COURSE OUTLINE

Course Number	Course Title	Credits
CIV229	**Mechanics of Materials**	**4**
Hours: Lecture/Lab/Other	**Co- or Pre-requisite**	**Implementation Semester & Year**
3/3/0	**CIV106 with a minimum C grade**	**Fall 2022**

Catalog description:
With an introduction to engineering materials and their mechanical properties, examines strains that occur in elastic bodies subjected to direct and combined stresses, shear and bending moment diagrams, deflections of beams, and stresses due to torsion. Lab testing involves various materials such as cast iron, steel, brass, aluminum, and wood to determine their physical properties and to demonstrate various testing techniques.

General Education Category:
Not GenEd

Course coordinator:
James Maccariella, 609-570-3462, maccarij@mccc.edu

Required texts & Other materials:

Statics and Strength of Materials, latest edition
Cheng
McGraw Hill
ISBN-13: 978-0028030678

Course Student Learning Outcomes (SLO):

Upon successful completion of this course the student will be able to:

1. Demonstrate basic engineering materials terminology. [Supports ILG 1; PLO 1, 3]
2. Demonstrate the relationship between external forces member reactions. [Supports ILG 1, 2; PLO 1, 3]
3. Analyze various types of materials problems. [Supports ILG 2, 11; PLO 1, 3]
4. Generate and interpret loading diagrams. [Supports ILG 2, 11; PLO 1, 3]
5. Solve problems in a well-organized and logical manner. [Supports ILG 2, 11; PLO 1, 3]
6. Complete laboratory testing of various materials to determine their physical properties. [Supports ILG 1, 11; PLO 1, 3]
7. Demonstrate the relationship of engineering materials to the study of advanced topics in engineering. [Supports ILG 1, 11; PLO 1, 3]

Course-specific Institutional Learning Goals (ILG):

Institutional Learning Goal 1. Written and Oral Communication in English. Students will communicate effectively in both speech and writing.
Institutional Learning Goal 2. Mathematics. Students will use appropriate mathematical and statistical concepts and operations to interpret data and to solve problems.
Institutional Learning Goal 4. Technology. Students will use computer systems or other appropriate forms of technology to achieve educational and personal goals.

Institutional Learning Goal 11. Critical Thinking: Students will use critical thinking skills understand, analyze, or apply information or solve problems.

Program Learning Outcomes for Civil Engineering Technology (PLO)

1. Prepare designs for highways, buildings, and bridges.
2. Perform route/construction surveys using survey equipment and methods.
3. Test and analyze various construction materials.
4. Prepare design drawings.

Units of study in detail – Unit Student Learning Outcomes:

Unit I Simple Stresses and Strain [Supports Course SLO #1, 2, 3, 4, 5, 6, 7]

Learning Objectives
The student will be able to:

- Define stress, tension, compression and shear.
- Calculate stresses in members with holes, slots, pins, or irregularities.
- Calculate the strain for a member subjected to a load in tension, compression, or shear.
- Calculate stress and strain using the Modulus of Elasticity.
- Determine the Modulus of Elasticity for a given material when subject to a tensile, compressive, or shearing load.
- Calculate working stress, factor of safety and ultimate strength.
- Complete laboratory testing and reports for various materials such as: cast iron, steel, brass, aluminum, and wood to determine their physical properties.
- Complete team assignments involving computation of stress and strain.

Unit II Shear and Moment Diagrams [Supports Course SLO #1, 2, 3, 4, 5, 6, 7]

Learning Objectives
The student will be able to:

- Determine the shear and moment by taking a section of the beam and analyzing this section as a free body diagram.
- Compute and plot the shear and moment diagrams.

Unit III Stress in Beams [Supports Course SLO #1, 2, 3, 4, 5, 6, 7]

Learning Objectives
The student will be able to:

- Draw a free body diagram showing and calculate the beam reactions.
- Calculate the shear force in a beam subjected to transverse loads.
- Compute and draw the beam's shear force diagram.
- Calculate the bending moment in a beam subjected to transverse loads.
- Compute and draw the beam's bending moment diagram.
- Compute the location of the beam's neutral axis.
- Compute the Moment of Inertia and Section Modulus.
- Compute the maximum shear and bending stresses in the beam.

- Interpret standard designations for I-beam, channels, and angles.

Unit IV **Compression Members [Supports Course SLO #1, 2, 3, 4, 5, 6, 7]**

Learning Objectives
The student will be able to:

- Calculate the least moment of inertia with respect to the centroidal axes.
- Calculate the radius of gyration.
- Calculate the slenderness ratio from the radius of gyration.
- Use the Euler Formula to determine the buckling load for non-slender compression members.

Unit V **Deflection in Beams [Supports Course SLO #1, 2, 3, 4, 5, 6, 7]**

Learning Objectives
The student will be able to:

- Solve for deflection in cantilever, simple, and overhanging beams.
- Understand the importance of deflections as a serviceability limit state.

Evaluation of student learning:

Course student learning outcomes will be assessed by the following activities:

Tests (3)	30%
Quizzes and Homework	20%
Lab Reports	20%
Final Exam	30%