

## ENGRD 202 / T&AM 202 Mechanics of Solids

**Credit:** 4 hours

**Course (catalog) description:** Fall, spring. 4 credits.

Principles of statics: forces and moments; equilibrium of particles, bodies, trusses, frameworks and mechanisms. Mechanics of solids: tension stress and strain; shear stress and strain; mechanical properties; axial force and statically indeterminate axial problems; torsion of round bars; shearing force, bending moment and bending stresses for symmetric beams, deflection of cantilever and simply-supported beams.

**Required or Elective course:** Elective, but required by some Majors.

**Prerequisite(s):** PHYS 112 (Physics I: Mechanics), coregistration in MATH 192 (Calculus for Engineers) or permission of instructor.

**Textbook(s) and other required material:**

1. *Engineering Mechanics, Statics*, J.L. Meriam and L.G. Kraige, John Wiley & Sons, Fifth Edition, 2001, or equivalent.
2. *Mechanics of Materials*, J.M. Gere, Brooks/Cole, Fifth Edition, 2002.
3. Lab manual by TAM staff.

**Course objectives:** For students to learn to use basic statics and materials concepts to make predictions about the forces in, the strength of, and the deformations of common simple structures.

**Topics covered:**

- Introduction to Statics; Forces
- 2D-Force Systems; Moments and Couples
- 3D-Force, Moment-Couple Systems
- Free Body Diagrams (FBDs) and Equilibrium in 2D/3D
- Internal forces in trusses, frames and machines.
- Friction
- Centers of mass and loadings with distributed forces
- Stress, Strain, Mechanical Properties
- Linear Elasticity in one dimension
- Axially-loaded Members
- Statically-indeterminate axial systems
- Stresses on Inclined Sections (using FBDs of triangular prisms)
- Torsion of circular shafts
- Shear Forces and Bending Moments
- Bending stress in symmetric beams
- Deflection of cantilever and simply-supported beams
- Lab topics: trusses, mechanical properties in tension, beam stress and deflection, buckling.

**Class/laboratory schedule:** Three 50-minute lectures, one 50-minute recitation, and four 2-hour labs per semester.

**Contribution of course to meeting the professional component:** Basic engineering sciences with experimental experience.

**Course outcomes and their relation to ABET program outcomes (a-k):**

Upon completion of the course, students should be able to:

1. Draw complete and correct free body diagrams. (a)

2. Apply the principle of equilibrium to calculate external and internal forces in simple, statically determinant mechanical systems, including simple shear and bending moment distributions. (a)
3. Understand the concepts of stress, strain, deformation and elasticity. Analyze the stress, strain and deformation in bars subject to axial, bending and torsional loads. (a)
4. Use the principles of elasticity and equilibrium to solve for stresses in simple statically indeterminate systems. (a)

**Outcome Assessment:** In addition to analyzing student surveys administered by the College, the instructor will assess the outcomes of the course by considering student results on specific questions on homeworks and exams and laboratory reports.

**Person(s) who prepared this description and date of preparation:**

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