

Laser Welding

CERTIFICATE COURSE

FMA



Certificate Course Outline

Gain knowledge needed to build the foundation for sound laser welding and process implementation from setup to final weld inspection. This is a comprehensive 3-day course that covers concepts, fundamentals, and applications of laser welding technology. You'll be able to confidently engineer, design, and weld like and unlike materials, and troubleshoot common problems. Topic placement subject to change based on attendee needs.

Learning Objectives

Laser Basics

- Review the introduction to lasers, including properties, generation principles, components, and materials/pump sources.

Types of Industrial Lasers

- Review types of industrial lasers, including CO2, excimer, fiber, disk, direct diode, and blue (GaN) diode lasers.

Laser Operation Modes

- Review continuous and pulsed laser modes, including Q-switching and mode-locking, along with symbols, definitions, and units of pulse laser.
- Review second-harmonic generation (SHG) and third-harmonic generation (THG).
- Review techniques for laser beam delivery, including reflective and transmissive optics, beam expanders, and laser beam scanning systems.
- Review CO2 and fiber laser modes, beam shaping, and calculations related to CO2 and fiber/disk lasers.
- Review devices for measuring wavelength, power/energy, and beam profile.

Laser Welding

- Review advantages of laser welding and its modes, including conduction and keyhole welding.
- Review parameters affecting laser welding, such as wavelength, focus position, depth of focus, power, density, mode, beam shaping, remote welding, hybrid welding, and properties of materials including composition, thermal properties, and surface conditions.
- Review welding speed, alignments, shielding gas, and fume extraction systems.

Advanced Topics

- Review surface and internal defects in laser welding.
- Review techniques for welding similar and dissimilar materials, including stainless steel, galvanized steel, aluminum, aluminum/steel, and aluminum/copper.
- Review common troubleshooting issues, optics cleaning, and safety protocols.