

**ME 231 - Strength of Materials
Spring 2023**

Catalog Data: ME 231 Strength of Materials; Lecture 3 hrs; Credit 3 hrs.

A study of the mechanics of deformable materials, durability, chalk propagation, performance, and life-cycle analysis; theory of stress and strain; deformations under simplified loads (axial, torsional, bending); analysis of columns, buckling loads; review of data acquisition and instrumentation for testing; material selection for design.

Prerequisite: ME 205, and ME 210.

Class Schedule: MWF 9:30 – 10:50, ETB, Room 102

Text: Mechanics of Materials, Beer, Johnston, DeWolf, and Mazurek, 7th Edition, McGraw Hill, 2015, ISBN 978-0-07-339823-5.

References: (1) Lectures and Class notes.

Instructor: Dr. Mohamed Seif, PhD, PE
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Objectives: At the completion of this course the students will be/have:

Course Learning Outcome	Program Outcome	Assessment Tool
1. Understand the concepts of normal, shear and bending stress	a	Homework, quiz, exams
2. Know how to select and apply factors of safety to design	e, c, k	Homework, quiz, exams
3. Be familiar with Hooks law and modulus of elasticity	a, e	Homework, quiz, exams
4. Be able to calculate deformation under axial loading	a, e	Homework, quiz, exams
5. Analyze torsion and stress concentration in circular shafts	a, c, e	Homework, quiz, exams
6. Determine bending moment and stresses	a, e	Homework, quiz, exams
7. Draw shear and bending moment diagrams	a, e	Homework, quiz, exams
8. Use Mohr circle to identify the principal stresses and strains	a, e, k	Homework, quiz, exams

Lecture No.	Topic	Homework	Due
1	Introduction to Mechanics of Materials		
2-3	Introduction-Concept of stress, Normal stress, Shear stress and Bearing stress		
4-5	Application, analysis and design of a simple structure		
6-7	Design considerations: Ultimate strength, allowable load, factor of safety and selection of appropriate factor of safety	H1	TBD
8-10	Stress and strain in axial loading, concept of yield point, Hooke's law and modulus of elasticity,		
11-13	Deformation under axial loading, Poisson's ratio	H2	TBD
14	Test 1		
15-17	Torsion, angle of twist, power transmission, stress concentration in circular shafts	H3	TBD
18	Test 2		
19-22	Bending Moment and pure bending moment, stresses in pure bending	H4	TBD
23-26	Analysis and design of beams for bending- Drawing shear and bending moment diagrams.	H5	TBD
27	Test 3		
28-30	Transformation of stresses and strain-Mohr circle, Principal stresses and strains.	H6	TBD
31	Review session		

Instructional Methods:

1. The instructor will present the materials through the use of lectures, visual aids, illustrations, and computer demonstrations. The overall responsibility for learning rests upon each student.
2. Attendance - Each student will be responsible for all class sessions. Absences from tests and other academic work may not be made up unless previous arrangements have been made with the instructor. Make-ups, if any, will be based on proven valid reasons.
3. All assignments must be completed by the assigned deadline date. The assignments and deadline dates will be provided by the instructor.

Evaluation and Grading Policy:

1. Attendance: 5%. Attendance and active participation in class count for 5% of the total grade. Each student will be responsible for all class sessions. Absences from exams and other academic work may not be made up unless previous arrangements have been made with the instructor. Make-up exams, if any, will be based on proven valid reasons. Students are required to attend and sign the attendance sheet every class.

2. Homework: 25%. Homework counts for 40% of the final grade. Homework is due at the beginning of the class meeting after it is assigned. Late homework will not be accepted. In particular, homework turned in after the official last day of classes will not be considered for grading. Homework is the student's individual scholastic work. Cheating and or plagiarism is an unethical conduct. Students demonstrating such behavior will be subject to severe university disciplinary sanction if such behavior is demonstrated.
3. Semester Exams: 40%. Two semester exams of equal weight count for 40% of the final grade. No make-up exams will be given except under extreme circumstances and by proven valid reasons.
4. Final Exam: 30%. The final exam counts for 30% of the final grade.
5. Grade Scale: A: 90-100 B: 80-89 C: 70-79 D: 60-69 F: Below 60
6. Honesty is expected in all work. Any indication of dishonesty will prove fatal with "F" grade in the final grade of the course.

Makeup: No makeup exams/Labs allowed for unexcused absences. For health related absences, on provision of the medical excuse, a makeup exam may be arranged at the discretion of the instructor and with an Official University Excuse.

STYLES OF LEARNING AND TEACHING: We all have different strengths and weaknesses as learners, as well as habitual or preferred ways of receiving and processing information. Your instructors may also be accustomed to approaching specific subjects or materials in certain ways. Our objective is always to inform and stimulate, as well to encourage independent learning. Please feel free to talk with me at any time during the semester concerning ways in which I might help you to address your individual learning needs. Students with disabilities are encouraged to meet with me early in the semester to discuss accommodations.