

LEHIGH VALLEY CHAPTER OF ASM PRESENTS METALLURGY FOR THE NON-METALLURGIST MEI CLASS

WHERE: Carpenter Technology Research and Development Facility (Union Street & Centre Avenue in Reading, PA)

WHEN: Meeting every Wednesday (Starting 09/08/10 at 5:15pm for ~10 weeks (Approximate class length 2 hours)

COST: \$500/student (Includes Text, Supplies, Knowledgeable Instructors, and CEUs)

INSTRUCTORS: Carpenter Metallurgists -- Kurt Rohrbach and Jim Scanlon

CONTACT: Mark Burton, 610-208-3516 or MBurton@cartech.com

CLASS DESCRIPTION/CURRICULUM

Metals and alloys are used in the greatest variety of applications of all engineering materials. As such, it is important, if not essential, for those involved in manufacturing, engineering and construction to have an understanding of what metals are, how they behave and why they behave differently than ceramics, glass, and plastics. It is also important to understand how they can be made stronger or more corrosion resistant, how they can be processed into shapes by casting, forging, forming, machining, or welding, and how such processes can alter the properties of the metal or alloy in either favorable or unfavorable ways. This course provides this knowledge to those who, while not specialists in metals (i.e., metallurgists), would benefit from such an understanding.

TARGET AUDIENCE

Metal Processing Personnel Machine Shop Superintendents QA Managers Heat Treating Operators and Managers Component Designers Technicians Marketing, Technical Writers, and individuals without a materials background wishing to better understand the role of materials science

REQUIRED PRE-REQUISITES

High school chemistry and physics

LEARNING OBJECTIVES

Upon completion of this course, you should be able to:

Describe how metals behave, and why; including why and how they can be formed
Recognize how metals can be strengthened by alloying, cold-working, and heat treatment
Determine why metals and alloys are not behaving as expected and can be made to behave as needed
Choose what metal or alloy to use for specific combinations of properties

COURSE OUTLINE

Metals: A History: History of the discovery of the major commercially important metals; the first primitive refining techniques; brief descriptions of cultural significance of metals.
Extractive Metallurgy: Techniques used to win metals from mineral ores, including hydrometallurgical, pyrometallurgical, and electrometallurgical techniques.

Solidification of Metals: Introduction to the science of metallurgy, including crystal structure; concepts of solidification and solid solubility; basic binary phase diagrams.

Metal Forming: Forging, rolling, extrusion, swaging, and other techniques employed to form metals at elevated temperatures; rolling, stamping, coining, spinning, and other techniques used to form metals at ambient temperatures.

Mechanical Properties and Their Measurement: Definitions of mechanical properties and explanations of testing procedures; introduction to concepts of standardization and quality control.

Steels and Cast Irons: Applications and Metallurgy: Description of the allotropic nature of iron and its effect on the properties of steels and cast irons; listing of selected applications of steels and cast irons.

Heat Treatment of Steel: Hardness and hardenability of steel; specific processes and their applications; heat treating procedures, equipment, quenchants, and hardness measurements.

Case Hardening of Steel: Techniques used to harden the case of a metal, including carburizing, nitriding, carbonitriding; procedure for measuring case depth.

Strengthening Mechanisms: Techniques used to harden the nonferrous metals, including age hardening, strain hardening and related metallurgical concepts for aluminum, titanium, copper, and other nonferrous metals.

Nonferrous Metals: Industrial Applications and Properties: Light metals, aluminum, beryllium, magnesium, and titanium; copper and its alloys; lead, tin, and zinc; precious metals.

Joining: Techniques of welding, brazing, and soldering, including descriptions of specific applications of each process described.

Corrosion and Corrosion Prevention: Causes of corrosion and the environmental factors which contribute to it; types of corrosion are discussed, together with techniques for minimizing it.

Quality Control and Failure Analysis: Procedures for predicting and/or evaluating the performance of metals in service.

Materials Characterization and the Selection Process: Explanation of the designation systems for classes of metals and alloys in worldwide use today; descriptions of factors which affect the selection of a material for a particular application; brief comparison of polymers and ceramics related to metals; case studies of material selection problems.

If you have any questions, or if you are interested in attending these ASM MEI classes, please contact Mark Burton, Metallurgist, at 610-208-3516 or at mburton@cartech.com no later than August 1st.