Course Name: MEC-141 Strength of Materials for Engineering Technology Date Updated: 4/2022

Credit Hours/week: Lec 2, Lab 1 hrs./wk. – 3 cr. BEGINNING: SPRING 2022

Catalog Description: This course studies the mathematical determination of stress and deflection for materials having applied loads of normal, shear, torsion, bending or combinations of these. The rational design of mechanical components, such as fasteners, weldments, tanks, shafts, beams and columns, to satisfy stress, deflection and stability criteria are studied. Also included are Mohr's circle and strain gauge techniques. This course is intended for Engineering Technology students; Engineering Science students should take ENR-230, Engineering Strength of Materials.

Prerequisite: MEC-104, MEC-110

Text: Mechanical Design of Machine Components, Ugural, CRC Press

Supplementary Material: Calculator, Use of universal materials testing machines and torsion testing machine in laboratory SH 105.

Syllabus:

Period	Topics
1	Statics Review – Centroids and Moment of Inertia
2	Stress and Strain
3	Further Applications of Stress and Strain
4	Torsion
5	Shear and Moment Diagrams
6	Test 1 – Bending & Shear
7	Bending, Sheer, Deflection
8	Combined Stress
9	Combined Stresses – Mohr Circle
10	Beam Design
11	Test 2 - Columns
12	Columns, Bolted & Welded Connections
13	Bolted & Welded Connections, Stress Concentrations
14	Pressure Vessels, Stress Concentrations
15	Review
16	Final Exam

Students are expected to adhere to the policies of the County College of Morris. These can be accessed at: (insert link here)

Statement of Expected Course LEARNING OUTCOMES

- Explain the basic concepts of stress and strain due to a force on a structure or a machine member.
- Calculate direct tensile, compressive and shear stresses induced due to a force or forces applied.
- Determine elastic deformation of a member in either tension or compression. Also determine thermal deformation and thermal stress due to change in temperature.
- Discuss torsion and torsional deformation due to an applied torque.
- Calculate torsional shear stress and angle of twist of a circular member subjected to a single or multiple torques at different positions along the member length.
- Design circular members under torsion.
- Determine the magnitude of reaction forces, shearing forces and bending moment anywhere within a beam subjected to concentrated loads, uniformly distributed load, linearly varying distributed loads and concentrated moments.
- Draw free-body diagrams for beams showing all external forces and reactions. Draw shearing force and bending moment diagrams.
- Compute location of centroids and moments of inertia of areas.
- Explain the derivation of the flexure formula for beams and the effect of the moment of inertia on bending stress. Compute the stress at any point within the cross-section of the beam. Select beams to carry a given loading safely.
- Calculate the magnitude of shearing stresses in beams by using the general shear formula.
- Determine the combined normal stress resulting from the application of bending stress with either direct tensile or compressive stress using the principle of superposition.
- Construct Mohr's circle for biaxial stresses.
- Interpret the information available from Mohr's circle for the stress condition at any point in any orientation.
- Use Mohr's circle data to draw the principal stress element and the maximum shear stress element.
- Compute deflection of beams at selected points under different loadings using standard formulas and moment-area method.
- Discuss the principles of column design.
- Examine yield strength, ultimate strength and allowable strength for materials and select proper safety factor in design.

Statement of Relation to Curriculum(s):

- Required course for Mechanical Engineering Technology students.