refine requirements, translate to functional, sketch concept ideas, morph charts, pugh, etc.
    - CAD, tolerance analysis, physics, modeling, FEA Present design to class
    - Refine design, produce measured 2D drawings, BOM, marketing strategy
    - Perform rapid prototyping of parts, perform post processing and assembly, finishing, send to company
    - Receive feedback and incorporate into improved design and manufacturing plan (processes, materials selection, costs, market analysis, product success testing and analysis, etc.)
    - Final report to company with analysis, rendred 3D images of final product, and presentation to the class
2. Jumping Bot Design Report [10%]
3. Manufacturing process presentations (will occur throughout semester one per week) [10%]
4. Attendance, daily presentations, homework [10%]

Sketch Notebook: The purpose of the notebook is to help focus on design and redesign issues. In particular, students should maintain sketches of good and bad designs, with appropriate explanations, plus assignments in class. Notebooks will be collected and 'graded', but the grade not permanently recorded (around midterm time).

Quizzes and Exams: Exams be given roughly at the midway point and near end of the semester. Quizzes will be given periodically at the beginning of class. Both will be based on:

1. lectures,
2. discussion from articles given out in class, and other web-based media (TED talks, etc.)
3. presentations on products that each student will make during the semester

Daily Presentations: The format will be explained in more detail in class. Students bring in some *thing* that they find interesting and exciting, and describe:

1. the virtues of the product (usually the easy part),
2. where the product could still be improved, and
3. basic data on the cost and manufacturing aspects of the product.

Ideas for improvement will be solicited from the rest of the class after each presentation. The class will vote to choose the best$^{\psi}$ two ideas, and the students with the best ideas each day will each receive a 'point'. At the end of the semester, the two students with the most points each get their lowest quiz grade changed to a 100%.

$^{\psi}$ (we will attempt to define 'best' as we progress through the semester)

Class Policies

- Assignments are due *at the beginning of class* on the due date. Late work will be reduced by a factor of 50% of the original possible score per day it is late.
- It is your responsibility to check with the instructor, GTF or TA to make sure that all quizzes and assignments have been recorded correctly, and that you are not missing any points on the grade sheet on blackboard. After two weeks from the time the assignment is returned there will be no change in grades.
- Except in cases of extreme emergency, making up of missed exams/quizzes will be permitted only with prior approval BEFORE the regularly scheduled date/time.
- Students must follow the BU Academic Conduct Code, which can be found at: `http://www.bu.edu/academics/files/2011/08/AcademicConductCode.pdf`. Any violation of this conduct code will be reported to the College of Engineering Academic Conduct Committee.