ENGR 213 : STRENGTH OF MATERIAL

Transcript title

Strength Of Material

Credits

4

Grading mode

Standard letter grades

Total contact hours

40

Lecture hours

40

Prerequisites

ENGR 211 and MTH 252.

Course Description

Studies properties of structure materials. Analyzes stress and deformation in axially-loaded members, in circular shafts and beams and in statically indeterminate systems containing these components.

Course learning outcomes

1. Calculate average normal, shear, and bearing stresses on sections and connectors.
2. Relate allowable stress, material strength and safety factor in component design.
3. Use Mohr's circle to determine principal stresses, maximum shear stress, and principal axes orientation.
4. Calculate stresses for axial, torsion, beam bending, and combined loading on simple structural elements.
5. Draw shear and bending moment diagrams, and write beam equilibrium equations.
6. Calculate beam deflections using integration of the moment equation and the method of superposition.

Content outline

Define average normal, shear, and bearing stresses, and calculate for simple axially loaded components and pinned connectors. Define normal, shear, and thermal strain, and calculate for simple object deformations. Describe tension tests and stress-strain diagrams. Identify the mechanical properties of materials used in engineering mechanics analyses. Define the design concepts of strength, safety factor, and allowable stress. Use equations for stress within and deformation of axially loaded structural elements and assemblies. Use equations for stress within and deformation of circular shafts and assemblies under torsional loading. Develop equilibrium and graphical approaches to analysis of internal shear and bending moment in beams. Use equations for flexural normal stress in beams, and establish the basic methods of beam design. Develop and use equations for shear stress and shear flow in monolithic and composite beams with typical symmetric cross-sectional geometries. Generalize the concept of stress, and introduce the plane stress element. Establish equations for stress coordinate transformation, principal stresses, and maximum shear stress. Develop Mohr's Circle for plane stress. Analyze simple combined loading problems. Establish integration and superposition methods for calculating beam deflections.

Required materials

A strength of materials textbook will be required.