MECH 2322

Mechanics of Materials

Course Syllabus

Instructors: Yirong Lin, Ph.D.

Locations: LART 323

Time: TRs 12:00 pm– 1:20 pm

Offices: Engineering A 111, or MS Team

Office Hours: TRs 3:00 pm to 4:00 pm, In-person or MS Team

Emails: ylin3@utep.edu

Textbook: "Mechanics of Materials", by Russell C. Hibbeler
Prerequisites: MECH 1321 or CE 23 Statics with a C or better

Overview

Mechanics of materials, a.k.a. strength of materials, is one of the fundamental classes in mechanical engineering curriculums. The overall goal of this course is to develop an understanding of the mechanical behavior of structures under different types of loading conditions. The main focus is to mathematically model and determine 1) the stresses and 2) the deformations in a deformable body under load. A significant percentage of mechanical engineers will work primarily on component and system designs, utilizing the concepts learned in this course. The ability to determine the size and shape of parts to ensure that the stresses and/or deformations do not approach or exceed the load-carrying capacity of the material is a very important aspect for a design engineer. Therefore, the ability to calculate stresses, strains, and deformations in simple structural elements is essential and will be learned in this course.

The following load types will be learned: axial, shear, torsion, flexure (beam), and simple combinations of these load types, column buckling, and other more specialized load types.

Course Objectives
At the end of this class the typical students should be well prepared in the following areas:

1. Identify and solve basic axial, shear, torsion and beam bending stress analysis and deflection problems.
2. Solve simple combined loading stress analysis and deflection problems.
3. Have a good understanding of stress and strain components, and stress transformation in 2D and 3D.
4. Solve statically indeterminate problems
5. Ability to resolve internal tractions(stresses) with properly chosen F.B.D.s

Course Policies
Grading: The grade in this class will be based on 3 midterm exams during the semester, 3 quizzes, and 1 final project. The grade will be computed as follows:

Final grade calculation:

Final Score = 0.3*Quizzes + 0.5*Midterm Exams + 0.2*Final Project

The tentative division for letter grade is as follows:

$90 \leq A \leq 100$; $75 \leq B < 90$; $55 \leq C < 75$; $40 \leq D < 55$; $F < 40$

***Exams*:** Exams will be announced well in advance so that there is no excuse for missing an exam. There will be three midterm exams and a final. **There will be no make-up exams given**!

Quiz: Quizzes will be assigned in class, and students are expected to solve them and submit them during the specified time. **There will be no make-up quizzes given**!

Homework: 8-10 Optional Homework problem sets will be assigned as practice problems. These will be not be graded.

1. Chapter 1: Stress
   Hibbeler 1.2, 1.3, 1.4, 1.5, 1.6
2. Chapter 2: Strain
   Hibbeler 2.1, 2.2
3. Chapter 3:Materials
   Hibbeler 3.1, 3.2, 3.4, 3.6, 3.7
4. Chapter 4: Axial
   Hibbeler 4.1, 4.2, 4.3, 4.4, 4.5, 4.6, 4.7
5. Chapter 5: Torsion
   Hibbeler 5.1, 5.2, 5.3, 5.4, 5.5
6. Chapter 6: Bending
   Hibbeler 6.1, 6.2, 6.3, 6.4, 6.5
7. Chapter 7: Transverse shear in bending
   Hibbeler 7.1, 7.2, 7.3
8. Chapter 8: Combined loading
   Hibbeler 8.1, 8.2

Tentative **Exam Dates (exact dates will be announced ahead of time during the semester):**

Quiz: Quiz 1 (03/05/24), Quiz 2 (04/02/24), Quiz 3 (04/30/24)
Exam: Exam 1 (03/07/24) Exam 2 (04/04/24), Exam 3 (05/02/24)
Final Project: Group presentation during final weeks until 05/04/23. Topic TBD