

Course Syllabus

A Hands-On Introduction to Metalcasting



Course Code 1-100L	CEUs 1.7 CEUs
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Course Introduction

This course introduces the process of metalcasting. It provides a broad picture of what happens in a casting facility, while illustrating the technology, variables and complexity involved in producing a casting. It covers casting design, alloy selection, process selection, design of the gating system, pouring and shakeout methods, cleaning and finishing methods, quality assurance, and safety and environmental regulations.

Benefits to Taking the Course:

Attendees will gain valuable insight by participating in the making of several castings throughout the 3 day course, and will leave the course understanding the basic process of making a casting and key decisions to be made in metalcasting facilities.

Learning Outcomes

1. Describe the metalcasting industry by defining the term metalcasting, listing at least 5 end-use markets for metalcastings, and listing at least two challenges facing the industry.
 - a. Define the term metalcasting.
 - b. Identify the current state of the metalcasting industry by listing five end use markets and listing two challenges facing the industry.
 - c. Explain the role of technology in the metalcasting process.
2. Summarize the overall process of how a casting is made from part design through delivery to the customer.
 - a. Identify at least 3 characteristics that must be considered when designing castings.
 - b. Describe the basic characteristics of the major alloys used in metalcasting.
 - c. List at least 3 criteria that must be considered when selecting an alloy.
 - d. Name the processes available for producing a cast part, outline the basic steps of each, and summarize at least two advantages and two disadvantages of each.
 - e. Name at least three different factors involved in determining which process should be used for a given cast part.
 - f. Explain the function of the gating and risering system, and identify the individual components of the system.
 - g. Explain the role of the gating and risering system in determining casting quality.
 - h. Name the furnaces used in the metalcasting industry, and describe the factors considered when a foundry determines which furnace(s) to use.
 - i. Explain the different methods by which molten metal is poured into a mold.
 - j. Explain the different methods by which the solidified casting may be removed from the mold.
 - k. Explain the purpose of cleaning and finishing a casting, and describe at least three methods that may be used.
3. Describe the quality assurance methods and measures used to ensure castings meet customer specifications.
 - a. Describe at least five quality assurance tests, and identify whether they would be conducted pre or post casting.
 - b. Describe at least two specifications for quality assurance testing.
4. Explain the importance of safety in the metalcasting industry.

Lesson Outline

- Introduction
- What is Metalcasting?
 - Definition
 - Examples
 - Industry Overview
- Casting Design
- Alloy Selection
 - Types of alloys
 - Alloy selection
- Casting Processes part 1
 - Lab: Lost Foam, Investment Casting
- Casting Processes part 2
 - Lab: Green Sand Molding
 - Demos: Coldbox, Nobake, Shell
- Gating & Riser Systems
 - Components
 - Impact of design on quality
- Making the Casting
 - Melting technology
 - Pouring methods
 - Lab: Pour Castings
 - Demo: Permanent Molding
- Cleaning & Finishing the Casting
 - Removing the casting from the mold
 - Tools, equipment, materials and methods
 - Lab: Shake-out and Clean Castings
- Quality Assurance
 - QA Testing
 - Defects
 - Demo: Quality Tests
- Case Studies

Instructional Methods:

- Lecture
- Hands-on laboratories
- Case Studies
- Video
- Discussion
- Action Plan

Assessment Methods:

No formal assessment will take place in this course; however, attendees will participate in informal activities such as knowledge check and Q&A sessions with the facilitators to verify that learning outcomes are being met. Assessment of successful achievement of learning outcomes must be included throughout the course in order to meet the ANSI/IACET 1-2013 standard for continuing education programs and for CEUs to be awarded.

Texts, Books or other Resources available for purchase:

- AFS Metalcasting Principles & Techniques
<http://www.afsinc.org/ProductDetail.cfm?ItemNumber=15853>

Attendee Requirements to Earn CEUs:

1. Present at least 15 hours of the total 17 hours of instructional time (90%), which does not include meals or breaks.
2. Active participation (can include asking questions, communicating with other attendees during and taking part in group activities, providing responses during whole class or group discussions).
3. Successful achievement of learning outcomes.

Who Should Attend?

- Designers
- Engineers – industrial, metallurgical, mechanical, process, project, manufacturing, material
- Shop personnel
- Office personnel
- Sales/Marketing professionals
- Quality Control personnel
- Casting Buyers
- Casting Sales
- Individuals without a metals background wishing to better understand the role of casting from design through production
- Those new to the metalcasting industry, as well as those who have previous experience