



Technical Training Lab at Columbus State





Welcome

The MEP Technical Training Lab (TTL) learning program at Columbus State Community College is a blended approach to technical development. We mix online curriculum with hands-on lab instruction to accelerate your learning. The web-based training is a competency-based program available 24 hours per day. You may access coursework within the lab or at your location. After completion of the virtual training, a series of hands-on lab experiences will be conducted in the Technical Training Lab located at Columbus State during scheduled lab hours.

Getting Started

- After completing a registration form, you will receive an email welcoming you to Columbus State Community College online/lab learning. This email will contain an activation code and instructions on how to activate your account.
- Once the account has been activated you will have a specific amount of time to complete the online curriculum.

The Basics

- The TTL learning program consists of topics such as AC/DC electrical systems and basic pneumatics. Each topic comprises a series of learning activity packets (LAPs). For example, AC/DC Electrical System LAP 1 is Basic Electrical Circuits. Each LAP is broken down into segments, and each segment consists of objectives, activities, and skills.
- The TTL team will set up a training plan for you to complete a certain number of LAPs in a specified timeframe. For example, complete AC/DC Electrical System LAPs 1 and 2 during Week One, complete LAP 3 and 4 during Week Two, etc.
- A pre-quiz must be taken before launching a LAP.

- After completion of the pre-quiz, the launch button will allow access to the educational content.
- Upon completing the LAP, a post-quiz must be completed.
- In some instances, programs include virtual labs. Those labs are to be completed using virtual trainers as part of the online/lab curriculum.
- You will have access to an online scheduling tool to reserve hands-on learning equipment upon completion of at least one web-based LAP. The scheduling tool will notify faculty and staff about what you will be completing.

Contact Information

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MEP Technical Training Lab Certificate Programs

TTL CERTIFICATES	TTL COURSES	COURSE HOURS	COST
Electrical Certificate 1	AC/DC Electrical Systems Electric Motor Control Variable Frequency AC Drives	80	\$2 ,688
Electrical Certificate 2	Electrical Wiring Systems Rotating Electric Machines	40	\$1, 344
Allen-Bradley ControlLogix 5500 Certificate	Allen-Bradley ControlLogix 5500	72	\$1, 613
Allen-Bradley CompactLogix - Studio 5000 Certificate	Allen-Bradley CompactLogix - Studio 5000 PLC	60	\$ 2,284
Allen-Bradley CompactLogix - Factory Talk View Certificate	Allen-Bradley CompactLogix - Factory Talk View	42	\$ 1,620
Fluid Power Certificate Hydraulics	Basic, Intermediate, and Advanced Hydraulics	48	\$1, 612
Fluid Power Certificate Pneumatics	Basic, Intermediate, and Advanced Pneumatics Pneumatic Troubleshooting	68	\$2, 284
Plastics Technology Certificate	Manufacturing Processes	20	\$1,000
Mechanical Certificate 1	Mechanical Drives 1 Mechanical Drives 2 Mechanical Drives 3	84	\$2, 822
Process Control Certificate	Pump Systems Process Control System Thermal Process Control	92	\$ 3,091
Instrumentation Certificate	PLC Troubleshooting Process Control System ControlLogix Process Control	104	\$3 ,494
Multicraft Technician Certificate	AC/DC Electrical System Electric Motor Control Basic Pneumatics Mechanical Drives 1 Intro to Welding and Welding Concepts	136	\$ 4,300
Maintainer/Operator Certificate	Safety Awareness Measurement and Gauging Mechanical Drives System 1 Basic Pneumatics AC/DC Electrical Systems Electric Motor Control 21 st Century Job Skills	40	\$1,400

Electrical Certificate 1

80 Hours | Theory/Hands-on

AC/DC Electrical Systems

AC/DC Electrical Course teaches fundamentals of AC/ DC electrical systems used for power and control in industrial, commercial, agricultural, and residential applications using virtual training technology. Students learn industry-relative skills included in subject areas such as:

- 1. Basic Electrical Circuits
- 2. Electrical Measurements
- 3. Circuit Analysis
- 4. Inductance and Capacitance
- 5. Combination Circuits
- 6. Transformers

Variable Frequency AC Drives

Variable frequency AC drives teaches variable frequency AC solid-state control of 3-phase electric motors. Learners develop knowledge in the operation, installation, performance analysis, troubleshooting, and design of AC solid state control using 2-wire, 3-wire, manual, and open-loop speed control. Highlights motor jogging and dynamic braking as well as programmable acceleration and deceleration.

- 1. Introduction to Variable Frequency AC Drives
- 2. Variable Frequency AC Drives Speed and Torque Control
- 3. Variable Frequency AC Drives -Acceleration/Deceleration and Braking
- 4. Variable Frequency AC Drives Fault Diagnostics and Troubleshooting

Electric Motor Control

Electric motor control teaches electric relay control of AC electric motors found in industrial, commercial, and residential applications. Learners gain understanding of the operation, installation, design, and troubleshooting of AC electric motor control circuits for many common applications. Develops skills in interpreting schematics, system design, motor start/stop circuits, motor sequence control, reversing motor control, and motor jogging. Safety is emphasized throughout, highlighting motor safety, lockout/tagout and safety interlocks. Students learn industry-relevant skills included in subject areas such as:

- 1. Introduction to Electric Motor Control
- 2. Manual Motor Control and Overload Protection
- 3. Control Transformers
- 4. Control Ladder Logic
- 5. Control Relays and Motor Starters
- 6. Introduction to Troubleshooting
- 7. Systems Troubleshooting
- 8. Reversing Motor Control
- 9. Automatic Input Devices I
- 10. Basic Timer Control: On-Delay and Off-Delay

Electrical Certificate 2

40 Hours | Theory/Hands-on

Electrical Wiring Systems

Industrial Electrical Wiring introduces concepts used in many industry tasks in electrical wiring. Learners will describe the function of electrical prints, panels, the wiring between panels, and wire color coding. They will also learn concepts in control system wiring fundamentals, wiring between and outside panels, panel wiring, wire bundling, and experience a project in how to wire an electrical machine.

- 1. Introduction to Electrical Control Wiring
- 2. Electrical Control System Wiring

Rotating Electric Machines

Basic Electrical Machines introduces electrical circuits and works through many industry tasks in Electrical Systems.

- 1. DC Series Motors
- 2. DC Shunt and Compound Motors
- 3. Motor Speed and Torque
- 4. Motor Performance
- 5. Split-Phase AC Motors
- 6. Capacitor-Start AC Motors
- 7. Permanent Capacitor and Two-Capacitor Motors
- 8. Three-Phase AC Induction Motors

Allen-Bradley ControlLogix 5500 Certificate

72 Hours - Theory/Hands-on

This course will teach how to design, program and operate a PLC to control a number of process applications used by industries all over the world. The skills learned are in high demand everywhere today. These skills include orientation, operation, programming, memory organization, program analysis, motor control, discrete I/O interfacing, troubleshooting, systems troubleshooting, event sequencing, application development timer instructions, counter instructions, program control instructions, and math and data move instructions.

- 1. Introduction to Programmable Controllers
- 2. Basic PLC Programming
- 3. PLC Motor Control
- 4. Discrete I/O Interfacing
- 5. PLC Timer Instructions
- 6. PLC Counter Instructions

- 7. Introduction to PLC Troubleshooting
- 8. PLC Systems Troubleshooting
- 9. Event Sequencing
- 10. Application Development
- 11. Program Control Instructions
- 12. Math and Data Move Instructions

Allen-Bradley CompactLogix Studio5000PLC

60Hours-Theory/Hands-on

Programmable Logic Controllers (PLC) are the backbone of automated processes in modern industry. This course covers program editing, basic PanelView Plus terminal operation, PLC motor control, analog inputs/outputs and more.

- 1. Introduction to Programmable Controllers
- 2. PC-PLC Connections
- 3. Controller Operation
- 4. PanelView Plus Terminal-PLC Connections
- 5. PanelView Plus Terminal Operation
- 6. PLC Programming
- 7. PLC Memory Organization
- 8. Project Creation and Organization
- 9. Programming Software, Analysis and Documentation
- 10. PLC Motor and Variable Speed Drive Control Basics
- 11. Data Types, User-Defined Tags, and Interlock Options
- 12. Timer Instructions and Time-Driven Sequencing
- 13. Counter Instructions
- 14. Event Sequencing
- 15. Program Initialization and Master Control Reset
- 16. Subroutines
- 17. Math and Data Move Instructions

Allen-Bradley CompactLogix Factory Talk View

42 Hours-Theory/Hands-on

FactoryTalk[®] View Machine Edition Software is a versatile Human-Machine Interface (HMI) application that provides a dedicated and powerful solution for machine-level operator interface devices.

- 1. FactoryTalk View Studio Machine Edition
- 2. Application Displays and objects
- 3. PanelView Plus Application Editing
- 4. Alarms, Diagnostic, and Information Messages
- 5. Analog Inputs Sensors
- 6. Analog Input Default Configuration and Operation
- 7. Analog Input Tag Structures and Parameterization
- 8. Comparison Instructions and On/Off Control
- 9. Analog Output Devices and Modules
- 10. Analog Output Configuration
- 11. Variable Speed Drives and PWM Temperature Control
- 12. Stepper Motor Control

Fluid Power Certificate Hydraulics

48 Hours | Theory/Hands-on

Basic Hydraulics

Basic Hydraulics introduces hydraulic power use and application, allowing learners to develop skills and knowledge needed to apply hydraulics in modern industry. It takes learners through key topics and skills in hydraulic power and safety, hydraulic circuits, hydraulic schematics, the principles of hydraulic pressure and flow, and hydraulic speed control circuits. It covers pumps, fluid friction, how to connect hydraulic circuits, hydraulic cylinders and valves (including needle valves), and a wide array of hydraulic applications.

- 1. Hydraulic Power Systems
- 2. Basic Hydraulic Circuits
- 3. Principles of Hydraulic Pressure and Flow
- 4. Hydraulic Speed Control
- 5. Pressure Control Circuits

Intermediate Hydraulics

Intermediate Hydraulics builds on Basic Hydraulic skills teaching hydraulic components and system applications. Students learn industry-relevant skills related to new topics including operation, installation, performance analysis, and design. These topics include accumulator sizing, system design, circuit applications, component operation/installation, pilot-operated directional control valves (DCVs), 2-stage directional control valves, cam-operated directional control valves (DCVs), DCV spool center types and applications, cylinder types and mountings, pressure-compensated flow control valves, pilot-operated check valves, directoperated relief valves, non-compensated flow control valves, rapid traverse slow feed circuits, cylinder sequencing, remote pressure control, pump unloading circuits, and p-port check valves.

- 1. Hydraulic DCV Applications
- 2. Hydraulic Cylinder Applications
- 3. Hydraulic Relief Valve Operation
- 4. Hydraulic Check Valve Applications
- 5. Accumulator Applications

Advanced Hydraulics

The eLearning course adds to the basic and intermediate hydraulic skills teaching advanced applications. Students learn industry-relevant skills related to these new topics including operation, installation, performance analysis, maintenance, and design. These topics include heat exchangers, reservoirs, fluid conductors, fluid conditioning, filtration, motor performance, pump performance, system design, and maintenance.

- 1. Hydraulic Motor Applications
- 2. Hydraulic Pump and Motor Performance
- 3. Fluids and Conditioning

Fluid Power Certificate Pneumatics

68 Hours | Theory/Hands-on

Basic Pneumatics

Basic Pneumatics prepares learners to work intelligently in industry with pneumatic applications. It introduces pneumatic power and takes learners through key topics and skills in pneumatic power and safety, pneumatic circuits, pneumatic schematics, the principles of pneumatic pressure and flow, and pneumatic speed control circuits. It covers pressure regulation, air filtration, how to connect pneumatic circuits, pneumatic cylinders, valves, and actuators, a wide array of pneumatic applications, pressure and cylinder force, pneumatic leverage, pressure and volume, and air flow resistance.

- 1. Pneumatic Power Systems
- 2. Basic Pneumatic Circuits
- 3. Principles of Pneumatic Pressure and Flow
- 4. Pneumatic Speed Control

Intermediate Pneumatics

Intermediate Pneumatics builds on the basic pneumatics skills to teach intermediate pneumatic components and system applications. Learners gain industry-relevant skills related to these new topics including operation, installation, performance analysis, maintenance, and design. These topics include camoperated valves, cylinder sequencing with cam valves, cylinder deceleration circuits, pilot operated DCVs, shuttle valves, air logic components, air logic design, air filters, filter selection, filter maintenance, water removal techniques, air dryers, after-coolers, water traps, air lubricators, and component maintenance.

- 1. Pneumatic DCV Applications
- 2. Air Logic
- 3. Pneumatic Maintenance

Advanced Pneumatics

Advanced Pneumatics adds to the basic and intermediate pneumatic skills teaching advanced pneumatic applications. Students learn industryrelevant skills related to these new topics including operation, installation, performance analysis, maintenance, and design. These topics include advanced pneumatic principles, pneumatic cylinder loads, cylinder applications, quick exhaust valves, motor loads, air bearings, component sizing, air compressor types, air compressor operation, flow measurement, compressor performance, air filtration, lubricators, water removal, dryers, and pneumatic component maintenance.

- 1. Moving Loads Pneumatically
- 2. Vaccuum Systems
- 3. Air Compressors

Pneumatic Troubleshooting

Teaches pneumatic troubleshooting.

- 1. Introduction to Pneumatic Troubleshooting
- 2. Air Reparation Troubleshooting
- 3. Troubleshooting Pneumatic Cylinders
- 4. Motor and Rotary Actuator Troubleshooting
- 5. Troubleshooting DCV and Flow Control Valves
- 6. Troubleshooting Vacuum Systems
- 7. Troubleshooting Pneumatic Systems

Plastics Technology Certificate

20 hours | Theory/Hands-on

Plastics Technology provides an introduction to injection molding operations that covers the injection molding process, material and machine safety, molding operations, and molding problems and solutions. This program includes teaching inserts, threads and multiple part molds, integral hinge, and system purging. It continues into more advanced topics such as chemistry and properties of plastics, blow molding operations, and extrusion process, safety, and operations. The program also incorporates introduction to plastics technology through molding and continues into blow molding and extrusion operations.

- 1. Introduction to Injection Molding Operations
- 2. Injection Molding Operations
- 3. Plastics: Chemistry and Properties
- 4. Introduction to Blow Molding Operations
- 5. Introduction to Extrusion Operations

Mechanical Certificate 1

84 Hours | Theory/Hands-on

Mechanical Drives 1

This course provides a comprehensive understanding of how to operate, install, and analyze mechanical drives and how they are used in real-world applications. Learners study topics like: the function and construction of a bedplate; four types of shaft material; the operation of a fractional HP V-belt drive; how to determine allowable chain sag for a given application; and methods of measuring spur gear backlash.

- 1. Introduction to Mechanical Drive Systems
- 2. Key Fasteners
- 3. Power Transmission Systems
- 4. Introduction to V-Belt Drives
- 5. Introduction to Chain Drives
- 6. Spur Gear Drives
- 7. Multiple Shaft Drives

Mechanical Drives 2

Mechanical Drives 2 covers heavy duty V-Belt drives including conventional, multiple, wedge, and variable speed V-Belt drives. This course describes V-Belt selection and maintenance by covering V-Belt size specification, component identification, and troubleshooting. Learners develop fundamental knowledge of synchronous belt drives, lubrication concepts, precision shaft alignment, and coupling. Also covered is heavy duty chain drives which describes silent chain drives, multiple-strand systems, chain selection, chain lubrication, chain maintenance and troubleshooting.

- 1. Heavy-Duty V-Belt Drives
- 2. V-Belt Selection and Maintenance
- 3. Synchronous Belt Drives
- 4. Lubrication Concepts
- 5. Precision Shaft Alignment
- 6. Couplings
- 7. Heavy-Duty Chain Drives

Mechanical Drives 3

Mechanical Drives 3 includes describing lubrication, selection, maintenance, and troubleshooting of plain ball bearings. It introduces anti-friction bearings by describing two types of bearing and teaching the fundamental skills of how to identify, mechanically install, thermally install, and troubleshoot those bearings. Also covered is gasket and seals (such as O-ring seal, lip seal, and mechanical seal), advance gear drives (such as helical gear drives, right angle gear drives, and speed reducers), gear drive selection, and maintenance.

- 1. Plain Bearings
- 2. Ball Bearings
- 3. Roller Bearings
- 4. Antifriction Bearings Selection and Maintenance
- 5. Gaskets and Seals
- 6. Advanced Gear Drives
- 7. Gear Drive Selection and Maintenance

Process Control Certificate

92 Hours | Theory/Hands-on

Pump Systems

The Pumps Systems curriculum teaches skills related to centrifugal pumps, which are used in aost every industry to transfer non-hydraulic fluids of various types from one place to another. Students learn a comprehensive set of industry-relevant skills including how to operate, install, maintain, troubleshoot, analyze performance, and select centrifugal pumps as well as system design.

- 1. Centrifugal Pump Operations
- 2. Centrifugal Pump Characteristics
- 3. Centrifugal Pump Troubleshooting
- 4. System Characteristics
- 5. Centrifugal Pump Performance
- 6. Multiple Pump Operation

Process Control Systems

Level and Flow Process Control teaches two of the most common types of process control systems, flow and liquid level. This course covers process control safety, instrument tags, piping and instrumentation diagrams, and level measurement, then moves into system control functions such as liquid level control, automatic control methods, basic flow measurement and control, and control loop performance.

- 1. Introduction to Process Control
- 2. Instrument Tags
- 3. Piping and Instrumentation Diagrams
- 4. Loop Controllers
- 5. Final Control Elements
- 6. Level Measurements
- 7. Liquid Level Control
- 8. Methods of Automatic Control
- 9. Basic Flow Measurement and Control
- 10. Control Loop Performance
- 11. Ultrasonic Level Measurement and Control
- 12. Differential Pressure Flow Measurement and Control

Thermal Process Control System

Process control systems provide precise control of liquids and gases in a wide variety of industrial applications including food processing, chemical manufacturing, and bio-technology. The Temperature Process Control eBook teaches one of the most common types of process control systems, temperature control. Students will learn to calibrate, adjust, install, operate, and tune thermal process control systems in industrial applications.

- 1. Thermal Energy
- 2. Basic Temperature Control Elements
- 3. Temperature Sensors
- 4. Temperature Transmitters
- 5. Basic Temperature Control

Instrumentation Certificate

104 Hours | Theory/Hands-on

PLC Troubleshooting System Allen-Bradley ControlLogix 5500

This course teaches how to design, program and operate a PLC to control a number of process applications used by industries all over the world. The skills learned are in high demand everywhere today. These skills include orientation, operation, programming, memory organization, program analysis, motor control, discrete I/O interfacing, troubleshooting, systems troubleshooting, event sequencing, application development timer instructions, counter instructions, program control instructions, and math and data move instructions.

- 1. Introduction to Programmable Controllers
- 2. Basic PLC Programming
- 3. PLC Motor Control
- 4. Discrete I/O Interfacing
- 5. Introduction to PLC Troubleshooting
- 6. PLC Systems Troubleshooting
- 7. Event Sequencing
- 8. Application Development
- 9. PLC Timer Instructions
- 10. PLC Counter Instructions
- 11. Program Control Instructions
- 12. Math and Data Move Instructions

Process Control Systems

Process control systems provide precise control of liquids and gases in a wide variety of industrial applications including food processing, chemical manufacturing, and bio-technology. The Temperature Process Control eBook teaches one of the most common types of process control systems, temperature control. Students will learn to calibrate, adjust, install, operate, and tune thermal process control systems in industrial applications.

- 1. Introduction to Process Control
- 2. Instrument Tags
- 3. Piping and Instrumentation Diagrams
- 4. Loop Controllers
- 5. Final Control Elements
- 6. Level Measurements
- 7. Liquid Level Control
- 8. Methods of Automatic Control
- 9. Basic Flow Measurement and Control
- 10. Control Loop Performance
- 11. Ultrasonic Level Measurement and Control
- 12. Differential Pressure Flow Measurement and Control

ControlLogix Process Control

This PLC-based process control course covers topics such as on/off, open loop, closed-loop, PID control of level and temperature, analog module configuration, and loop tuning. These topics are important to anyone currently working in or interested in the field of PLC automation or process control.

1. PLC Based Liquid Level and Flow Control

Multicraft Technician Certificate

136 Hours | Theory/Hands-on

AC/DC Electrical Systems

- 1. Basic Electrical Circuits
- 2. Electrical Measurements
- 3. Circuit Analysis
- 4. Induction and Capacitance
- 5. Combination Circuits
- 6. Transformers

Basic Pneumatics

- 1. Pneumatic Power Systems
- 2. Basic Pneumatic Circuits
- 3. Principles of Pneumatic Pressure and Flow
- 4. Pneumatic Speed Control
- 5. Introduction to Electronics Sensors

Electric Motor Control

- 1. Introduction to Electric Motor Control
- 2. Manual Motor Control and Overload Protection
- 3. Control Transformers
- 4. Control Ladder Logic
- 5. Control Relays and Motor Starters
- 6. Introduction to Troubleshooting
- 7. Systems Troubleshooting
- 8. Reversing Motor Control
- 9. Automatic Input Devices
- 10. Basic Timer Control: On-Delay and Off-Delay

Mechanical Drive Systems 1

- 1. Introduction to Mechanical Drives Systems
- 2. Key Fasteners
- 3. Power Transmission Systems
- 4. Introduction to V-Belt Drives
- 5. Introduction to Chain Drives
- 6. Spur Gear Drives
- 7. Multiple Shaft Drives

Introduction to Welding and Welding Concepts

- 1. Welding Safety Essentials
- 2. PPE for Welding
- 3. Introduction to Welding
- 4. Introduction to GMAW
- 5. Introduction to SMAW
- 6. Introduction to GTAW

Maintainer/Operator Certificate

40 Hours | Theory/Hands-on

The Maintainer/Operator certificate program at Columbus State Community College provides entry level electromechanical training. The training builds a comprehensive foundation in basic understanding of electrical, mechanical, and hydraulic systems. Upon completion of the program, students will have knowledge in topics including basic measurements, Lockout/Tag out, 3 phase power, and electric motor installation. The program expedites training time, reduce workplace accidents, and enhance employee productivity.

Safety

- 1. Personal Protective Equipment
- 2. Safety Practices and Regulations
- 3. Lockout/Tag Out

Measurement & Gauging

- 1. Basic Measurement
- 2. Precision Measurement Tools

Mechanical Drive Systems 1

- 1. Introduction to Mechanical Drives Systems
- 2. Key Fasteners

Basic Pneumatics

- 1. Pneumatic Power Systems
- 2. Basic Pneumatic Circuits

AC/DC Elecrical Systems

- 1. Basic Electrical Circuits
- 2. Electrical Measurements

Electric Motor Control

- 1. Introduction to Electric Motor Control
- 2. Manual Motor Control and Overload Protection

21st Century Job Skills

- 1. Communication
- 2. Working in Teams
- 3. Conflict Resolution



ONLINE, SHORT-TERM TRAINING FOR YOUR EMPLOYEES

Columbus State has deep roots in central Ohio's manufacturing industry, the backbone of the region's economy. The **MEP at Columbus State** recognizes how vital manufacturing companies and their employees are to central Ohio.

That's why we're partnering with digital training providers **Tooling U-SME** and **Amatrol** to offer new online training programs paired with one-on-one virtual coaching by our faculty and professional staff. We're underwriting the majority of the cost for the program to make it more accessible to small and midsize manufacturing companies during this time when they need it most.

This online training allows your employees to upskill in preparation for a new industry landscape in the coming months while keeping them engaged and up-to-date in the meantime. The curriculum consists of 6 months of coursework, and participants set their own pace.

CERTIFIED MANUFACTURING ASSOCIATE (CMfgA) SMART MANUFACTURING WELDING MACHINING

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CERTIFIED MANUFACTURING ASSOCIATE (CMfgA)



CERTIFICATION

DEVELOP THE SKILLS NECESSARY FOR A SUCCESSFUL CAREER IN MANUFACTURING

The Certified Manufacturing Associate training program helps prepare dislocated workers, underemployed individuals, veterans, and more start a new career in manufacturing. The 25-class online training program from Tooling U-SME can be bundled with the nationally recognized Certified Manufacturing Associate credential. This training program prepares individuals for high-demand, entry-level careers including assemblers, manufacturing associates, and production operators. It can also be used by manufacturers as an effective onboarding program for new employees.

SHORT-TERM, COMPREHENSIVE TRAINING

Online classes from Tooling U-SME provide the best manufacturing content developed by industry experts. The information is presented in an engaging and interactive format for maximum effectiveness, and pre-and post-assessments measure a student's increased knowledge.

Classes are self-paced, typically taking 60 minutes to complete. The 25-class training program will help employees prepare for the certification exam. They are conveniently accessible anytime, anywhere on desktops and laptops, and on tablets and phones with the Tooling U-SME app.

BUILD A COMPREHENSIVE FOUNDATION OF KNOWLEDGE

This program introduces basic concepts in the areas needed for a successful career as a Certified Manufacturing Associate:

Measurement

Quality

Safetv

Robotics

and Inspection

Troubleshooting

- Additive Manufacturing
- Blueprint Reading
- CNC
- Inspection
- Lean
- Math Fundamentals

EARN A NATIONALLY RECOGNIZED CERTIFICATION

The SME Certified Manufacturing Associate (CMfgA) credential demonstrates that an individual has foundational manufacturing knowledge and may be an ideal candidate for entry-level employment. It is the first step toward a lifelong career in an industry where there is opportunity for advancement and well-paying jobs.

sme.org/cmfga

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Choose a starting point based on employee's experience or company goals for a quick-start training solution.

CERTIFIED MANUFACTURING ASSOCIATE (CMfgA)

CERTIFIED MANUFACTURING ASSOCIATE TRAINING PROGRAM

Complete Class List

- Introduction to Additive Manufacturing
- Introduction to CNC Machines
- Introduction to Assembly
- Safety for Assembly
- Tools for Threaded Fasteners
- Basic Measurement
- Basics of Tolerance
- Blueprint Reading
- 5S Overview

- Troubleshooting
- Quality Overview
- Introduction to Robotics
- Robot Safety
- Bloodborne Pathogens
- Intro to OSHA
- Ergonomics
- Personal Protective Equipment
- Lockout/Tagout Procedures

- SDS and Hazard Communication
- Hand and Power Tool Safety
- Fire Safety and Prevention
- Math Fundamentals
- Math: Fractions and Decimals
- Units of Measurement
- Lean Manufacturing Overview

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SMART MANUFACTURING



PROFESSIONAL DEVELOPMENT

SAFER, FASTER, MORE EFFICIENT MANUFACTURING WITH SMART MANUFACTURING

Manufacturing is quickly evolving and now requires new knowledge and skills. Technologies such as digital security, robotics, IIOT solutions, and 5G networks and infrastructure are changing the industry and the way manufacturers work, creating demand for workers who are skilled in these advanced technologies. Forwardthinking manufacturers are investing in training programs to build the Industry 4.0 capabilities needed to remain competitive

FLEXIBLE AND CONVENIENT

Online classes are self-paced, typically taking 60 minutes to complete. They are easily and conveniently accessible on desktops and laptops, and on tablets and phones with the Tooling U-SME app.

Online Training offers:

- Content developed by industry experts
- Accessible anytime, anywhere
- Self-paced
- Predefined curriculum for each job role
- Engaging and interactive content
- Pre- and post-training knowledge assessments
- Access to Tooling U-SME's Learning Management System (LMS)
- Guidance from our Client Success team, including advice, insights, and ideas built on best practices and years of experience

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EFFECTIVE COMBINATION OF CLASSES

This Industry 4.0 training program offers a comprehensive overview of the competencies needed to take advantage of the smart manufacturing technologies that are driving the industry forward. This series includes the following classes:

- Introduction to Additive
 Manufacturing
- Additive Manufacturing Safety
- The Basic Additive Manufacturing Process
- Additive Manufacturing Methods and Materials
- Introduction to Hybrid
 Manufacturing
- Rapid Prototyping
- Additive Manufacturing: Prototype to Production
- Design for Additive Manufacturing
- Metrology for Additive Manufacturing
- Additive Manufacturing Materials
 Science
- Integrating Additive Manufacturing with Traditional Manufacturing
- Additive Manufacturing as a Secondary Process
- Nondestructive Testing for Additive Manufacturing
- Reverse Engineering for Additive
 Manufacturing
- The Additive Manufacturing Supply Chain
- Managing the Additive Manufacturing Supply Chain
- Hybrid Manufacturing with Directed Energy Deposition
- Lightweighting with Additive

Manufacturing

- Additive Manufacturing Qualification
- Design for Fused Deposition Modeling
- Design for Material Jetting
- Design for Directed Energy
 Deposition
- Design for Laser Powder Bed Fusion
- Design for Vat Photopolymerization
- Design for Binder Jetting
- Design for Sheet Lamination
- Overview of Additive Manufacturing (3D Printing) Technologies
- Additive Manufacturing –
 Implementation and Best Practices
- Cybersecurity for Manufacturing Basics
- Cybersecurity for Manufacturing: Malware Overview
- Introduction to the Industrial Internet of Things
- Data Collection Fundamentals
- Automatic Identification Technology
- Cybersecurity for Manufacturing: Hacking Overview
- Cybersecurity for Manufacturing: Wireless Networks
- Introduction to Digital Networks
- Data Collection: Inventory and Maintenance

- Introduction to Digital Twin
- Introduction to Digital Thread
- Introduction to Digital Enterprise
 Strategy
- Introduction to Machine Learning and Artificial Intelligence
- Machine Learning and Artificial Intelligence Applications
- Data and Design Management for Digital Enterprises
- Automated Systems and Control
- Introduction to Robotics
- Robot Safety
- Robot Applications
- Robot Components
- End Effectors
- Robot Installations
- Industrial Network Integration
- Robot Power and Drive Systems
- Introduction to Collaborative Robots
- Robot Axes and Pathways
- Robot Sensors
- Robot Control Systems
- Vision Systems
- Robot Troubleshooting
- Concepts of Robot Programming
- Robot Maintenance



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PROFESSIONAL DEVELOPMENT

LEARNING PLANS FOR MANUFACTURING JOB ROLES

Training Packages from Tooling U-SME offer quick-start, progressive road maps in various functional areas that allow manufacturers to build career paths for employees. They are intended to enhance your existing OJT and help you create a job progression plan. Unlike many other training programs, these packages require minimal preparation. They are efficient, effective training, developed with input from manufacturing experts.

FLEXIBLE AND CONVENIENT

Online classes are self-paced, typically taking 60 minutes to complete. They are easily and conveniently accessible on desktops and laptops, and on tablets and phones with the Tooling U-SME app.

CAREER PATHWAYS FOR MACHINING JOB ROLES

Combine job roles for learning pathways, or offer single job roles for targeted learning. Large comprehensive programs are also available.



GRINDING TECHNICIAN

MEP

MACHINING Fundamentals

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MACHINING

Online Training offers:

- Content developed by industry experts
- Accessible anytime, anywhere
- Self-paced

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- Predefined curriculum for each job role
- Engaging and interactive content
- Pre- and post-training knowledge assessments
- Access to Tooling U-SME's Learning Management System (LMS)
- Guidance from our Client Success team, including advice, insights, and ideas built on best practices and years of experience

To begin your training program or for more information, call MEP at Columbus State at **614-287-5000** or email **mep@cscc.edu**

Ohio Manufacturing Extension Part

PRODUCTION MACHINIST

CNC Programmer

MACHINING

MACHINING FUNDAMENTALS

Basic Measurement Basics of Tolerance Blueprint Reading Calibration Fundamentals Hole Standards and Inspection Thread Standards and Inspection 5S Overview Lean Manufacturing Overview

Essentials of Heat Treatment of Steel Ferrous Metals Introduction to Mechanical Properties Band Saw Operation Basic Cutting Theory Cutting Processes Introduction to Metal Cutting Fluids Metal Cutting Fluid Safety

Grinding Nonferrous Metals

Grinding Wheel Geometry

Grinding Wheel Materials

Introduction to Grinding Fluids

Coordinates for the CNC Lathe

Coordinates for the CNC Mill

Introduction to CNC Machines

Introduction to Fastener Threads

Surface Texture and Inspection

Offsets on the CNC Lathe

Offsets on the CNC Mill

Setup for the Centerless Grinder

Grinding Processes

Grinding Variables

Grinding Safety

Overview of Machine Tools ISO 9001 Review Bloodborne Pathogens Fire Safety and Prevention Hand and Power Tool Safety Intro to OSHA Lockout/Tagout Procedures

Setup for the Cylindrical Grinder

Basics of G Code Programming

Introduction to CNC Machines

Introduction to Fastener Threads

Benchwork and Lavout Operations

Holemaking on the Manual Mill

Setup for the Surface Grinder

Surface Grinder Operation

Introduction to GD&T

Maior Rules of GD&T

SPC Overview

Engine Lathe Basics

Engine Lathe Setup

Manual Mill Basics

Engine Lathe Operation

Noise Reduction and Hearing Conservation

Personal Protective Equipment Powered Industrial Truck Safety Safety for Lifting Devices SDS and Hazard Communication Walking and Working Surfaces Geometry: Circles and Polygons

Geometry: Lines and Angles Geometry: Triangles Math Fundamentals Math: Fractions and Decimals Trigonometry: Sine, Cosine, Tangent Units of Measurement

GRINDING TECHNICIAN

Basic Grinding Theory Basics of the Centerless Grinder Basics of the Cylindrical Grinder Basics of the Surface Grinder Centerless Grinder Operation Cylindrical Grinder Operation Dressing and Truing Grinding Ferrous Metals

MACHINE OPERATOR

Basics of G Code Programming Basics of the CNC Lathe Basics of the CNC Mill **Control Panel Functions** for the CNC Lathe Control Panel Functions for the CNC Mill

CNC PROGRAMMER

Calculations for Programming the Lathe Calculations for Programming the Mill Canned Cycles for the Lathe Canned Cycles for the Mill

Creating a CNC Milling Program Creating a CNC Turning Program Introduction to CAD and CAM

for Machining In-Line Inspection Applications

PRODUCTION MACHINIST

Calculations for Programming the Lathe

Creating a CNC Turning Program

Major Rules of GD&T Intro to Six Sigma Metrics for Lean

Introduction to GD&T

Surface Texture and Inspection Metrics for Lean Process Flow Charting SPC Overview Strategies for Setup Reduction Troubleshooting Essentials of Communication Essentials of Leadership

> Manual Mill Operation Manual Mill Setup Classification of Steel Intro to EDM Safety for Metal Cutting Machine Guarding Chucks, Collets, and Vises

Clamping Basics Locating Devices Supporting and Locating Principles

Chucks, Collets, and Vises

Clamping Basics Locating Devices Supporting and Locating Principles

Introduction to Metals Speed and Feed for the Lathe Speed and Feed for the Mill Quality and Customer Service Automated Systems and Control Robot Axes

Calculations for Programming the Mill Canned Cycles for the Lathe Canned Cycles for the Mill Creating a CNC Milling Program

Introduction to GD&T Major Rules of GD&T Metrics for Lean Process Flow Charting Strategies for Setup Reduction Troubleshooting Taper Turning on the Engine Lathe Threading on the Engine Lathe ANSI Insert Selection Basic Cutting Theory Carbide Grade Selection

Cutting Tool Materials Drill Tool Geometry Impact of Workpiece Materials Lathe Tool Geometry Mill Tool Geometry Optimizing Tool Life and Process

Speed and Feed for the Lathe Speed and Feed for the Mill Essentials of Communication Essentials of Leadership

TOOLMAKER AND DIEMAKER

Basic Grinding Theory Basics of the Cylindrical Grinder Basics of the Surface Grinder Cylindrical Grinder Operation

Dressing and Truing Grinding Ferrous Metals Grinding Nonferrous Materials Grinding Processes

Grinding Safety Grinding Variables Grinding Wheel Geometry Grinding Wheel Materials

Introduction to Grinding Fluids Setup for the Cylindrical Grinder Setup for the Surface Grinder Surface Grinder Operation

National Network

Die Cutting Variables Material Tests for Welding Fixture Design Basics

— New content is always being added. Check with your representative for the most current list of classes. —







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