

Course Outline for: ENGR 2331 Deformable Body Mechanics

A. Course Description:

- 1. Number of credits: 3
- 2. Lecture hours per week: 3
- 3. Prerequisites: ENGR 2235 (C or better)
- 4. Corequisites: None
- 5. MnTC Goals: None

An introduction to the linear stress-strain behavior of engineering materials, building upon principles from engineering statics. Topics include the analysis of stresses due to uniaxial loading, bending, and torsion, as well as stress transformations, beam deflections, indeterminate structures and column buckling. Students will gain practical insight into real world engineering scenarios.

B. Date last reviewed/updated: January 2025

C. Outline of Major Content Areas:

- 1. Stresses and strains.
- 2. Material constitutive relationships.
- 3. Statically indeterminate structures.

D. Course Learning Outcomes:

Upon successful completion of the course, the student will be able to:

- 1. Draw the stress cube corresponding to a given state of stress.
- 2. Draw the deformations corresponding to a given state of strain.
- 3. Transform a state of stress into a different coordinate system.
- 4. Communicate the application of St. Venant's Principle to the interpretation of material stress calculations.
- 5. Calculate internal loads in beams.
- 6. Calculate stress in beams due to internal tension, shear force, bending moment, and torsion.
- 7. Apply the principle of superposition to calculate the stress in beams with combinations of internal loads.
- 8. Calculate the state of strain for any state of stress.
- 9. Calculate beam displacements under simple loading conditions.
- 10. Apply beam displacements to calculate reaction loads for indeterminate structures.
- 11. Calculate critical loads for the onset of column buckling.

E. Methods for Assessing Student Learning:

Methods for assessment may include, but are not limited to, the following:

- 1. Exams
- 2. Problem sets

3. Group projects

F.

Special Information: Students must have a graphing calculator.