MAE 131A (4 units)
Solid Mechanics I

Class/Laboratory Schedule: four hours of lecture, eight hours outside preparation.12 hours/week total

Course Coordinator(s): Maziar Ghazinejad, Marko Lubarda

Textbooks/Materials:
1. Hibbeler: Mechanics of Materials, Pearson, 10th Edition, 2022
2. Beer and Johnston: Mechanics of Materials, McGraw-Hill, 6th ed., 2011.
3. R.R. Craig: Mechanics of Materials, John Wiley, 3rd ed., 2011.

Catalog Description: Concepts of stress and strain. Hooke's law. Axial loading of bars. Torsion of circular shafts. Shearing and normal stresses in beam bending. Deflections in beams. Statically determinate and indeterminate problems. Combined loading. Principal stresses and design criteria. Buckling of columns.

Prerequisites: Math 20D and MAE 130A or SE 101A.

Type of Course: Required

Course Objectives:
Objective 1
1.1 Students will demonstrate that they can apply the equilibrium conditions to determine the distribution of internal forces in a structure.
1.2 Students will demonstrate that they can distinguish between normal and shear stresses, normal and shear strains, and the corresponding material properties.

Objective 2
3.1 Students will demonstrate that they can recognize the qualitative features of the stresses, strains, material properties, and area properties associated with axial, torsional, transverse, and bending loading.
3.2 Students will demonstrate the ability to solve for stresses and strains in structural components under axial, torsional, transverse, and bending loadings, acting individually or in combination.

Objective 3
3.1 Students will demonstrate that they can solve for the principal stresses in structural components subjected to a combined state of loading.
3.2 Students will demonstrate that they can recognize, formulate, and solve statically indeterminate structural components.

Course Topics:

1. Concept of stress and strain
2. Hooke's law
3. Axially loaded bars
4. Torsion of circular shafts
5. Bending of beams
6. Transverse Shear Loads and Stresses
7. Statically indeterminate problems
8. Combined Loading
9. Stress Transformation and Principal Stresses
10. Buckling of columns

Last updated: 7th April 2025