

ME360: Product Design, Spring 2015

Instructors:

A1,C1: Dr. Enrique Gutierrez-Wing, esgw@bu.edu, (617) 358-1137, EMA 202c
Office hours (by appointment): Tue,Thu 12:00-14:00, Fri 9:00-13:00

B1,D1: Prof. Peter Zink, pzink@bu.edu, (617) 358-1631

Class Times: (A1) Tue,Thu 8:00-10:00,
(B1) Tue,Thu 16:00-18:00,
(C1) Mon, Wed 12:00-14:00,
(D1) Tue,Thu 10:00-12:00

Class Location: EPIC Design Studio, 750 Commonwealth Avenue

TAs & Contact Info: (A1) Aidan Corrigan, amhc@bu.edu
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(C1) Megan Hollander, meganjh@bu.edu
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Prerequisites: ME359 - Introduction to CAD and Machine Components,
or ME407 - Computer Aided Design and Manufacture.

CourseWebsite: <http://learn.bu.edu>

Course Description

This is a project-based course aimed at developing skills for the design of engineering products. The emphasis of the course is on the use of analytical and technical skills for product design. Lectures and discussions will provide the elements to meet the challenges encountered by the student at each design stage. CAE Tutorials will be used to simulate the static, kinematic, dynamic and heat transfer behavior of engineering systems using engineering software, in order to support and improve designs. In the final project students will work in teams to develop a real product for an external customer.

Learning Objectives

By the completion of this course, the student will:

- Analyze an adverse practical scenario and identify the problem(s) causing it.
- Identify the stages of a product design process: observation and problem definition, preliminary design, engineering analysis, detailed design, prototyping and testing.
- Work as part of a team through a structured design process.
- Apply engineering principles to guide her/his design decisions with respect to: statics, kinematics, dynamics and heat transfer issues, material selection, manufacturing processes and product usability.
- Build and test prototypes to assess the appropriateness of a proposed design.
- Interpret test data and use it to validate, improve or discard a proposed design.

- Communicate with a technical audience or a potential customer at the different stages of the design process through: design briefs, project proposals, sketches, engineering drawings, technical reports and group presentations.

Textbook

The Materials Selection sessions will be based on the following book, which can be accessed free of charge through the BU e-brary:

Materials Selection in Mechanical Design

Author: Ashby, Michael

Publisher: Butterworth-Heinemann

Date Published: 01/2005

Reading materials and videos will be provided through the course Blackboard portal.

Grading

- 1) Class activities and attendance [35%] includes CAE tutorials, design exercises, product presentations and quizzes.
- 2) Assignments [35%] based on homework, assigned reading materials, course sketchbook and practical tasks outside the classroom.

This include some or all of the elements below:

- Perform initial customer research, gather requirements, conceptual design.
- Refine requirements, translate to functional, sketch concept ideas and formalize process communication.
- CAD, tolerance analysis, physics, modeling, FEA.
- Refine design, produce measured 2D drawings, bill of materials.
- Create and test prototypes and models.
- Incorporate feedback into design, develop manufacturing plan (processes, materials, costs, product success testing.)
- Final report with analysis, test results and presentation.

- 3) Design Project [30%] will consist of the development of a product for an industrial partner.

Rules

- 1) No food or drink (except water) in the EPIC studio.
- 2) No use of phones or laptops in class.

Course schedule, Sections A1, B1 and D1

Unit 1: Design process

Unit 2: Get it right

Unit 3: Make it right

Unit 4: User centered design

Unit 5: What's next?

SESSION	DATE	TOPIC
1	20-Jan	Introduction to course
2	22-Jan	The design process
3	27-Jan	User requirements, problem definition, design specifications, functions
4	29-Jan	Concept generation, Morph chart, concept selection
5	3-Feb	Simple design project
6	5-Feb	Good design
7	10-Feb	Engineering simulation, statics, cards exercise
8	12-Feb	Engineering simulation, dynamics
9	19-Feb	Engineering simulation, heat transfer
10	24-Feb	Engineering simulation, mechanisms, DOFs
11	26-Feb	Materials selection I
12	3-Mar	Materials selection II, review
13	5-Mar	Midterm quiz
14	17-Mar	Design for manufacture and assembly
15	19-Mar	Cost analysis
16	24-Mar	Prototyping and testing I
17	26-Mar	Prototyping and testing II
18	31-Mar	Project presentations I
19	2-Apr	Project presentations II
20	7-Apr	User centered design: wallet exercise
21	9-Apr	Aesthetics and ergonomics
22	14-Apr	Emotional design, affordances
23	16-Apr	Product to market
24	21-Apr	Sustainable design and product lifecycle
25	23-Apr	Review
26	28-Apr	Final quiz
27	30-Apr	Course evaluations

Course schedule, Section C1

Unit 1: Design process

Unit 2: Get it right

Unit 3: Make it right

Unit 4: User centered design

Unit 5: What's next?

SESSION	DATE	TOPIC
1	21-Jan	Introduction to course
2	26-Jan	The design process
3	28-Jan	User requirements and problem definition, functions
4	2-Feb	Morph chart, concept selection
5	4-Feb	Simple design project
6	9-Feb	Good design
7	11-Feb	Calculation, statics, cards exercise
8	17-Feb	Calculation, dynamics
9	18-Feb	Calculation, heat transfer
10	23-Feb	Calculation, mechanisms, DOFs
11	25-Feb	Materials selection
12	2-Mar	Materials selection
13	4-Mar	Midterm exam
14	16-Mar	Design for manufacture and assembly
15	18-Mar	Cost analysis
16	23-Mar	Prototyping and testing
17	25-Mar	Prototyping and testing
18	30-Mar	Project presentations
19	1-Apr	Project presentations
20	6-Apr	User centered design: wallet exercise
21	8-Apr	Aesthetics and ergonomics
22	13-Apr	Emotional design, affordances
23	15-Apr	Sustainable design and product lifecycle
24	22-Apr	Quiz (Program quiz review on Friday 04/24?)
25	29-Apr	Course evaluations