

**Department of Industrial Engineering & Management**  
**Faculty of Engineering and Architecture**  
**American University of Beirut**  
**ENMG 663: Product Design and Development**  
**Spring 2016-2017, 5:30-8:00 PM Tuesdays**

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### **Course Description**

Marketing research, engineering design, and entrepreneurship are usually taught as separate topics in separate courses with minimal overlap. However, the need for a new breed of engineers, making sound technical decisions balanced by business considerations, requires the integration and fusion of these three streams into a single course providing engineers with a systems perspective. Developing a product without understanding customer needs or how to bring it to market can be a futile engineering exercise. Alternatively, launching a company without an effective product development process is often disastrous. This course provides students with a holistic perspective for the development of complex engineered systems/products, including design, analysis and management. Topics covered include marketing research, integrated system/subsystem/component design, production planning, manufacturing strategy, supply chain management, innovation, and entrepreneurship. *Prerequisites:* Senior or graduate standing in FEA.

### **Course instructor**

Prof. Ali Yassine, 311 Bechtel. Tel. 3494, [ay11@aub.edu.lb](mailto:ay11@aub.edu.lb)  
Office Hours: 3:00 pm - 4:00 pm Tues. & Thur., or by appointment.

### **Texts**

*Required:* Ulrich, K. & S. D. Eppinger, *Product Design & Development*, 5<sup>th</sup> or 6<sup>th</sup> Edition, Irwin/McGraw-Hill, 2012 or 2016.

*Optional:* Cook, Harry, *Design for Six Sigma as Strategic Experimentation*, ASQ, Quality Press, Milwaukee, 2005.

### **Student learning outcomes**

- The student will be able to explain the product development process as it applies to a broad range of firms that develop and/or use technology as a core element in their value propositions.
- The student will be able to identify / solicit customer needs as related to product development.
- The student will be able to convert customer needs to engineering specifications and detailed product design.
- The student will learn and be able to use various quantitative tools, methods, and procedures for the development of new world-class products.
- The student will be able to explain the importance of intellectual property and product development economics.
- The student will have a practical understanding of the product innovation and management process having applied their knowledge in a group project.

### **Student evaluation**

- **Homework** assignments are 15% of the grade.
- **Case study** presentation is 10% of the grade.
- **Group Project (40%)**
  - Midterm project report is 10% of the grade.
  - Mid-term project presentation is 5% of the grade.
  - Final project report is 15% of the grade.
  - Final project presentation is 15% of the grade.
- **Final exam** (closed book and notes) is 35% of the grade.

## Case Study

The class will be divided into small (i.e. 2-3) student teams. Each team will be assigned a case study. The team is responsible for preparing a 15 minutes presentation on the assigned case study.

## Group Project

Each team of students (2-3 students) will work on the design and development, including market research and manufacturing planning, for improving an existing simple product (examples include coffee machines, coffee mugs, office staplers, tape dispensers, kitchen trash baskets, etc.). Deliverables include two reports, two presentations, and a final prototype. More information will be discussed in class.

## Attendance

A student is allowed to miss (with a legitimate excuse) up to THREE lectures only. Each additional absence will result in reducing the student's final grade by 3 points.

## TENTATIVE DETAILED COURSE SCHEDULE --- Topics to be covered

Wk	Date	Topic	Reading Assignment
1	Jan. 24	Introduction: Systems & Entrepreneurial Engineering Introduction: Product design & development <b>Deep Dive Video</b>	U&E Chps 2-3
2	Jan. 31	Demand & Pricing Theory <b>Team formation and selection of project idea</b>	Cook Chps 2-3
3	Feb. 7	Marketing Research - Conjoint Analysis & DVM	Cook Chps 2-3
4	Feb. 14	Customer Needs Analysis Engineering Specifications- QFD Method	U&E 4 U&E 5, Hauser paper
5	Feb. 21	Concept Generation & Selection	U&E 6-7
6	Feb. 28	Concept Testing & Prototyping	U&E 8, 12
7	Mar. 7	Product Architecture & Platform Design Design For Manufacturing & Assembly (DFMA)	Ulrich paper, Stone paper U&E 11, Ashby paper
8	Mar. 14	<b>Midterm Presentations --- Midterm project report due</b> Project progress review & consulting	
9	Mar. 21	Robust Design Failure Mode and Effect Analysis (FMEA)	U&E 13, Taguchi paper Kmenta & Ishii paper
10	Mar. 28	Economics of Product Development	U&E 15, Handout
11	Apr. 4	Managing Complex Development Projects	Browning paper
12	Apr. 11	Math-based Models for Managing PD	Krishnan paper Smith paper
13	Apr. 18	<b>Case study presentations</b>	
14	Apr. 25	<b>Final project presentations --</b> Written report due Wrap up	
15	May 2	<b>FINAL EXAM</b>	