

Course Objectives/Course Outline Spokane Community College

Course Title: Materials, Processes, and References

Prefix and Course Number: APM 221

Course Learning Outcomes:

By the end of this course, a student should:

- Demonstrate the ability to utilize *Machinery's Handbook* as a reference for information about metallurgy, materials, and processes
- Describe the material composition and characteristics of the five basic metals: steel, stainless steel, cast iron, aluminum, and brass (copper)
- Describe processes commonly used to manipulate metals, including shot peening, forging, casting, and other processes
- Explain how alloys influence the characteristics of metals
- Describe the chemical transformation of metals caused by various processes
- Describe applications of physical and chemical surface treatments and coatings to metals
- Apply heat treatment processes to metals and analyze the results
- Apply Rockwell hardness testing to metals
- Apply nondestructive (NDT) techniques to various materials and analyze the results
- Identify material samples based on physical characteristics and test results
- Demonstrate proper safety procedures when handling and treating materials
- Describe standards and their applications to materials and processes
- Describe the composition and characteristics of composites, plastics, and ceramics

Course Outline:

I. Week One

- A. Safety Overview
- B. Basic Processes
- C. Machinery's Handbook

II. Week Two

- A. Material Properties
- B. Rockwell Hardness Testing
- C. Lab: Material Sample Identification

III. Week Three

- A. Steel
- B. Nonferrous metals; Aluminum
- C. Lab: Material Sample Id continued

IV. Week Four

- A. Heat Treating and Annealing
- B. Swaging
- C. Shot Peening
- D. Lab: Heat Treating and Work Hardening

V. Week Five

- A. Case Hardening
- B. Reaming, honing, press fit assembly, and heat treatment
- C. Lab: Case-Hardening Steel

VI. Week Six

- A. Midterm Exam covers skills learned in Weeks 1 - 5
- B. Open Lab

VII. Week Seven – Field Trip

(Class will meet at the field trip site. Bring a pen, notebook, safety glasses.)

- A. Field Trip – Outside Processing Plant
- B. Date, time, location TBD.

VIII. Week Eight

- A. Copper – Bronze, Brass
- B. Magnesium, Titanium, Nickel
- C. Lab: Annealing – Copper Bracelet

IX. Week Nine

- A. Plastics, Ceramics, Composites
- B. Molding and casting processes
- C. Nondestructive Testing
- D. Lab: Cuttlefish Bone Casting

X. Week Ten

- A. Lab: Microscope
- B. Nondestructive Testing
- C. Conductivity Testing

XI. Week Eleven

- A. Passivation, Anodizing
- B. Paints and Sealants
- C. MIL standards

XII. Week Twelve

- A. Final Exam covers skills learned in Weeks:
- B. 1 - 11
- C. Open Lab