MECH 11: Materials and Manufacturing

Credits and contact hours: 4 units, 3.25 per quarter.
Course Instructor: Panthea Sepehrband

Catalog Description:
The principles of manufacturing processes as related to materials properties, design and production. A review of structures, properties and manufacturing processes for main groups of engineering materials including metals and metallic alloys, polymers and ceramics.

Prerequisites: MECH 15 - Introduction to Materials Science

Course type: Required, sophomore level mechanical engineers

Course Learning Objectives:
The student, upon completion of this course, will be able to:

- Understand the basic principles of manufacturing processes (assessed through homework assignments, exams, and project).
- Identify the major classes of engineering materials (assessed through homework assignments, exams and group project).
- Analyze the effect of manufacturing processes on materials properties and behavior (assessed through homework assignments, exams and quizzes).
- Select a combination of appropriate materials and manufacturing methods for various engineering applications (assessed through homework assignments, exams and project).
- Applied concept of math in predicting and evaluating materials properties (assessed through homework assignments, exams and quizzes).
- Inspect a product and reason as to what processes were used to produce it (assessed through group project)
- Present results of an inspection project in a clearly written and technically justified written report (assessed through group project)

Relationship of Course to Student Outcomes:
This course contributes heavily under categories

- Ability to apply knowledge of math science and engineering (A)
- Ability to design system, component, or process to meet needs (C)
- Ability to identify, formulate, & solve engineering problems (E)

This course contributes moderately under categories

- Ability to communicate effectively (G)
- Ability to use techniques, skills, & modern engineering tools necessary for engineering practice (K)
**Topics Covered:**
- Introduction to Manufacturing Processes (Ch. 0)
- Review of the Structure of Materials (Ch. 1)
- Review of Mechanical Behavior of Materials (Ch. 2)
- Heat Treatment (Ch. 4)
- Ferrous Metals and Alloys (Ch. 5)
- Nonferrous Metals and Alloys (Ch. 6)
- Metal Casting (Ch. 10, 11)
- Metal Forming (Ch. 13-16)
- Structure and Properties of Polymers (Ch. 7)
- Forming and Shaping Polymers (Ch. 19)
- Structure and Properties of Ceramics (Ch. 8)
- Forming and Shaping Ceramics (Ch. 18)
- Structure and Properties of Composite (if time permits) (Ch. 8)
- Forming and Shaping Composite (if time permits) (Ch. 19)

**Contribution of the course to curriculum component:** Contributes one-quarter course to the engineering science component