

ME 3035

DESIGN OF MECHANICAL ELEMENTS

Summer Term 2009, Tue/Thurs 05:30p-08:15p

Instructor:	L. Rafael Sanchez, PhD., PE
Office:	NC 3514 B
Phone:	303-556-2361
Office Hours:	4:00 - 5:15 PM, Tue., Thurs.
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DESIGN OF MECHANICAL ELEMENTS

- Definition of Engineering Design:

“The process of applying the various techniques and scientific principles for the purpose of defining a device, a process or a system in sufficient detail to permit its realization” (R.L. Norton)

- The objective of this course is to apply the scientific principles and techniques to the analysis of commonly used elements of machines, such as bolts, bearings, springs, gears, etc.
- The student is expected to specify and integrate the mechanical design elements into a proposed *design project*. Analysis more than synthesis will be stressed. The student is not expected to invent a device. Instead, the general concept for the design project will be provided and to be analyzed to prevent failure, for instance, by loading or deflection.

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Code of Conduct

The students are required to abide by the student code of conduct. Please see link: <http://thunder1.cudenver.edu/studentlife/studentlife/studentcodeofconduct.html>

Instruction Materials

Text: R.C. Juvinall and K.M. Marshek, "Fundamentals of Machine Component Design", 4th edition, John Wiley & Sons. ISBN: 13 978-0-471-66177-1

References: Shigley and Mischke, "Mechanical Engineering Design, McGraw Hill. Eight Edition.

Robert L. Norton, "Machine Design. An Integrated Approach. Prentice Hall,

The instruction materials also include notes prepared by Dr. Sanchez that summarize and focus on the main topics covered. The notes are mostly based on the text, but they are NOT a substitute to the text.

Recording of the class by any medium (audio, video) is prohibited (unless allowed by the instructor).

Homework

Homework will be collected one week after the assignment date. The solution to the homework will be discussed right after being collected. Therefore, **late homework does not** count for credit.

→ It is suggested to work on your homework from Friday to Monday, and to ask questions (if needed) during office hours/class on Tuesday. Given the fast pace of this course, it would be hard to work in the homework one day before due.

→ While it is encouraged to discuss the homework problems with someone else, homework must be an **INDIVIDUAL** effort. The final interpretation of the problems and calculations must be a personal matter. Examples of improper behavior include, (i) looking at homework solutions given in past semesters instead of working on your own, (ii) Two students or more having identical spreadsheets for the calculations of the same problem.

Quizzes

Quizzes may be given at the discretion of the instructor.

Attendance

Students missing classes must catch up with the lectures and the assignments. For unjustified absences, the burden for catching up will be solely on the student. Examples of justified absences are: sicknesses, accidents, work related issues, etc. Examples of unjustified absences are: going away on vacations from work, having to study for another class, etc. **Missing and rescheduling an exam will require hard evidence of a justified absence** (Doctor's visit receipt, for instance) as well as prompt notification to the instructor.

Design Project

In addition to lectures and homework, a design project will be assigned. The design project will be a team effort, with three students making a team. Some of the goals for the design project are i) to apply design principles to the analysis of an engineering problem, ii) to evaluate the student's ability to work by teams, iii) to grade the student's ability to plan, organize and distribute tasks.

Student participation on the design project will be graded according to the fulfillment of the goals above. EACH student must have a thorough understanding of the design concepts worked out by the other students in the team. Therefore, an erroneous approach by one member will also affect the grade of the other team members (although may be in lesser degree), if the errors are accepted and presented by the team.

The project focuses on the ANALYSIS of a mechanical design. The analysis typically includes previous knowledge from subjects such as statics, dynamics, strength of materials, etc., as well as material presented here. Some topics, such as springs, and gears, will be covered in the last weeks. However, this should not slow down your project, provided that by then you are ready with the rest of the work.

The design project is intended to help the students to prepare for ME 4035, Senior Mechanical Design I.

There are two required meetings with the instructor. A student (or team) missing to meet will lose five (5/100) points per meeting.

The design project deadlines are:

1. Gantt diagram due 06/18/09
2. First meeting with instructor by 06/26/09
3. Progress report due 07/03/09
4. Second meeting with instructor by 07/22/09
5. Final report must be submitted NO LATER THAN Tue., 07/28/09

Grading

Midterm Exam:	30 %	$90 \leq A \leq 100$
Final Exam:	40 %	$80 \leq B \leq 89$
Design Project:	15 %	$70 \leq C \leq 79$
Homework:	15 %	$60 \leq D \leq 69$

Quizzes, if given, will count as homework

SYLLABUS

ME 3035 DESIGN OF MECHANICAL ELEMENTS Summer 2009

DATE	SUBJECT	READING ASSIGNMENT
06/09	Introduction, Review, FBD	Ch 1, 2
06/11-06/16	Review of Stress/Strain, Mohr's circle, Contact Stress	Ch 4 - 5
06/18	Mechanical Properties of Materials Failure Theories	Ch 3 Ch 6
06/23- 06/25	Variable Loading, Fatigue	Ch 8
06/30	Review of Deflection, Stiffness and column loading Curved beams	Ch 5
07/02	MIDTERM EXAM	
07/02	Power Screws	Ch10
07/07-09	Bolted Joints Eccentric loads on bolts	Ch 10 Ch 10
07/14	Ball and Roller Bearings	Ch 14
07/16	Springs, Spring Strength	Ch 12
07/21,23	Gearing, Stresses in Gears	Ch 15
07/28	Brakes, Clutches	Ch 18
07/30	FINAL EXAM	