1. *Course number and name*
   ENGR 309: Mechanics of Materials

2. *Credits and contact hours*
   3 Credit Hours

3. *Instructor's or course coordinator's name*
   Instructor: Timothy B. D'Orazio & Zhaoshuo Jiang, Professor of Civil Engineering
   Course coordinator: Zhaoshuo Jiang, Professor of Civil Engineering

4. *Text book, title, author, and year*
   Beer, F. P., Johnston, E. R., DeWolf, J. T., and Mazurek D. F., Statics and Mechanics of Materials, 2nd Edition, McGraw-Hill, 2016

   a. *other supplemental materials*
      Hibbeler, R. C., Mechanics of Materials, 9th Edition, Pearson, 2014.

5. *Specific course information*
   a. *brief description of the content of the course (catalog description)*
      Stress and deformation analysis for members under axial load, torsion, flexure, and combined forces: columns, strain energy. Elastic and ultimate resistance of materials.

   b. *prerequisites or co-requisites*
      Engr 102, Engr 200 concurrently.

   c. *indicate whether a required, elective, or selected elective course in the program*
      Required for Civil and Mechanical Engineering.

6. *Specific goals for the course*
   a. *specific outcomes of instruction, ex. The student will be able to explain the significance of current research about a particular topic.*
      Students will demonstrate an ability to:
      - Understand basic mechanical properties of solid materials.
      - Stress-strain of brittle and ductile materials.

      Students will demonstrate an ability to:
      - Determine internal forces in common civil and mechanical engineering components. Obtain stresses in prismatic bars under axial load.
      - Obtain stresses in circular shafts due to torsion.
      - Obtain stresses in prismatic beams due to bending loads.

      Students will demonstrate an ability to:
      - Transform stresses from one set of axes to another.
      - Use Mohr's circle to transform stresses.

Students will demonstrate an ability to:

- Compute deformation of beams under bending.
- Compute deformation of torsional members.
- Compute deformation of columns under axial load.

Students will demonstrate an ability to:

- Compute the buckling resistance of axially loaded columns.

b. explicitly indicate which of the student outcomes listed in Criterion 3 or any other outcomes are addressed by the course.

Course addresses ABET Student Outcome(s): a, c, e, i.

7. Brief list of topics to be covered

- Basic concepts of stress and strain
- Stresses in bodies subject to axial, torsional, and pressure loads.
- Forces and stresses in beams.
- Beam deflection.
- Transformation of stress and strain.
- Elastic design.
- Introduction to column stability.