Course Syllabus

Casting Design

Course Code	CEUs
8-310	1.2 CEUs

Course Introduction

This course addresses principles of effective metalcasting design by delving into the major factors that affect final part design. Participants will explore alloy selection, metalcasting process capabilities and limitations and their effects on casting design, and the impact of secondary operations. Other major topics will include design for manufacturability, fab to casting design conversions, dimensional control, and the importance of casting simulation. Discussion and case studies will be used throughout this 2 day course to illustrate effective and practical casting design principles. Participants should have knowledge and experience in designing engineered components prior to attending this course.

Learning Outcomes

1. Describe the effect of different alloy characteristics on a finished casting product
2. Identify material property factors to be considered when choosing a casting alloy
3. Identify how production and service requirements affect the casting method chosen
4. Choose an appropriate casting process based on the complexity and manufacturability of a part
5. Identify the secondary operations that affect casting design
6. Identify factors that control casting tolerance
7. Describe the benefits of simulation in casting design

Lesson Outline

<u>Module 1: Approach to Design</u>

- Lesson 1: Understanding the end product
  - Machining case study
- Lesson 2: Design approach
  - Examples of decision processes
  - Initial design exercise

<u>Module 2: Cast Materials</u>

- Lesson 1: Selecting a casting alloy
  - Iron, steel, aluminum, copper-based, magnesium, zinc, super-alloys and rarities
  - Case study
- Lesson 2: Comparison of alloy selection
  - Alloy Properties
  - Examples
  - Case study

<u>Module 3: Selecting a metalcasting process</u>

- Lesson 1: Considerations
- Lesson 2: Casting methods
- Lesson 3: Pre and post casting considerations
  - Rapid prototyping

<u>Module 4: Practical Casting Design</u>

- Lesson 1: Dimensional control
  - Changes associated with metal conditions, mold materials, shakeout and shot cleaning/peening, grinding and fettling, core position and stackups
  - Shrinkage (types and affects)

Junction design
Transition design (thick-to-thin sections)
Taking advantage of the casting process while maintaining manufacturability
Lesson 2: Consideration of secondary operations in design
Lesson 3: The value of casting simulation
Lesson 4: Design Conversions (fabrication-to-casting)
Examples
Considerations (material modulus vs. steel & UTS)
Case study activity

Instructional Methods:

- Class discussion
- Group activities
- Individual problem solving
- Case studies

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 facilitator 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.

Recommended Course Prerequisites:

- *Introduction to Metalcasting* course
- Experience designing engineered components

Texts, Books or other Resources available for purchase:

- Designing & Purchasing Metal Castings, AFS Publication
  http://www.afsinc.org/ProductDetail.cfm?ItemNumber=15611

Attendee Requirements to Earn CEUs:

1. Present at least 11 hours of the total 12 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?

The target audience for this course consists of individuals responsible for:

- buying from casting suppliers.
- designing/engineering cast components.