

ME301 Mechanical Systems I

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Course Attributes	Sabanci University – 2021-22 Summer Semester Undergraduate - 3 SU Credit / 10 ECTS/ 42 Teaching Hours
Course Schedule	Tuesday 13:40-16:30 FENS L065 Wednesday 15:40-17:30 (Recitation) FENS L065 Friday 08:40-11.30 FENS L067
Prerequisites	A passing grade in ENS 204 is required

Course Relevance and Objectives

This course introduces fundamental principles and methods of structural mechanics. Topics covered include stresses and strains in structural elements, states of stress (shear, bending, torsion), statically indeterminate systems, displacements and deformations, deflections with simple loadings, superposition techniques, thermal stresses, combined stresses, Mohr's circle, combined loadings, buckling, energy methods, elastic stability, and approximate methods.

The course objective can be listed as to:

1. Introduce students to mechanics of materials and fundamentals of strength of materials,
2. Understand the sources and relationship between strain and stress and learn how to calculate them given various loading conditions
3. Apply computational techniques, such as Mohr's circle, to solve mechanics problems
4. Learn how to conduct mechanical component design based on stress and deflection analysis
5. Calculate deflections of structural elements under basic loading.
6. Introduce students to the principles of design for static failure
7. Learn how to analyze a given solid mechanics problem in a simple and logical manner and using fundamental concepts to find its solution

Learning Outcomes

Students who passed the course satisfactorily can do the following tasks:

1. Calculation of external/internal forces and moments for modelling of structural members
2. Estimation of stresses due to axial force and simple shear
3. Classification of mechanical properties of materials
4. Calculation of deformation of members under axial force
5. Calculation of torsional stress and deformation
6. Prediction of stresses under pure bending
7. Calculation of transverse-shear stress and its exact distribution through the thickness
8. Prediction of stresses under combined loading and superposition of stresses
9. Transformations of stress and strain
10. Prediction of beams' elastic curve

Course Syllabus

Week	Topic
Week 1 (18.07.22 - 22.07.22)	Introduction and Review of Statics Concepts of Stress and strain
Week 2 (25.07.22 - 30.07.22)	Mechanical properties of materials Axial Loading
Week 3 (01.08.22 - 05.08.22)	Torsion Pure Bending
Week 4 (08.08.22 - 12.08.22) (Midterm)	Transverse Shear Stress Combined Loading
Week 5 (15.08.22 - 19.08.22)	Combined Loading Transformation of Stress and Strain
Week 6 (22.08.22 - 26.08.22)	Failure Theories Deflection of beams
Week 7 (29.08.22 - 02.09.22) (Final Exam)	Deflection of beams

Textbooks

1. Hibbeler, R.C., 2014. Mechanics of Materials, Ninth Edition, Prentice Hall, New Jersey, USA
2. Beer, Jr., E., Johnston, R., DeWolf, J., Mazurek, D., 2014. Mechanics of Materials, Seventh Edition, McGraw-Hill Education.

Assessment Criteria

Midterm (30%), Homework (20%), Final Exam (50%)

- ▶ *There will be 5 homework's given in the Weeks 2-3-4-5-6.*

Course Material

The outline of lecture notes, homework, and other course-related material will be posted at the SUCourse site (<https://sucourse.sabanciuniv.edu/>).