



Fairfield University
School of Engineering

Syllabus for: Machine Design, ME311

Instructor: Prof. William Dornfeld

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Course Web Page:

<http://www.faculty.fairfield.edu/wdornfeld/ME311/311Resources.html>

Instructor Assistance: One Half Hour before or after every class, or by appointment

Lecture Hours: 6:30 to 9:00 PM Thursdays

Class Requirements:

- 1) Completion of ME308 (Strength of Materials) is a prerequisite for this course.
- 2) Assigned homework will be discussed at the following class session - students will present their solutions at the beginning of the session.
- 3) Oral and written reports will be required for the reverse-engineering projects.

Course Description:

Fundamentals of mechanical engineering design are applied to analyze, design, and/or select components typically used in the designs of complete mechanical systems. Part 1 of the course covers the design process and analysis of stress and deflection. Part 2 includes material properties and loadings (steady state and variable) as they relate to failure prevention. Responsible design (safety factors and ethics) will be addressed. Part 3 covers the procedures for design and analysis of common machine elements such as columns, cylinders, fasteners, and springs. In team “reverse engineering” (R-E) projects, students will apply the course topics to real hardware. Computer techniques including MSEXcel will be emphasized.

Course Learning Goals	Bloom	ABET	Expected Outcomes
1. Students will learn to analyze the stress and strain aspects of machine components.	4	2	<ol style="list-style-type: none"> a. Ability to correctly analyze stress and deflection of loaded structures. b. Ability to select correct material strength properties.
2. Students will learn how to determine failure and fatigue in mechanical components and determine safety factors.	4	1, 5	<ol style="list-style-type: none"> a. Ability to understand and apply safety margins. b. Demonstrate ability in reverse engineering project.
3. Students will learn to support hand calculations by applying computer techniques to design analysis and to use the Web to obtain design information.	4	1, 2	<ol style="list-style-type: none"> a. Use computing tools to solve homework problems and in reverse engineering project.
4. Students will produce oral and written presentations and demonstrate functioning in team situations.	5	4, 7	<ol style="list-style-type: none"> a. Generate professional quality R-E project report and oral presentation. b. Demonstrate teamwork in R-E projects.

Bloom’s Taxonomy levels: 4 = Analysis; 5 = Synthesis.

For ABET student outcomes, see http://www.abet.org/wp-content/uploads/2018/03/C3_C5_mapping_SEC_1-13-2018.pdf

Schedule:

	Session	Topics	Reading (<u>Before</u> Class!)
1	3-Sep-20	Introduction - Fundamentals of the Design Process, Review of Stress, Units, Mohr's Circle	Chap. 1; Chap. 2 But Not 2.8.3, 2.11, & 2.17-2.18
2	10-Sep-20	Materials - Strength & Other Properties, Stresses & Strains, Power Transmission	Chap. 3 But Skim 3.3 & 3.7 - 3.8; Chap. 4
3	17-Sep-20	Review of Deflection, Strain Energy Methods	Chap. 5 But Not 5.3 & Skim 5.5-5.6.
4	24-Sep-20	Stress Concentration; Steady Loading - Failure Theories	Chap. 6.1-6.2, 6.6-6.8
5	1-Oct-20	Variable Loading – Fully Reversing Fatigue; Modifying Factors; S-N Curves	Chap. 7.1-7.9
6	8-Oct-20	Review; In-Class Exam	
7	15-Oct-20	Fluctuating Fatigue; Impact	7.10 -7.10.1 (Except Complete Modified Goodman Diag.), 7.13-7.14
8	22-Oct-20	Review; Columns & Buckling	Chap. 9
9	29-Oct-20	Cylinders & Press Fits; Disks	Chap. 10 (Skim 10.2)
10	5-Nov-20	2nd In-Class Exam	
11	12-Nov-20	Power Screws; Bolted Joints	Chap. 16.1-16.4, Skim 16.5
12	19-Nov-20	Mechanical Springs – Stress & Deflection	Chap. 17.1-17.5, Skim 17.6-17.9
13	26-Nov-20	NO CLASS - Thanksgiving Break	
14	3-Dec-20	Review; In-Class Exam	
15	10-Dec-20	Reverse Engineering Presentations; In-Class Mini-Final	Written Project Reports Due

Textbook: *Fundamentals of Machine Elements*, 3rd Edition, Hamrock, Jacobson, & Schmid, CRC Press, ISBN 9781439891322. Do NOT get any other edition. Only paper version may be used during exams – no e-books.

Attendance Policy: All students are expected to attend every scheduled class session and to turn in homework **each week it is due**. Students are responsible to acquire notes and homework assignments from classmates in case of absence, and to notify the professor.

The course will be graded as follows:

Midterm Exams (2)	40%
Final Exam	30%
Rev. Engr. Reports (Oral & Written)	20%
Homework / Participation / Quizzes / Professionalism	10%

1. All students should review the Academic Honesty section of the Undergraduate Course Catalog to understand what conduct to avoid and what bad things happen when that conduct is not avoided.

2. Students who have arranged for special accommodations through the Office of Accessibility should present a letter from that Office confirming their need for special accommodations.

The seven characteristics of highly successful ME311 students:

1. Complete textbook readings before class.
2. Complete all homework assignments.
3. Ask questions when something isn't clear (for class, homework, & exams).
4. Draw good sketches, show all steps, apply sanity checks to their work, and keep track of units.
5. Search the Web for tutorials and component information.
6. Be a team player in the Reverse Engineering projects and in-class activities.
7. Apply computer techniques to class material, but not instead of hand calculations.