**MECH 355: Continuum Mechanics (3 Credits)**

This course mainly focuses on the mechanics of continua, stress tensor, deformation and flow, constitutive relations and applications to common solids and fluids.

(Prerequisite: CIVL 301 and MECH 360)

**Course Learning Outcomes:**

By the end of the course, students will be able to:

* Identify, formulate and solve complex engineering problems by applying principles of engineering, science and mathematics.
* Develop and conduct appropriate experimentation, analysis and data interpretation, and use engineering judgment to draw conclusions.
* Acquire and apply new knowledge, using appropriate learning strategies.
* Understand linear vector spaces, relevant to continuum mechanics, and perform vector. and tensor manipulations in Cartesian and curvilinear coordinate systems.
* Describe and explain motion, deformation and forces in a continuum.
* Derive equations of motion and conservation laws for a continuum.
* Understand constitutive models for fluids and viscoelastic solids.
* Solve simple boundary value problems for fluids and solids.

**Course Materials:**

• Spencer A., Continuum Mechanics, Dover Publications.

• Coman C., Continuum Mechanics and Linear Elasticity: An Applied Mathematics Introduction (Solid Mechanics and Its Applications), Springer.

• Rubin D., Introduction to Continuum Mechanics, Pergamon Press.

• Lai W., Introduction to Continuum Mechanics, Butterworth-Heinemann.

**Course Content:**

1. The Indicial Notation
2. Tensors and Tenor Calculus
3. Curvilinear Coordinates
4. Kinematics of a Continuum
5. Stress
6. Linear Isotropic Elastic Solid
7. Linear Anisotropic Elastic Solid
8. Constitutive Equation for Isotropic Elastic Solid Under Large Deformation
9. Newtonian Viscous Fluid
10. Non-Newtonian Fluids
11. Integral Formulation of General Principles