



## ME216 Mechanics of Materials (Required Course)

**Code and Name:** ME216 Mechanics of Materials

**Credit Hours:** 3 (Lecture: 3, Tutorial: 1)

**Textbook:**

- Mechanics of Materials, Timothy A. Philpot, 2<sup>nd</sup> Edition, John Wiley & Sons, Inc., 2011.

**Other References:**

- Mechanics of Materials: R. C. Hibbeler, 8<sup>th</sup> Edition, Pearson-Prentice Hall, 2011.

**Course Description:**

Normal and shear stress, normal and shear strain, stress-strain relations for ductile and brittle materials, yield and ultimate stress, elasticity and plasticity, Hooke's law, Poisson's ratio. Axial loading, stress on inclined planes. Torque and torsion, deformation of circular bars under torsion, polar moment of inertia. Pure shear and pure bending, Euler's beam theory, curvature and bending moment, second moment of inertia, normal and shear stress in beams of various cross-sections. Plain stress and strain, Principal and maximum shear stress and strain, Mohr's circle, and general 3-D stress-strain relationship in elasticity, buckling of columns.

**Pre-requisites:** GE201 Statics, ME211 Material Science and Engineering.

**Co-requisites:** None

**Course Learning Outcomes:**

With relation to ABET Student Outcomes (SOs: 1-7)

1. Discuss the usefulness and limitation of the derived formulae for real life problems (1)
2. Conduct stress analysis on a component with the aid of calculators as well as conduct failure analysis to determine the safety of a structure. (1)
3. Transformation of a physical problem into a mathematical problem to enable estimations of stress as well as safety assessment. (1)
4. List the various assumptions associated with the derived equations (6)
5. Combining strength of material analysis together with failure theory in order to design a safe structure (1)

**Topics to be covered:**

- Axial Deformation.
- Torsion.
- Equilibrium of Beams.
- Design Concepts.
- Bending.
- Shear Stress in Beams.
- Beam Deflection.
- Statically Indeterminate Beams.
- Stress Transformations.
- Strain Transformations.
- Combined Loads.

**Grading Policy:**

The grading for the course are 60% coursework and 40% Final Exam. The course work consists of two Midterm Exams, where each midterm exam is worth 20%. It also includes quizzes, homework, and projects for the remaining 20% that is modified by the course instructor.

