

Issued: 8/24/12

COURSE OUTLINE

Course Prefix and Number	SYEN 4399
Course Title	Elements of Mechanical Design
Credit	3 Hours
Semester and Year	Fall 2012
Instructor	Dr. Andrew Wright
Class Time	section 02, MW 3:05-4:20 (lecture), F 9:00-10:50 (lab) section 03, MW 3:05-4:20 (lecture), F 1:00-2:50 (lab)
Class Location	EIT 224 (lecture), ETAS 003 (lab)
Office Location	EIT 522
Office Hours	M,R, 9-10
Telephone	569-8071
Email	abwright@ualr.edu
Class Notes Site:	http://calliope.ualr.edu -> Courses -> Elements of Mechanical Design

Prerequisite: ETME 2333. Advanced CAD or SYEN4200. IS. Solid Modeling and Design or consent of the instructor; SYEN 4376. Mechanics of Materials, SYEN 3370. Statics and Dynamics

Course Description:

Introduction to the design, integration and best practices for using mechanical elements such as springs, gears, cams and mechanisms, clutches and brakes, and bearings. Methods of joining, such as fasteners, welds, press and shrink fits, and shaft coupling will be covered. Performance and failure analysis for components and machines will be covered. Solid modeling of machine assemblies for documentation and basic analysis will be emphasized. A semester long design project in which a mechanical system is designed, fabricated and characterized will serve as the practical application of these concepts.

Learning Objectives:

1. An inventory of the basic mechanical elements used in machines
2. Using solid modeling techniques to facilitate the mechanical design process
3. Learning the connections between design, modeling, and fabrication; how to restrict the design space to available fabrication techniques
4. Have a controlled, first experience in creating a realized design; testing for failure and performance.

Texts, Readings, and Instructional Resources

Required Text: **Robert Mott, Machine Elements in Mechanical Design, Prentice-Hall, 4th ed., 2003.**

ISBN: 0130618853, ISBN-13: 9780130618856

Assignments, Evaluation Procedures, and Grading Policy

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The course requirements consist of:

1. **Homework:** Homework assignments will be given periodically to supplement the reading material and lectures.
2. **Stress Exam:** an in-class written exam based on stress material that was covered in Mechanics of Materials.
3. **Mid-term Exam:** an in-class written exam at the mid-point in the semester.
4. **Final Exam:** an in-class written exam at the examination time.
5. **Final Project:** a group report based on the design undertaken in the class. Credit will be given based on both the report and the machine designed and constructed during the semester.
6. **Scrub School:** The first six weeks of lab will be spent refreshing shop skills by building parts to a drawing and comparing the finished parts against the spec for compliance. When the student has finished his quota of completed parts, he will be cleared to join a design team.
7. **Class Participation:** attendance, participation in discussion, questions on homework, other relevant activities that contribute to the advancement of the class.

XVI. Grading

- | | |
|------------------------|-----------|
| 1. Homework | 10 points |
| 2. Stress Exam | 5 points |
| 3. Mid-term | 25 points |
| 4. Final Exam | 25 points |
| 5. Final Project | 25 points |
| 6. Scrub School | 5 points |
| 7. Class Participation | 5 points |

XVII. Grades (points gained/100 points)

A = 90%

B = 80%

C = 70%

D = 60%

F = below 60%

Attendance will be taken periodically. If a student is absent for four times his/her final grade will be reduced by one letter grade (i.e., from A to B or B to C). Students who do not attend during the first eleven days of class may be administratively dropped from the course.

A student who misses more than six classes or labs will receive a final course grade of an F and may be administratively withdrawn prior to the drop date at the discretion of the instructor.

Tardiness is disruptive, so please be respectful of your peers and instructor and get to class on time. If you are tardy, please come into the room quietly and sit in the nearest available seat to the door.

Cell phones can be disruptive. Please turn off your cell phone (i.e. airplane mode) before class. If you forget and receive a call in class, please immediately disable your ringer/buzzer and terminate the call. Do NOT answer the call and have a conversation as this may be classified as disruptive behavior.

Disruptive Behaviour may result in your being administratively dropped from the class, especially if it is persistent. Persistent disruptive behaviour will also be penalized through the Class Participation grade.

Sickness or Emergency is a legitimate excuse to make up a graded assignment (attendance or exam). However, to guarantee that no late penalties are applied, the student should notify the instructor in advance or provide an independent written excuse (e.g., a doctor's note) after the fact.

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Make up policy: Exams may be made up on the date of the final exam provided that the student notifies the instructor in writing at least two weeks prior to the date of the final exam. There will be an 80% maximum for any exam for which a legitimate excuse was not provided for the absence.

Mid-Term Grades are not required by this course. They may be issued based on student's progress in the course at the mid-point, if it appears that such grades would be useful in assisting in an intervention to improve the student's chance of success in the course.

Late assignments are any homework or lab assignment that is turned in after the official due date. The assignment will receive a 20 point deduction unless excused for some sickness/emergency.

Electronic delivery of assignments will NOT be accepted in lieu of a hard-copy of the assignment. However, in extreme circumstances, the student may delivery his/her assignment electronically by the due date to avoid the late penalty. A hard copy must follow up in a reasonable time (for instance, the time it might take the post office to deliver a hard copy) and the hard copy must be identical in content to the electronic copy. The instructor will dispose of the electronic copy once the hard copy has been accepted.

Modifications to Syllabus may be made to improve delivery of the course content. The instructor will provide an updated syllabus at least one week prior to any changes taking effect and no modifications will be done within two weeks of the final exam.

Students with Disabilities:

Per academic policy 501.2, the following statement must be included in all syllabi (see <http://ualr.edu/policy/index.php/5012/>)

“Students with Disabilities: Your success in this class is important to me, and it is the policy and practice of the University of Arkansas at Little Rock to create inclusive learning environments consistent with federal and state law. If you have a documented disability (or need to have a disability documented), and need an accommodation, please contact me privately as soon as possible, so that we can discuss with the Disability Resource Center (DRC) how to meet your specific needs and the requirements of the course. The DRC offers resources and coordinates reasonable accommodations for students with disabilities. Reasonable accommodations are established through an interactive process among you, your instructor(s) and the DRC. Thus, if you have a disability, please contact me and/or the DRC, at 501-569-3143 (V/TTY) or 501-683-7629 (VP). For more information, please visit the DRC website.”

This statement has not been prepared by the instructor of this course, but is an academic policy, so please excuse the colloquial wording (use of first and second person).

The UALR Student Handbook is available at <http://ualr.edu/deanofstudents/assets/archive/HANDBOOK.pdf>.

CLASS SCHEDULE

SYEN 4317. Elements of Mechanical Design Dr. Andrew B. Wright

Grades Due:

Wk	Date	Lecture Topic	Reading	Hmwk Problems
1	Aug. 27	Introduction to design	Chapters 1, class notes	Read chapters 2, 3, 4; work problems by the date of the Stress Exam.
	Aug. 29	Introduction to design	Chapters 1, class notes	
2	Spt. 3	Labor Day ... no class		
	Spt. 5	Failure Criteria	Chapters 5	
3	Spt. 10	Fasteners STRESS EXAM DUE , Prerequisite exam based on material in chapters 2, 3, 4.	Chapter 18, class notes	Team Selection Starts
	Spt. 12	Fasteners	Chapter 18, class notes	
4	Spt. 17	Machine Frames, Bolted Connections, and Welded Joints	Chapter 20	Team Selection Ends
	Spt. 19	Keys, Couplings, and Seals	Chapter 11, class notes	
5	Spt. 24	Shaft Design	Chapter 12, class notes	
	Spt. 26	Shaft Design	Chapter 12, class notes	
6	Oct. 1	Tolerances and Fits	Chapter 13	Final Design of Bail
	Oct. 3	Rolling Contact Bearings	Chapter 14, class notes	
7	Oct. 8	Rolling Contact Bearings	Chapter 14, class notes	
	Oct. 10	Ratchets and Latching Mechanisms	Notes	
8	Oct. 15	Ratchets and Latching Mechanisms Mid-term grades viewable by students	Notes	Final Design of Latch/Release
	Oct. 17	Ratchets and Latching Mechanisms	Notes	
9	Oct. 22	Motion Control: Clutches and Brakes	Chapter 22	
	Oct. 24	Motion Control: Clutches and Brakes	Chapter 22	
10	Oct. 29	Kinematics of Gears	Chapter 8	Final Design of Clutch
	Oct. 31	Spur Gear Design	Chapter 9	
11	Nov. 5	Spur Gear Design	Chapter 9	
	Nov. 7	Spur Gear Design	Chapter 9	
12	Nov. 12	Belt and Chain Drives	Chapter 7	Final Design of Gear Box
	Nov. 14	Belt and Chain Drives	Chapter 7	
13	Nov. 19	Helical, Bevel, Worm Gears	Chapter 10	
	Nov. 21	Thanksgiving ... No labs this week		
14	Nov. 26	Helical, Bevel, Worm Gears	Chapter 10	
	Nov. 28	Helical, Bevel, Worm Gears	Chapter 10	
15	Dec. 3	Plain Surface Bearings	Chapter 16	
	Dec. 5	Linear Motion Elements	Chapter 17	
16	Dec. 10	Springs Last Day of Classes Dec. 11. Consultation Day	Chapter 19	
17	Dec. 17	1:30-3:30. Final Exam, Final Report Due.		