## MECH 240L: Introduction to Engineering Materials Laboratory (1 Credit)

This course introduces students to experimental methods used to characterize engineering materials and mechanical behavior. Topics/experiments Included: experiments in mechanical properties, heat treatment, metallography, corrosion properties and X-ray diffraction. (Co-requisite: MECH 241)

**Course Learning Outcomes:**

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

A1. Demonstrate detailed knowledge and understanding of engineering materials properties of various engineering materials.

A2. Apply the method and principles of engineering materials to suggest solutions to improve material resistance to various failures.

B1. Critically analyze material properties using standard materials testing equipment and techniques to distinguish the material classification based on their properties.

B2. Gather and analyze experimental data and discuss experimental findings as they relate to material processing, structure, and property.

B3. Express and communicate ideas effectively in written and oral format.

C1. Work effectively in a team to conduct experiments, analyze data to produce written report that investigate different modes of material’s failure and material heat and cold work processes effect on material’s properties.

**Course Learning Resources:**

* Engineering Materials Lab. Handouts.
* Fundamentals of materials science and engineering, William Smith, Javad Hashemi, McGrawHill.
* Somayaji, Shan. Civil Engineering Materials, Upper Saddle River, New Jersey: Prentice Hall, 2001. ISBN: 013083906.
* E. Paul De Garmo, J.T. Black, R.A. Kohler. Materials and Processes in Manufacturing, John Wiley and Sons, Inc., NY, 11 th Edition, 2012. R. Dubrovsk.
* Laboratory Manual for ME 215A, CAPCO Pub., Oklahoma, 1998.William D. Callister, Jr.
* Materials Science and Engineering. An Introduction. John Wiley and Sons, Inc., NY, 3 Edition, 1994.

**Course Content:**

1. Atomic Structure.
2. Torsion Test.
3. Fatigue Test.
4. Tensile Testing of Metals.
5. Tensile Testing of Polymers.
6. Impact Testing of Materials.
7. Metallographic Observations.
8. Cold Work, Recovery, Recrystallization, and Grain Growth.
9. Precipitation Hardening.
10. Heat Treatment of Steel and Hardenability of Steel.
11. Corrosion of Metals.