MECH 3334: Mechanical Design

Textbook: Mechanical Engineering Design: Shigley’s 10th ed.
by Richard G. Budynas and J. Keith Nisbett

Class/Lab Meeting: TR, 3:00 pm to 4:20 pm

Class Room: Quinn Hall 212

Prerequisite: MECH 2322 - Mechanics of Materials

Instructor: Dr. Calvin M. Stewart, Ph.D., cmstewart@utep.edu
Phone: 915-747-6179
Office Hours: TR, 9:00-10:00am
Office: ENG A117

Course Objectives

At the end of the course, students will learn how to design, build, and test a mechanical design based on the principles of mechanical engineering. Specifically, students will be able to:

1. Identify the appropriate material and safety factors for a mechanical design;
2. Perform Stress Analysis under axial, torsion, bending, transverse, and multiaxial loading;
3. Identify and apply the appropriate Static Failure theory for a ductile or brittle material;
4. Identify and apply the appropriate Dynamic Failure theory for a ductile or brittle material;
5. Apply Stress Analysis, Static Failure, and Dynamic Failure theories to mechanical design problems;

Topics Covered

1. Introduction (Chapter 1)
2. Materials (Chapter 2)
3. Load and stress analysis (Chapter 3)
4. Failures resulting from static loading (Chapter 5)
5. Failures resulting from variable loading (Chapter 6)
6. Screws, fasteners, and the design of nonpermanent joints (Chapter 8)
7. Welding, bonding, and the design of permanent joints (Chapter 9)
Grades

Your final grade for this course will be based on the following activities:

<table>
<thead>
<tr>
<th>Assignments</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Homework/Quizzes</td>
<td>10%</td>
</tr>
<tr>
<td>Projects (1)</td>
<td>30%</td>
</tr>
<tr>
<td>Midterm Exams (3)</td>
<td>60%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>100%</strong></td>
</tr>
</tbody>
</table>

Late and incomplete homework will not be accepted.

**Grade Scale**

<table>
<thead>
<tr>
<th>Percentage</th>
<th>Grade</th>
</tr>
</thead>
<tbody>
<tr>
<td>100-90%</td>
<td>A</td>
</tr>
<tr>
<td>89-80%</td>
<td>B</td>
</tr>
<tr>
<td>79-70%</td>
<td>C</td>
</tr>
<tr>
<td>69-60%</td>
<td>D</td>
</tr>
<tr>
<td>&lt;60%</td>
<td>F</td>
</tr>
</tbody>
</table>

The instructor reserves the right to revise this grading plan.

Calculators

The following will be the only calculators allowed during exams:
- Casio: All fx-115 models. Any Casio calculator must contain fx-115 in its model name.
- Hewlett Packard: The HP 33s and HP 35s models, but no others.
- Texas Instruments: All TI-30X and TI-36X models. Any Texas Instruments calculator must contain either TI-30X or TI-36X in its model name.

These are the same calculators that are currently being allowed in the Fundamental of Engineering (FE) and Professional Engineering (PE) exams (http://ncees.org/exams/calculator-policy/).

Attendance

Exams and quizzes are given at the beginning of the classes. No additional time will be allowed for late attendees. If a student misses ANY assignment due to university related duty, serious illness, or family emergency a makeup assignment may be arranged. The instructor MUST be notified PRIOR to the absence. Written proof must be provide along with contact information for verification. A message may be left with the Instructor by email.

Cheating

All-scholastic activities must be completed individually (unless noted in writing). Students are expected to be above reproach in all-scholastic activities. Students who engage in scholastic dishonesty are subject to disciplinary penalties, including the possibility of failure in the course and dismissal from the university. Scholastic dishonesty includes but is not limited to cheating, plagiarism, collusion, the submission for credit of any work or materials that are attributable in
whole or in part to another person, taking an examination for another person, any act designed to
give unfair advantage to a student, or the attempt to commit such acts (Regents Rules and
Regulations, Part One, Chapter VI, Section 3, Subsection 3.2, Subdivision 3.22). Scholastic
dishonesty harms the individual, all students, and the integrity of the university; policies on
scholastic dishonesty will be strictly enforced.

If there is evidence that you have cheated, the evidence will be submitted to the Office of Student
Conduct and Conflict Resolution with the recommendation of Expulsion from the University. To
preserve confidentiality, DO NOT attempt to communicate with the Instructor if you have been
contacted by OSCCR.

Exams

Exam dates are listed in the course schedule; however, dates are subject to change. All exams will be
closed book. Make-up exams will be given as oral exams. You will be allowed a one page, single
sided formula sheet. No solution to a problem may be listed upon it. It must be stapled to your exam
when you turn it in. Electronic devices (e.g. laptops, tablets, cell phones, etc.) are not permitted.
Hoodies must be down. Hats must be turned backwards. To receive full credit on the exam, the
exam problem solution must conform to the following structure:

1. Knowns/Unknowns: List the given parameters. List the parameters you must find.
2. Free Body Diagram: Draw a neat FBD that includes arrows with arrowheads, dimensions,
   and all the parameters needed to solve the problem. (When appropriate).
3. Assumptions: List any assumptions made, and the equations you will need.
4. Steps: Give necessary details so that people can easily follow your calculations. Answers
   without the steps will not be accepted.
5. Equations: label each equation with a number (1), (2), (3), etc.
6. Answer: Include units and box your final answers.
7. Neatness: Disorganized, incomplete, and/or copied work will be penalized.

Course Drop

It is the student’s responsibility to officially drop a course that s/he no longer wishes to take before
the course drop deadline. Failure to do so WILL result in a grade of “F” on the student’s academic
record. If you fall behind, do not give up and quit attending without dropping the course first.
Athletes must receive permission from the Miner Athletic Advising Center before dropping a course.
International students with F or J visas must receive permission from the Office of International
Programs before dropping a course.

Study Guide

Read the text to be discussed prior to the scheduled class and review the subject thoroughly after the
class. Read the textbook carefully. Work on all examples given in the text and solve as many
unassigned problems as you can. Expect to spend 10 to 15 after-class hours each week on the
subject. Establish a good studying habit and you will do very well in the class.
Disability and Accommodations
If you have a disability and need classroom accommodations, please contact The Center for
Accommodations and Support Services (CASS) at 747-5148, or by email to cass@utep.edu, or visit
their office located in UTEP Union East, Room 106. For additional information, please visit the
CASS website at www.sa.utep.edu/cass.

Class Schedule

<table>
<thead>
<tr>
<th>Week</th>
<th>Topic</th>
<th>Reading and Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>1/17</td>
<td>Introduction and Materials</td>
<td>Chapter 1 and 2</td>
</tr>
<tr>
<td>1/24</td>
<td>Stress Analysis</td>
<td>Chapter 3</td>
</tr>
<tr>
<td>1/31</td>
<td>Stress Analysis</td>
<td>Chapter 3</td>
</tr>
<tr>
<td>2/7</td>
<td>Stress Analysis</td>
<td>Chapter 3</td>
</tr>
<tr>
<td>2/14</td>
<td><strong>Exam 1</strong></td>
<td></td>
</tr>
<tr>
<td>2/21</td>
<td>Static Failure</td>
<td>Chapter 5</td>
</tr>
<tr>
<td>2/28</td>
<td>Static Failure</td>
<td>Chapter 5</td>
</tr>
<tr>
<td>3/7</td>
<td><strong>Exam 2</strong></td>
<td></td>
</tr>
<tr>
<td>3/13-17</td>
<td><strong>Spring Break (No Class)</strong></td>
<td></td>
</tr>
<tr>
<td>3/21</td>
<td>Fatigue Failure</td>
<td>Chapter 6</td>
</tr>
<tr>
<td>3/28</td>
<td>Fatigue Failure</td>
<td>Chapter 6</td>
</tr>
<tr>
<td>4/4</td>
<td>Fatigue Failure</td>
<td>Chapter 6</td>
</tr>
<tr>
<td>4/11</td>
<td><strong>Exam 3</strong></td>
<td></td>
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<tr>
<td>4/18</td>
<td>Design of NonPermanent Joints</td>
<td>Chapter 8</td>
</tr>
<tr>
<td>4/25</td>
<td>Design of Permanent Joints</td>
<td>Chapter 9</td>
</tr>
<tr>
<td>5/2</td>
<td><strong>Project Due</strong></td>
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</tbody>
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The above schedule, policies, and assignments in this course are subject to change in the event
of extenuating circumstances or by mutual agreement between the instructor and the students.