

Virginia Western Community College

MEC 132

Mechanics II –Strengths of Materials

Prerequisites

MEC 131- Teaches Newton's laws, resultants and equilibrium of force systems, trusses and frames, determination of centroids, and distributed loads and moments of inertia. Introduces dry friction and force systems in space.

Corequisites

None

Course Description

Teaches the concepts of stress and strain and their relationship in compressive and tensile applications. Provides an analysis of normal and shear stresses in member subjected to axial loading, bending and twisting. Combined loading involving multiple types of shear and normal stresses are discussed. Principles of superposition are used to establish characteristic stress elements of material states and these are used to formulate a Mohr's circle representation. Failure mechanisms, factor of safety and VonMises Stress are used to determine successful designs.

Semester Credits: 3 Lecture Hours: 3 Lab Hours: 0

Required Materials

Textbook:

OER Textbook: Applied Strength of Materials for Engineering Technology, Barry Dupen Indiana University - Purdue University Fort Wayne, dupenb@ipfw.edu

Instructor developed materials.

Software:

MDSolids (free download at <https://web.mst.edu/~mdsolids/one>)

Other Required Materials:

None

Course Outcomes

At the completion of this course, successful students will be able to

- Use Statics principles to identify forces in a system
- Understand the concepts of stress and strain
- Calculate stress and strain in axially loaded members
- Calculate thermal strain
- Identify and calculate torsion in circular members.
- Identify and calculate components of normal and transverse shear stress in beams under bending loads.
- Use thin wall approximation to calculate stresses in pressure vessels
- Calculate deflection of beams in different bending scenarios
- Understand buckling failure in columns.
- Draw and notate a representative stress element.
- Transform stress and strain stress elements.
- Use Principle of Superposition to identify combined stress states.
- Use Mohr's circle to identify principal stresses.
- Calculate Von Mises Stresses in parts and determine Factor of Safety

Topical Description

- Area Moment of Inertia
- Centroids
- Stress/Strain Material Properties
- Thermal Expansion and Axial Stress
- Axial Loading
- Torsion
- Shear and Moment Diagrams (V-M)
- Shear and Moment with Distributed Loads
- Transverse Shear and Q
- Buckling of Columns
- Combined Loading
- Beam Deflection
- Stress Transformation
- Mohr's Circle
- Von Mises Stress and Failure Theories

Notes to Instructors

Beginning Fall 2020, VWCC will require students to have a computer or reliable access to a computer, capable of participation in an online format. Online courses at Virginia Western

require a significant amount of interaction with Canvas, the Learning Management System, and many require real-time class sessions using the Zoom web-conferencing tool. To be successful in online classes, students must have substantial access to a computer with hi-speed internet connectivity. The expected requirements are listed on the college webpage.

[TITLE IX STATEMENT](#)

[ADA STATEMENT](#)