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Course Name

Turning and Welding Training Program

Sector Name

Mechanical Engineering

Document Type

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Turning and Welding Training Program

Course Introduction

This training program is designed to provide participants with a comprehensive, hands-on approach to mastering advanced techniques in both turning (machining) and welding.

This training is ideal for those who already have a basic understanding of these processes and seek to refine their skills for more complex applications.

The program focuses on enhancing precision, optimizing machine and welding setups, and integrating both disciplines to handle intricate manufacturing tasks found in industries such as aerospace, automotive, and heavy machinery.

The program aims to develop the technical proficiency necessary to meet the challenges of modern industrial manufacturing and to ensure participants are capable of working on high-precision projects, with a strong emphasis on quality, efficiency, and safety.

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Target Audience

- ✓ Technicians & Skilled Workers – Handling machining, turning, and welding tasks.
- ✓ Engineers (Mechanical, Manufacturing, Industrial, etc.) – Designing and optimizing welding and machining processes.
- ✓ Maintenance & Repair Personnel – Performing welding and turning for equipment maintenance.
- ✓ Supervisors & Workshop Managers – Overseeing machining and welding operations.
- ✓ Apprentices & Trainees – Developing hands-on skills for industrial applications.

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Learning Objectives

- ✓ Master the setup and operation of CNC and manual lathes for high-precision machining.
- ✓ Perform complex turning operations, including multi-axis turning, threading, and contouring.
- ✓ Program CNC lathes using G-codes and M-codes for advanced part production.
- ✓ Optimize cutting parameters (speed, feed rates, and tool selection) for various materials.
- ✓ Develop advanced MIG welding techniques, including pulse welding, spray transfer, and multi-pass welding.
- ✓ Master TIG welding processes for welding thin and thick materials with precise heat control.
- ✓ Perform advanced Stick and Flux-Cored Arc Welding (FCAW) on thicker materials and structural steel.
- ✓ Achieve high-quality welds with minimal defects, and troubleshoot common issues such as porosity, undercut, and excessive spatter.
- ✓ Understand and apply advanced joint design principles to create stronger, more efficient welds.
- ✓ Weld complex joints (butt, T-joint, corner, and bevel joints) with different welding processes.
- ✓ Gain expertise in welding in various positions (flat, vertical, overhead) and optimize results for each position.

- ✓ Understand the effects of heat treatment and material properties on welding and turning processes.
- ✓ Apply appropriate pre- and post-weld heat treatment to ensure weld strength and prevent material distortion.
- ✓ Perform machining on heat-treated materials with high accuracy.
- ✓ Combine turning and welding techniques in real-world applications, such as machining and welding parts for mechanical assemblies.
- ✓ Optimize the fit-up and alignment of turned parts to ensure strong and precise welded joints.
- ✓ Solve complex production challenges that require both turning and welding skills.
- ✓ Identify and resolve issues in both turning and welding processes to improve product quality and efficiency.
- ✓ Apply best practices for safety, machine maintenance, and material handling to reduce downtime and ensure optimal performance.
- ✓ Produce complex parts that meet industry standards for precision, strength, and durability.
- ✓ Complete multi-step projects involving both turning and welding operations, ensuring high-quality finishes and functional designs.

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Course Outline

✓ 01 DAY ONE

Introduction to Turning and Welding

- ✓ Overview of turning and welding processes.
- ✓ Turning: Explanation of the lathe machine, its components, and basic operations.
- ✓ Welding: Introduction to welding types (MIG, TIG, Stick), safety, and basic equipment.
- ✓ Proper PPE (Personal Protective Equipment) for both turning and welding.
- ✓ Workplace safety protocols for handling machines and welding tools.

Hands-on Activities:

- ✓ Turning: Basic lathe machine operation (off and on, adjusting speed).
- ✓ Welding: Safety gear fitting and proper positioning.

Introduction to the Lathe Machine

- ✓ Understanding the lathe machine: components (bed, headstock, tailstock, carriage, etc.), controls, and functions.
- ✓ Different cutting tools and their functions.
- ✓ Setting tool height and cutting speed.
- ✓ Advanced operations: threading, boring, and knurling.

✓ Understanding cutting fluids and their importance.

Hands-on Activities:

✓ Creating various shapes on the lathe (e.g., tapered shapes, faces, and grooves).
✓ Setting up the lathe for threading.
✓ Creating internal and external threads.

Exercises:

✓ Practicing face turning and cutting external threads.
✓ Knurling a piece of metal.
✓ Boring a hole with proper alignment.

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Course Outline

✓ 02 DAY TWO

Advanced Turning Operations

- ✓ Complex turning operations: multi-axis turning, profile turning, and contouring.
- ✓ Understanding advanced tool paths, tool wear, and cutting tool materials.
- ✓ Optimization of cutting speed and feed rates.

Hands-on Activities:

- ✓ Execute advanced turning techniques such as profile turning and tapering on cylindrical parts.
- ✓ Setting up for multi-axis CNC turning operations (if available).

Exercises:

- ✓ Turn a tapered shaft with a specific finish.
- ✓ Perform contour turning on a complex piece.

CNC Lathe Programming and Operations

- ✓ Introduction to CNC lathe programming: G-codes and M-codes.
- ✓ Programming strategies for complex parts.

✓ CNC toolpath simulation and optimization.

Hands-on Activities:

✓ Create basic CNC programs for turning complex parts.
✓ Run simulated CNC programs on the lathe and observe the effects of the settings.

Exercises:

✓ Program and machine a simple part with multiple features (e.g., grooving, boring, threading) using a CNC lathe.
✓ Troubleshoot errors during CNC program execution.

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✓ 03 DAY THREE

Advanced Welding Techniques: MIG and TIG Welding

- ✓ Advanced MIG welding techniques: pulse welding, spray transfer, and short-circuit transfer.
- ✓ Advanced TIG welding techniques: using a foot pedal for heat control, back-purge gas, and multi-pass welding.

Hands-on Activities:

- ✓ Practice on advanced MIG welding using pulse welding and adjusting wire speed for specific materials.
- ✓ TIG welding on thicker materials (e.g., ¼-inch or thicker) with precise heat control.

Exercises:

- ✓ Perform a MIG weld using pulse mode to improve control of heat and penetration on a thicker piece.
- ✓ TIG weld a multi-pass weld on stainless steel.

Advanced Welding Techniques: Stick and Flux Core Arc Welding

- ✓ Stick welding (SMAW): welding with different electrodes, including low-hydrogen electrodes.

- ✓ Flux core arc welding (FCAW): understanding its use on thicker materials and its applications.

Hands-on Activities:

- ✓ Perform deep penetration welding with stick welding on thicker materials.
- ✓ Weld using flux-cored wire on a heavy-duty pipe or plate for multi-pass applications.

Exercises:

- ✓ Complete a deep penetration weld using SMAW.
- ✓ Use FCAW for heavy-duty welding on plates or structural steel.

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Course Outline

✓ 04 DAY FOUR

Advanced Joint Design and Welding Positioning

- ✓ Joint design: bevel angles, weld types, and preparing complex joints (butt, corner, T-joints).
- ✓ Welding in different positions (flat, horizontal, vertical, overhead).
- ✓ Factors influencing weld strength: material, joint geometry, and heat input.

Hands-on Activities:

- ✓ Prepare and weld complex joint types, such as double bevels or reinforced butt joints.
- ✓ Practice welding in difficult positions (overhead and vertical-up welding).

Exercises:

- ✓ Complete a fillet weld on a complex joint with specific angle requirements.
- ✓ Perform a vertical-up and overhead weld.

Welding Process Optimization and Troubleshooting

- ✓ Understanding welding parameters: voltage, current, travel speed, and their impact on the weld.

- ✓ Common welding defects and their causes (porosity, undercut, lack of fusion, etc.).
- ✓ Techniques for optimizing efficiency in welding: proper heat control, proper fit-up, and pre-heating.

Hands-on Activities:

- ✓ Troubleshoot common welding defects and adjust parameters to resolve them.
- ✓ Optimize travel speed, voltage, and current for a specific application.

Exercises:

- ✓ Identify and correct welding defects in practice pieces.
- ✓ Perform test welds with optimized parameters, ensuring no defects like porosity or spatter.

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✓ 05 DAY FIVE

Advanced Metallurgy for Welding and Turning

- ✓ Understanding metallurgy: material properties (hardness, tensile strength, heat treatment).
- ✓ The effects of heat on different materials during turning and welding.
- ✓ Pre- and post-welding heat treatments to improve weld quality and material properties.

Hands-on Activities:

- ✓ Weld on different materials, such as mild steel, stainless steel, and aluminum, to understand the impact of heat on each.
- ✓ Turn and finish parts made from high-carbon steel and alloy steel to demonstrate the effects of heat treatment on turning operations.

Exercises:

- ✓ Weld a multi-material assembly (e.g., mild steel and aluminum) and observe material behavior.
- ✓ Perform precision turning on a hardened steel workpiece.

Integration of Turning and Welding Skills

- ✓ Integrating turning and welding in manufacturing processes.
- ✓ Tolerances and finish requirements when welding turned parts.

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Confirmed Sessions

FROM	TO	DURATION	FEES	LOCATION
Jan. 4, 2027	Jan. 8, 2027	5 days	4950.00 $	Spain , Barcelona
May 24, 2027	May 28, 2027	5 days	4250.00 $	UAE , Abu Dhabi
Aug. 8, 2027	Aug. 12, 2027	5 days	4250.00 $	KSA , Riyadh
April 5, 2027	April 9, 2027	5 days	4250.00 $	UAE , Abu Dhabi

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