MECH 11: Materials and Manufacturing

Course Type: Required, sophomore level mechanical engineers

Catalog Description: Manufacturing processes and their use in the production of mechanical components from metals and plastics. (4 units)

Prerequisites: MECH 10 and MECH 15

Co-requisite: None


Course Objectives: This course focuses on the structure and properties of materials, how the structure and properties influence the processing routes engineers choose, and how processing may change the material’s structure and properties. The lectures focus on manufacturing techniques that students are likely to encounter as mechanical engineers. Students learn to inspect manufactured products and reason as to what processes were used to produce them.

Topics Covered:
- Review of Stress and Strain
- Yield Strength, Work Hardening, Dislocations, Temperature Effects on Mechanical Behavior
- Other Mechanical Properties: Hardness, Fatigue, Fracture Toughness, Creep
- Alloys (Young’s Modulus, Strengthening)
- Other Physical Properties
- Phase Diagrams
- Heat Treatment of Carbon Steels
- Metals Casting
- Forging
- Extrusion and Drawing
- Sheet Metal Processing
- Polymers
- Plastics Processing
- Welding (as time permits)
- Ferrous Alloys
- Nonferrous Alloys
- Economics: Cost, Quality Control, Volume
- Rapid Prototyping
- Ceramics and Sintering (as time permits)
- Integrated Circuit Fabrication
- Nanofabrication
Class/laboratory schedule: Lecture three times per week (3 hours 15 minutes total).

Contribution of the course to Curriculum requirements: Contributes a full quarter long course to the engineering science component.

Learning Outcomes:
- Examine contemporary manufacturing processes and recognize the advantages and disadvantages of each.
- Predict how manufacturing processes may change a material’s structure and properties.
- Determine the most efficient and effective methods to manufacture a particular product.
- Inspect a product and reason as to what processes were used to produce it.

Relationship of course to program outcomes:
This course contributes heavily under categories:
- Ability to apply knowledge of math, science, & engineering (A)
- Ability to identify, formulate, & solve engineering problems (E)
This course contributes moderately under category:
- Ability to communicate effectively (G)

Prepared by Wendelin Wright, Assistant Professor, 4/17/10.