

# Fundamentals of Welding Engineering



## OVERVIEW

This five-day course provides engineers and technicians an overview of the various aspects of welding technology. The course is organized into modules discussing welding processes, welding metallurgy and weldability, welding design and testing (including mechanical testing and NDT), and qualifications and procedure review. Students will leave with an appreciation for welder skills and a solid understanding of welding variables and their effect of weld quality.

Earn 40 CPD credits

## COURSE MODULES & LEARNING OBJECTIVES

### MODULE 1 - INTRODUCTION

- Provide the students with an overview of the topics to be covered including: welding processes, metallurgy, welding defects, weldability, welding symbols, mechanical testing, NDT, and code requirements.

### MODULE 2 - WELDING PROCESSES

- Welding basics and power supplies
- Welding processes with some hands-on instruction, demonstrations and code requirements, when applicable
- Welding automation (Manual, Semi-Automatic, Mechanized, Automated)
- Essential, non-essential, and supplementary essential variables
- Advantages and limitations

### MODULE 3 - WELDING METALLURGY, WELDABILITY, AND DEFECTS

- Basic metallurgy principles (composition and phase diagram overview)
- Welding metallurgy (cooling rates, regions of a weld, etc.)
- Alloy systems (focus on carbon and low-alloy steel and stainless steel with an overview of nickel alloys, other non-ferrous alloys, and polymers)
- Defect types
- Cracking phenomena (solidification cracking and liquation cracking, solid state cracking, hydrogen-induced cracking, fatigue, and fracture)
- Corrosion

### MODULE 4 - WELDING DESIGN AND TESTING

- Joint types and designs
- Welding symbols
- Mechanical testing
- Residual stress and distortion
- NDT principles and process descriptions (VT, PT, MT, ECT, RT, UT)



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## **MODULE 5 - CODES AND STANDARDS**

- ASME Section IX overview
- Weld Procedure Specifications (WPS)
- Procedure Qualification Record (PQR)
- Weld qualifications
- Other codes
- Effective use of standards

## **MODULE 6 - SUMMARY**

- Review of class objectives through case history or application examples
- Several welding procedure practical applications will be discussed
- Course feedback and evaluation

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