Workforce & Continuing Education
MACOMB COMMUNITY COLLEGE
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M-TEC
Michigan Technical Education Center

Controls Technician Certificate

The Controls Technician program prepares individuals for a future in advanced manufacturing environment. The Controls Technician concentrates on how machines coordinate and communicate in the assembly process. Topics covered include programming and troubleshooting of Programmable Logic Controllers (PLC) and Human Interface (HMI) devices. Motor control with Variable Frequency Drive (VFD) technology and part tracking utilizing Radio Frequency Identification (RFID) are also covered. This program also includes Industrial Certifications that can be earned through the Smart Automation Certification Alliance (SACA).

Non-Credit Course Code	Course Title	Hours	Days
CCAD-8144	Advanced Technology Readiness	8	1
OSHA-8001	OSHA 10-Safety Training	16	2
CMNF-8312	Trade Fundamentals	48	6
CELC-8013	Electrical Fundamentals	40	5
CELC-8012	Motor Controls and Drives	40	5
CELC--8016	Digital Electronics	40	5
CELC-8022	Electronic Sensors	24	3
CMNF-8269	Fluid Power Fundamentals	40	5
CMNF-8241	FANUC Robotics Operations	40	5
CMNF-8247	Basic PLC	40	5
CMNF-8285	Intermediate PLC-1	40	5
CMNF-8279	Intermediate PLC-2	40	5
CMNF-8280	Advanced PLC Maintenance and Troubleshooting	40	5
CMNF-8287	Allen Bradley HMI Programming	40	5
CMNF-8242	VFD Programming and Troubleshooting-VFD Power Flex	16	2
CMNF-8281	RFID-Radio Frequency Identification	24	3
A certificate of completion will be awarded to students who successfully complete the above courses. Certifications taken and passed for SACA will also be awarded.		536 hours	67days

Non-Credit Course Descriptions

Advanced Technology Readiness - CCAD-8144- 8 hours

Prerequisite: None

The purpose of this course is to ensure the student is prepared to complete a short-term accelerated program in the engineering and advanced technology fields. This course will cover key aspects industry leaders state are necessary in the rapidly changing environment. Of the nine critical competencies sprinkled throughout the entire program in various courses via projects and tasks, this course will focus on communication and collaboration, digital media literacy, and entrepreneurism. Students will learn the fundamentals of a variety of software applications, learn how to be resourceful during the program, and discover how to operate with an entrepreneurial mindset.

OSHA 10 – OSHA 8001- 16 hours

Prerequisite*: None*

This sixteen (16) hour training course covers basic industrial safety. Topics include lockout/tagout, personal protective equipment, aerial lift and fall safety, machine guarding, confined space safety, fire safety, hazardous materials and hazard communications. General shop safety including forklift pedestrian safety will also be discussed. Upon successful completion, participants receive an OSHA 10 certification.

Trade Fundamentals –CMNF-8312 – 48 hours

Prerequisite: None

This course includes a review of basic arithmetic; whole numbers, fractions, decimals, signed numbers, grouping symbols, square root, ratio and proportion, flat and round tapers, simple and complex gear ratios; practical industrial shop problems are employed. At the end of this course, student will be able to apply basic math and read a blueprint as it relates to machining components used in manufacturing.

Electrical Fundamentals – CELC 8013 – 40 hours

Prerequisite: None

This forty (40) hour training course covers the basics of AC (Alternating Current) and DC (Direct Current) theory and fundamentals. The student will first gain an understanding of the concepts of electrical schematics, components, voltage, current and resistance. These fundamentals will then be applied through Ohm's Law to basic circuit design and analysis. Power, magnetism and DC generation will also be introduced to complete the theories of DC applications

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Motor Controls & Drives – CELC 8012 – 40 hours

Prerequisite: CELC 8013/Electrical Fundamentals

This forty (40) hour course is designed to provide the basic skills in AC / DC motors and motor controls. The course provides an understanding of the operation of AC and DC motors and motor control circuits. Course topics include AC / DC motor operations, control circuit components, motor control wiring, connections, ladder diagrams, and interpretation of electronic motor control schematics.
Digital Electronics– CELC 8016 – 40 hours Prerequisite: CELC 8013/Electrical Fundamentals This forty (40) hour training course covers the basics of digital electronics fundamentals and troubleshooting digital circuits. Course topics include concepts of logic gates, Boolean expressions, and schematics for logic gates, inverters, amplifiers, digital electronic circuits, and troubleshooting analysis.

Electronic Sensors – CELC 8016 – 24 hours

Prerequisite: CELC 8013/Electrical Fundamentals

This twenty-four (24) hour course introduces the student to the newest and the most important electronic automation (Must Know Technology) of today, and the future. The student will be introduced to the many types and boundary ranges of sensors. Adjusting and alignment of sensors where needed will be included in the coursework. Sinking and sourcing explanations along with NPN and PNP types of sensors are included in the class. Interfacing sensors with PLC inputs and troubleshooting field wiring will also be covered.

Digital Electronics– CELC 8016 – 40 hours

Prerequisite: CELC 8013/Electrical Fundamentals

This forty (40) hour training course covers the basics of digital electronics fundamentals and troubleshooting digital circuits. Course topics include concepts of logic gates, Boolean expressions, and schematics for logic gates, inverters, amplifiers, digital electronic circuits, and troubleshooting analysis.

Fluid Power Fundamentals – CMNF 8269 - 40 hours

Prerequisite: CMTH 8008/Shop Math

This forty (40) hour course is designed to provide the basic skills in fluid power. This course provides an understanding of fluid power symbols, basic components of fluid power systems including basic laws and formulas for fluid power calculations. Course topics include pumps, control valves, actuators, and maintenance procedures of fluid power systems.

FANUC Robotics Operations – CMNF 8241 – 40 hours

Prerequisite: None

This forty (40) hour course is designed to provide the basic skills needed to operate and program FANUC robots. Course topics include robotic safety, controls, operations, and handling tool programming.

Basic PLC – CMNF 8247 – 40 hours

Prerequisite: CELC 8013 Electrical Fundamentals and CELC 8012 Motor Controls & Drives

This forty (40) hour course is designed to provide skills in programmable logic controllers (PLC) fundamentals. The course provides a general understanding of PLC hardware, applications, and logic. Course topics include PLC hardware, navigation of PLC controller software, use of simple logic instructions, and basic troubleshooting.

Intermediate PLC-1 – CMNF 8285 – **40 hours**

Prerequisite: CMNF 8247/Basic PLC/ CMNF 8285 PLC Intermediate 1

This course builds on the foundations of the PLC Basics course to include importing and exporting files, introduction to Ethernet and DeviceNet communication protocols. Students will also configure RSLinx serial drivers and work with the BootP server. Ladder logic components and tag assignment programming elements are also introduced along with online editing capabilities.

Intermediate PLC-2 – CMNF 8279 – **40 hours**

Prerequisite: CMNF 0007/Intermediate PLC-1

PLC Intermediate 2 is the third course in the PLC progression of courses with an emphasis how machines communicate with each other. Topics comprise toggling bits, trending and forcing programming elements. The configurations of I/O and communication modules plus rack arrangements and properties are also covered. File management and RSNetworx. DNT configuration file creation are included in this course

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Advanced PLC Maintenance and Troubleshooting – CMNF 8280 – **40 hours**

Prerequisite: CMNF 0008/Intermediate PLC-2

This forty (40) hour course is designed to provide advanced skills in PLC. The course provides an understanding of PLC hardware, system architecture and programming software. Course topics include setup, instruction sets, hardware, and advanced software programming and troubleshooting.

Allen Bradley HMI Programming – CMNF 8287 - **40 hours**

Prerequisite: None

This forty (40) hour course is designed to provide the skills in HMI fundamentals. The course provides an understanding of HMI functions hardware and applications. Course topics include PLC to HMI instructions, hardware, HMI graphics, and creating troubleshooting messages displayed on HMI.

VFD Programming and Troubleshooting - VFD Power Flex – CMNF 8282 – **16 hours**

Prerequisite: None

This sixteen (16) hour training course covers the basics of control loops. Students learn the basic functionality of servo systems and their practical applications and programming of the Allen Bradly PowerFlex VFD.

RFID - Radio Frequency Identification - CMNF 8281 - **24 hours**

Prerequisite: None

This twenty-four (24) hour class covers the use of Radio Frequency Identification (RFID) tags common in major corporations throughout the world. The major reasons for adopting this technology will be covered by looking at use cases in the pharmaceutical, retail, manufacturing, supply chain and security industries. This training will look at how RFID works technically, and how a company can find sound business reasons to adopt this technology. Participants will develop an understanding of the advantages and disadvantages of each using the latest technology.

NEW

Smart Automation Certification Alliance (SACA)

Throughout the program, you will be able to take Certification exams. Upon successful completion and passing of the SACA exams, the following Certifications can be awarded:

Controls Technician program:

- Program Controller Systems 1
- Electrical Systems 1
- Hydraulic Systems 1
- Electric Motor Control Systems 1
- Programmable Controller Systems 1
- Programmable Controller Troubleshooting 1

✓ **Noncredit to Credit Articulation -Up to eight (8) credits may be applied toward an associate degree.**