BAKER COLLEGE
STUDENT LEARNING OUTCOMES

ME 3210 Solid Mechanics
3 Semester Hours

Student Learning Outcomes & Enabling Objectives

1. Evaluate normal stresses in axially loaded members and average shear stresses in direct shear
    a. Calculate internal loadings in 2D and 3D members
    b. Define stress
    c. Determine average normal stress in an axially loaded bar
    d. Determine average shear stresses in members in direct shear, bolts, and welded connections
    e. Describe allowable stress design and limit state design
2. Analyze strain
    a. Describe deformation
    b. Define normal and shear strains
3. Investigate mechanical properties of materials
    a. Describe apply the tension and compression test
    b. Examine stress—strain behavior of ductile and brittle materials
    c. Define elastic modulus, strain energy, Poisson's ratio, and shear modulus
4. Analyze elastic deformation and stresses in axially loaded members
    a. Define Saint-Venant's principle
    b. Solve elastic deformation of an axially loaded member
    c. Determine thermal stress
    d. Examine stress concentrations
5. Evaluate stresses and deformation of members loaded in torsion
    a. Apply the principle of power transmission.
    b. Apply the torsion and angle of twist equations.
    c. Examine stress concentrations
6. Investigate the behavior of members in bending
    a. Calculate shear and moment and construct their diagrams
    b. Analyze bending deformation of a straight member
    c. Apply the flexure formula
    d. Examine stress concentrations
7. Evaluate shear stresses in members under transverse shear
    a. Apply the shear formula
    b. Determine shear flow in built-up and thin-walled members

8. Solve for stresses under combined loadings
    a. Determine stresses in pressure vessels
    b. Analyze stresses in members due to internal loads occurring simultaneously on a member's cross section.
    c. Design beams and shafts
9. Investigate stress transformation
    a. Define plane stress
    b. Determine stresses on arbitrary planes, and maximum stresses and their planes using stress transformation equations
    c. Construct Mohr's circle to obtain stresses on arbitrary planes, and maximum stresses and their planes
    d. Determine absolute maximum shear stress
10. Analyze strain transformation
    a. Define plane strain
    b. Apply general equations of plane-strain transformation
    c. Examine strain rosettes
    d. Describe material property relationships for plane stress and plane strain
11. Solve for deflection of beams and shafts
    a. Define the elastic curve
    b. Determine the slope and displacement by integration
    c. Apply general equations of plane-strain transformation
    d. Examine strain rosettes
    e. Describe material property relationships for plane stress and plane strain
12. Explore buckling of columns
    a. Define critical load
    b. Describe Euler's formula
    c. Solve for critical load in columns having various types of supports

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These SLOs are not approved for experiential credit.

Effective: Fall 2017