

# MECH 420 Mechanical Design

Fall 2010-11

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Office hours: Tuesday 8:00 – 10:00 a.m. RGB 410

## **Class Meetings**

Monday & Wednesday 11:00 – 12:20 pm, Bechtel Bldg. Wing A - 407

## **Textbook**

*Shigley's Mechanical Design*, by R.G. Budynas, and J. Keith Nisbett 8<sup>th</sup> edition, McGraw Hill, 2008.

## **Prerequisite**

MECH 320: Mechanics of Materials

MECH 340: Engineering Materials

## **Description**

A course that focuses on the mechanical design and selection of machine components such as screws, welds, joints; design of shafts and axles, selection of bearings; lubrication, design of friction elements for both static and fatigue conditions. Applications are covered through a number of case studies in addition to a team project.

## **Goals**

MECH 420 is designed to prepare students to determine the structural integrity of common machine components such as bolted joints, springs, gears and shafts, and to apply this knowledge within the context of a design problem.

## **Material and Objectives**

Topics covered in this course include:

1. Static failure theories (Chapter 5)
2. Fatigue failure theories (Chapter 6)
3. Shafts and shaft components (Chapter 7)
4. Screws, fasteners, and design of nonpermanent joints (Chapter 8)
5. Welding, bonding, and the design of permanent joints (Chapter 9)
6. Mechanical springs (Chapter 10)
7. Rolling-contact bearings (Chapter 11)
8. Design of gears in general (Chapter 13)

The above list is only provided as a guideline; it may vary depending on the class needs.

## **Grading Rubric**

Students will be graded according to the following scheme.

<b>Entry</b>	<b>Weight</b>	<b>Note</b>
Drop Quizzes & Interaction	10%	First 15 minutes
Midterm	25%	Textbook only
Final	35%	Textbook only
Project	30%	Detailed later

## **Resources for the Course**

Resources for the course include:

- MOODLE: Includes a forum which acts like a center of focus for the course. Any concerns you might have or ideas you want the entire class to hear you can post on the forum. Furthermore, anything I want to relay to you such as assignments, solutions, homework will be posted on Moodle.
- The text and references for the course.
- The instructor; class notes and handouts; your teammates.
- The library; the machine shop; products catalogues; the web.

## **Course Policy**

### **Class attendance and quizzes**

The class is a place for the teacher and students to interact. Therefore, I design my lectures in such a way to foster interaction. In order for the synergy to work you must bring your books and class lecture notes with you to class and follow during the lecture. Quizzes will be held without notice during the first 15 minutes of class, so please come early to lectures. You will not be given extra time if you are late.

### **Midterm and Final**

For this course you will be required to write a midterm and final exam. You are allowed to use your textbook (and only the textbook) to write these exams. I recommend you practice the assignment problems to get a flavor of typical mechanical design problems.

### **Project**

The final measuring stick for this course is a team-oriented project that involves both the design of a mechanical device and the finite element analysis (tentative) of some of its components. Meetings with each team will be held during the semester to discuss project progress and team needs at appropriate times. You will be expected to write a report about your project. More details of the project will be discussed at a later time.

### **Assignments**

Assignment problems will be assigned in conjunction with lecture topics. Although assignment problems are not graded, you are highly encouraged to do them because the knowledge acquired through the solution of these assignments will prove to be invaluable for the solution of the exams, final, and project.

### **Make-up tests and late homework policy**

NO MAKE UP TEST WILL BE GIVEN. If you miss an exam for a justified cause (with a doctor's report) I will change the weight of the grade accordingly to compensate for your missed exam.

### ABET requirements specific to Mechanical Design

<i>At the end of the course, students will have the:</i>	<i>Correlates to Abet item</i>
Ability to perform static and fatigue analysis of a member or component.	a,
Ability to carryout step by step design and analysis of different mechanical components including shafts, springs, permanent and nonpermanent joints, bearings, and gears.	b3
Ability to make selection of suitable mechanical components from the manufacturer catalogues.	b3
Ability to be able to turn open problem statement into detailed specifications.	b1
Ability to work on teams to carry out design of an entire machine.	a
Ability to have to make proper use of engineering formulae to calculate failure from static and fatigue loads.	a
Ability to have to use computer software tools (Matlab, ProE) to simulate the kinematics and dynamics of their system.	b3
Ability to build their system in shops using know-how gained from previous courses.	b3
Ability to prepare a final comprehensive report as well as deliver a team presentation.	b1