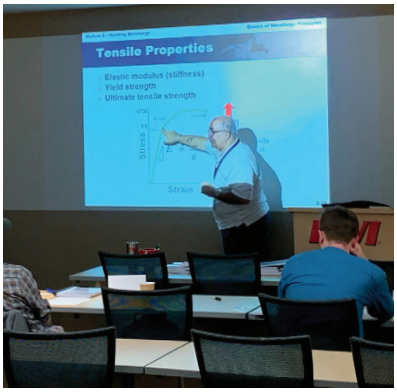
Fundamentals of Welding Engineering

Five-day Course | Columbus, Ohio

EWI offers "Fundamentals of Welding Engineering," a one-week course, structured around qualifying a welding procedure to meet the requirements of both ASME Section IX and AWS D1.1-Structural Welding Code - Steel. Sessions cover welding processes, including resistance and solid-state, laser, and most arc welding processes; welding design and mechanical testing; welding metallurgy and weldability; and nondestructive evaluation. Each of these topics meets code requirements. The last day involves completing procedure qualification records (PQR), welding procedure specifications (WPS), and welder qualification test records to meet the requirements of both codes. In addition to class lectures, the course includes hands-on arc welding of test plates and inspection of welds and demonstrations of other welding processes. To learn more about the Fundamentals of Welding Engineering course, contact Allison Kupferman, Outreach & Engagement Coordinator, at **akupferman@ewi.org**.



Course Outline

MODULE 1 – INTRODUCTION

- Course Overview
- Welding Codes Overview

MODULE 2 – WELDING PROCESSES

- Introduction to Arc Welding Processes
  - Arc Welding Power Sources
  - Shielded Metal Arc Welding
  - Gas Tungsten Arc Welding
  - Gas Metal and Flux Cored Arc Welding
  - Other Arc Welding Processes
- Introduction to High Energy Density Welding Processes
  - Laser Welding
  - Electron Beam Welding
- Introduction to Non-Arc Welding Processes
  - Resistance Welding
  - Solid-State Welding

MODULE 3 – WELDING METALLURGY

- Basics of Metallurgy Principles
- Basics of Welding Metallurgy
- Carbon and Low-Alloy Steels
- Preheat, PWHT, and Temper Bead Welding
- Stainless Steels
- Other Nonferrous Alloy Systems
- Thoughts on Weld Procedure Qualification

MODULE 4 – WELDING DESIGN AND TESTING

- Joint Design
- Welding Symbols
- Residual Stress and Distortion
- Mechanical Testing

MODULE 5 – WELDABILITY

- Weld Defect Types
  - Solidification and Liquation Cracking
  - Solid-State Cracking
  - Hydrogen-Induced Cracking
  - Fatigue and Fracture
- Corrosion
- Fractography
- Case Studies

MODULE 6 – NDE

- Types of Nondestructive Tests
  - Visual Testing (VT)
  - Liquid Penetrant Testing (PT)
  - Magnetic Particle Testing (MT)
  - Eddy Current Testing (ECT)
  - Radiographic Testing (RT)
  - Ultrasonic Testing (UT)

MODULE 7 – QUALIFICATION & PROCEDURE REVIEW

- Procedure Qualification
- Performance Qualification

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