Virginia Western Community College
EGR 246
Mechanics of Materials

Prerequisites
EGR 240

Corequisites
none

Course Description
Introduces concepts of stress, strain, deformation, internal equilibrium, and basic properties of engineering materials. Analyzes axial loads, torsion, bending, shear and combined loading. Studies stress transformation, principal stresses, and buckling.

Semester Credits: 3 Lecture Hours: 3 Lab/Clinical/Internship Hours: 0

Required Materials

Textbooks:
Mechanics of Materials, 10th ed., Author: Russell C. Hibbeler, Publisher: Prentice Hall, ISBN# 9780134583235.

Other Required Materials:
Calculator (TI-89 or higher preferred)
All Homework will be administered via: www.masteringengineering.com
The following supplementary materials are available:
MDSolids software

General Course Purpose

Prepare students for further studies in branches of engineering requiring mechanics.

See: https://courses.vccs.edu/courses/EGR246-MechanicsofMaterials

Course Outcomes

At the completion of this course, the student should be able to utilize the following:

- Critical Thinking
    - Use stress concentration factors to find stresses in, or allowable loads on, axially loaded members.
    - Solve problems using plane stress (or strain) transformation equations and Mohr's circle under combined loading conditions to identify principal stresses (or strain), along with maximum in-plane shear stress (or strain) and absolute maximum shear stress (or strain).
- Communication
    - Draw shear and moment diagrams for beams subjected to some combination of concentrated loads, distributed loads, and concentrated moments.
- Quantitative Reasoning
    - Apply the theory of solid mechanics to calculate forces, moments, stresses, and strains in a wide variety of structural members subjected to axial, torsion, transverse, and bending loads, both individually and in combination.
    - Use the stress-strain relationships for linear, elastic, homogeneous, isotropic materials and the basic properties of materials (e.g., elastic moduli, Poisson's ratio) to appropriately solve problems related to isotropic elasticity.
    - Analyze constrained and unconstrained members subjected to linear thermal expansion.
    - Analyze statically indeterminate structures to compute reactions and internal loading.
    - Calculate the stress in thin-walled pressure vessels.
    - Calculate area moments of inertia including use of parallel axis theorem.
    - Calculate the deflection of a beam using multiple approaches (e.g., direct integration, superposition)
    - Calculate the critical buckling loads for columns with different boundary conditions.

Topical Description

- Definition for stress
- Definition for strain
- Hooke's Law and material properties
- Uniaxial loading and superposition
- Stress concentrations
- Thermal loading
- Torsion of circular cross-sections
- Moments of inertia
- Normal and shear stress in beams
- Deflection of beams
- Buckling of columns
- Mohr's circle
- Stress and strain transformations
- Pressure vessels
- Combined loading of structural members

Notes to Instructors

- All instructors teaching this course will use the same textbook.
- Course content within this course may be covered at the instructor's discretion with all topics being covered.
- This course and its grades will be structured around a minimum of a mid-term, final exam, and homework.
- At the end of the semester, all instructors will give the outcome assessment as it relates to the final exam to the program head at the same time they prepare their student final grades.
- Homework can be assigned using Mastering Engineering.
- A comprehensive final exam will be given, which must be at least 10% of the final grade.

ADA Statement (PDF)
Title IX Statement (PDF)