

ASMI LEHIGH VALLEY CHAPTER PRESENTS MEI COURSE #0135: METALLURGY FOR THE NON-METALLURGIST

Issue Date: November 09, 2015

WHERE: Materion Brush Performance Alloys
230 Shoemakersville Road
Shoemakers, PA 19555

WHEN: Classes are to be held every Wednesday evening, starting January 13, 2016 at 5:30 PM for 10 weeks. Class Length is approximately 2 hours

COST: \$600/student
(Includes Course Manual, Supplies, Knowledgeable Instructors, and CEUs)

INSTRUCTORS: Experienced Carpenter Metallurgists

- Kurt Rohrbach – Former Director, Forged Bar & Billet Business Group (retired)
- Gian Colombo – Principal Metallurgist –Research & Development

REGISTRATION DEADLINE BY: Wednesday, December 30, 2015

Please contact Greg Del Corso, ASMI LVC Education Chairman to register for this class or for questions regarding the class (email: gregdelcorso@gmail.com; cell phone 610-223-9193).

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, testing, engineering and construction to have an understanding of what metals are, how they behave, and why they are different than ceramics, glass, and plastics. It is also important to understand how metals 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 or Testing Personnel, Machine Shop Superintendents, Technicians
- Quality Assurance Personnel
- Heat Treating Operators and Managers
- Sales, Marketing, Commercial, Financial, Engineering, and other individuals without a materials background who want to better understand the role of materials science in the performance of their job responsibilities and career paths

Learning Objectives: Upon completion of this course, you will be able to:

- Describe how and why metals behave the way they do and how they can be formed.
- Recognize how metals can be strengthened by alloying, cold-working, and heat treatment.
- Determine why metals and alloys do not always behave as expected and how they can be made to behave as-needed.
- Determine what metal or alloy can be used for a specific combination of properties.

Required Pre-requisites: High school chemistry and physics.

Course Outline:

1. **Metals:** History of the discovery of the major commercially important metals; the first primitive refining techniques; brief descriptions of cultural significance of metals.
2. **Extractive Metallurgy:** Techniques used to extract metals from mineral ores, including hydrometallurgical, pyrometallurgical, and electrometallurgical techniques.
3. **Solidification of Metals:** Introduction to the science of metallurgy, including crystal structure; concepts of solidification and solid solubility; basic binary phase diagrams.
4. **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.
5. **Mechanical Properties and Their Measurement:** Definitions of mechanical properties and explanations of testing procedures; introduction to concepts of standardization and quality control.
6. **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.
7. **Heat Treatment of Steel:** Hardness and hardenability of steel; specific processes and their applications; heat treating procedures, equipment, quenchants, and hardness measurements.
8. **Case Hardening of Steel:** Techniques used to harden the case of a metal, including carburizing, nitriding, carbo-nitriding; procedure for measuring case depth.
9. **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.
10. **Nonferrous Metals:** Industrial Applications and Properties: Light metals, aluminum, beryllium, magnesium, and titanium; copper and its alloys; lead, tin, and zinc; precious metals.
11. **Joining:** Techniques of welding, brazing, and soldering, including descriptions of specific applications of each process described.
12. **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.
13. **Quality Control and Failure Analysis:** Procedures for predicting and/or evaluating the performance of metals in service.
14. **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.

Successful Completion of this ASMI MEI Course also includes the following:

1. Three Continuing Education Credits and a Certificate of Course Completion
2. One year of free ASMI Membership