

MAE 156B (4 units)  
Fundamental Principles of Mechanical Design II

**Class/Laboratory Schedule:** four hours of lecture, three hours of lab, five hours outside preparation. 12 hours/week total

**Course Coordinator(s):** Nathan Delson

**Textbooks/Materials:**

1. Course pack from soft reserves

**Catalog Description:** Fundamental principles of mechanical design and the design process. Culmination of a team design project initiated in MAE 156A which results in a working prototype designed for a real engineering application.

**Prerequisites:** Completion of 156A in the immediately preceding quarter and grades of C- or better in MAE 156A, 101C, and 150.

- Required Course
- Technical Elective Course
- Other: \_\_\_\_\_

**Performance Criteria:**

Objective 1 (Open-Ended Design Problems)

1.1 Students will be given open-ended design problems which they will tackle in teams. Also students will answer exam questions and perform homework assignments that apply design methods to specific design problems.

Objective 2 (Design Project Management and Teamwork)

2.1 Students will be responsible for setting team deadlines, schedule, and budget allocation. Student teams will collectively make design decisions.

2.2 Peer review will be used for providing feedback regarding the contribution of individual team members.

Objective 3 (Communication)

3.1 Oral presentations will be made of the team progress, and of the final design. Video tapes of these presentations will be made available for self assessment.

3.2 Students will write a final report of their design project, and post components of the report on a web page, which can be used by the students as part of their portfolio.

Objective 4 (Application of Engineering Science)

4.1 Analysis will be used in the preliminary design stage to evaluate feasibility of various design concepts.

4.2 Analysis will be used in the detail design stage to select and design components.

4.3 The performance of the device will be evaluated, and engineering analysis will be used for redesign, optimization, and correlation of theory with practice.

#### Objective 5 (Engineering Ethics)

5.1 Team reports will include documentation of safety concerns, performance limitations, and provide credit to external resources, utilizing reference materials from case studies with ethical components.

### **Course Objectives:**

(Numbers in parentheses refer to the specific MAE Program Outcomes)

Objective 1: To teach students how to tackle open-ended design problems (3c).

Objective 2: To train students to effectively work in teams, manage project priorities, and meet project deadlines (3c, 4d).

Objective 3: To train students in graphical, written, and oral communication (7g).

Objective 4: To provide students with the experience of applying engineering science theory to real world design problems (1a,5e,9i).

Objective 5: Engineering ethics relevant to the design projects will be introduced through case studies with an ethical component (6f).

### **Course Topics:**

1. Engineering Design Process
2. Design Problem Identification
3. Concept Generation and Creativity
4. Concept Selection
5. Project Management: Scheduling, Risk Reduction Strategies, and Budgeting
6. Teamwork
7. Information Gathering (Lit. Searching and Vendor Contact)
8. Analysis of Mechanical Components and System Level Performance
9. Component Selection and Procurement
10. Machine Shop Fabrication Techniques
11. Application of Engineering Science in areas relevant to design topic (e.g. material strength, dynamics, fluid mechanics, heat transfer, control, and thermodynamics)
12. Detail Design Techniques
13. Application of Computer-Aided-Design and Computer-Aided-Analysis
14. Oral, Written, and Graphical Communication

**Prepared by:** Nathan Delson, April 2000

**Revised:** June 2006

**Reviewed TWG:** June 2010; July 2010

**Reviewed:** TWG, August 2012