C-ID Descriptor
Materials Science and Engineering Lab

Descriptor Details

- **Descriptor Title**: Materials Science and Engineering Lab
- **C-ID Number**: 140
- **Suffix**:
  - Lab Course (L)
- **Units**: 1
- **Date of Last Revision**: 2/26/2025 05:09:18 PM GMT+0000

General Description

This course is the experimental exploration of the connections between the structure of materials and materials properties. Laboratories provide opportunities to directly observe the structures and behaviors discussed in the lecture course (C-ID 140A), to operate testing equipment, to analyze experimental data, and to prepare reports.

Prerequisites

1 semester college-level general chemistry (e.g., CHEM 110 General Chemistry for Science Majors I, with Lab)

1 semester calculus-based physics (e.g., PHYS 205 Calculus-Based Physics for Scientists and Engineers: A)

Corequisites

C-ID ENGR 140

Advisories

N/A

Content

N/A

Lab Activities

Laboratory activities should cover a range of topics, activities, and experiments that draw from the following content:

- Atomic structure and bonding
- Crystal structures and crystallography
- Imperfections in crystals, including polycrystalline, semi-crystalline, and amorphous solids
- Diffusion
- Elastic and plastic deformation in metals
- Strengthening and toughening in metals
- Mechanical properties and testing
- Stress-strain analysis
- Mechanical failure: fracture, fatigue, creep
- Phase diagrams
- Phase transformations
- Iron-Carbon system, heat treatment of steels
- Metals and Metal Alloys
- Forming and Fabrication
- Thermal, electrical and magnetic properties, including semiconductors
- Chemical properties, including corrosion
- Structure and properties of polymers
- Structure and properties of ceramics
- Structure and properties of composites, including wood and concrete (optional)
- Selection of materials in engineering design (optional)

Course should include evaluating properties and behavior of materials based upon various standard materials testing techniques (e.g., hardness, tension, compression, impact, fatigue, creep) and processing treatments (e.g., strain hardening, recrystallization, Jominy, precipitation hardening, etc.).

Objectives

At the conclusion of the laboratory component of this course, the student should be able to:

1. Measure material properties and/or evaluate processing treatments using standard materials testing equipment and techniques.
2. Write laboratory reports that communicate the collection, analysis, and interpretation of experimental data according to professional engineering standards.

Evaluation Methods

Examinations which include problem-solving exercises, quizzes, tests, projects, laboratory reports.

*Note that not all of the methods listed are required.

Textbooks

Laboratory manuals typically developed on-site