

## AUTOMATED SYSTEMS TRAINING AT THE M-TEC

Macomb Community College's Michigan Technical Education Center (M-TEC) is the College's headquarters for its engineering and advanced technology workforce and continuing education team. The M-TEC is a 40,600-square-foot facility providing education and training in advanced integrated manufacturing, automated systems and robotics. We work across multiple industry sectors and in collaboration with employers to develop and deliver customized solutions addressing the technical talent pipeline at every level of an organization or industry sector.

A \$2.6 million investment by the Department of Labor, Michigan's Community College Skilled Trades Equipment Program and the College has funded a major upgrade of the facility, advancing its capabilities in advanced integrated manufacturing, automated systems and robotics. M-TEC offers training on the latest industry-specific equipment in body-shop, paint, general assembly and powertrain.

These Open Enrollment courses provide a way for companies to get the in-demand training they require in the most cost effective way. This is just a small part of what we do. There are many more training courses available so if you don't see what you need, please ask! We specialize in customized training that meets your specific need.

### Equipment Summary

- FANUC Robot Cells with Weld Controllers
- FANUC Robotics Paint Cell
- FANUC Robot Cell with Nordson Sealant System
- FANUC Fenceless CERT Carts with iRVision
- ABB Portable Robotic Work Cells with RFID and Conveyor
- Siemens S7/TIA portal PLC Trainers
- Allen Bradley RS-Logix 5000 PLC Trainers
- Allen Bradley PowerFlex VFD Training Stations
- VIBRALIGN Laser Alignment, Vibration Analysis trainers
- CMM Machine with PC DMIS software
- Hydraulic/Pneumatic Training stations
- Mechanical and Motor & Controls Trainers
- Lubrication Trainers
- Rigging equipment
- Metrology Equipment



# AUTOMATED SYSTEMS COURSE DESCRIPTIONS

*Classes are held Mon-Fri 8:00am-4:30pm unless otherwise indicated with \*\**

## OPERATIONS/CORE COURSES

### **Computer Literacy – CCMP 8081 - 32 hours**

*Prerequisite: None*

This thirty-two (32) hour course is designed to provide the skills in computer basics and office software applications. The course provides an understanding of computer hardware, file structure and office applications. Course topics include computer hardware, screen navigation, file management, and office applications including Word, Excel and PowerPoint.

### **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.

### **Team Building for Manufacturing – CMGT 8067 – 8 hours**

*Prerequisite: None*

This eight (8) hour course is designed to provide skills in teambuilding. The course provides an understanding of how changes in organizations affect teams and the different team models including: traditional teams, task forces, and cyber teams. The course also will look at types of conflict and tips for resolving conflict within the teams.

### **Blueprint Reading, GD&T and Metrology – CBPR 8013 – 40 hours**

*Prerequisite: None*

This forty (40) hour course is designed to provide the skills required for blueprint reading, geometric dimensioning and tolerance, and metrology. The course provides an understanding of blueprints, geometric dimensioning controls used on mechanical engineering drawings, and precision measurement tools.

### **Manufacturing Processes – CMNF 8274 – 24 hours**

*Prerequisite: None*

This twenty four (24) hour course is designed to provide the understanding of the different manufacturing processes. The course provides an understanding of types of production, materials, and production processes, including casting, molding, forming, machining, finishing and assembly. Career pathways connected to processes are also covered during this program. Students also have hands on time on mill and lathe.

### **Shop Math – CMTH 8008 – 24 hours**

*Prerequisite: None*

This twenty-four (24) hour course teaches students the fundamental math functions used in machining. The course will cover basic fractions and decimals as well as basic triangle and circle geometry relevant to the shop.



## ELECTRICAL COURSES

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### **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.

### **Motor Controls and 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, schematics for logic gates, inverters, amplifiers, digital electronic circuits, and troubleshooting analysis.

### **Electronic Sensors – CELC 8022 – 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.

### **Electro Hydraulics and Pneumatics – CELC 8020 - 40 hours**

*Prerequisite: CMNF 8207/Pneumatics and CMNF 8053/Hydraulics*

This forty (40) hour course is designed to provide an introduction to the basics of pneumatic, electro-pneumatic, and hydraulic control circuits. Students investigate the physical functions and properties of control elements and the role that these functions and properties play within the system. They also utilize technical documents such as data sheets, circuit diagrams, displacement step diagrams, and function charts to identify, localize, and correct malfunctions in (electro) pneumatic and hydraulic circuits; and they perform preventive maintenance on system (electro) pneumatic and hydraulic components.

### **Soldering – CWET 8055 - 16 hours**

*Prerequisite: None*

This sixteen (16) hour course introduces the student to hand soldering techniques and soldering knowledge. Students will demonstrate soldering skills using lead and lead free solder as used in manufacturing circuit boards. Restrictions of Hazardous Substances (ROHS) mainly lead will be looked at along with recycling electronic items. Individuals who complete the class successfully will have the skills to accurately solder, assemble and inspect the quality of soldered components

## MECHANICAL COURSES

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### **Mechanical Systems/Power Transmission – CMNF 8166 – 40 hours**

*Prerequisite: None*

This forty (40) hour course is designed to provide skills in mechanical power transmission systems. The course provides an understanding of mechanical systems and drives of power transmission mechanical equipment. Course topics include safety, chain drives, sprockets, belt drives, gears, motors, clutches, and couplings.

### **Pipefitting and Tube bending – CMNF 8240 – 40 hours**

*Prerequisite: None*

This forty (40) hour course is designed to provide skills in pipefitting and tube bending. The course provides an understanding of piping drawings, component identification, and equipment used in pipefitting and tube bending applications. Course topics include pipefitting, methods of tube bending, pipe materials, joints, fittings, and pipe hangers and support applications.

### **Machine Tool – CMNF 8276 - 40 hours**

*Prerequisite: CBPR 8013/Blueprint Reading, GD&T and Metrology and CMTH 8008/Shop Math*

This forty (40) hour course is designed to provide the skills in machine tool functions and applications. The course provides an understanding of operation of machine tool equipment including engine lathes, drill press, milling, grinders and basic power tools. Course topics include safety, speeds and feeds, engine lathe equipment operation, cutting tools, milling operation, grinders, sheet metal shear and break.

### **Machining Essentials – CMNF 8293 - 24 hours**

*Prerequisite: CBPR 8013/Blueprint Reading, GD&T and Metrology and CMTH 8008/Shop Math*

This twenty-four (24) hour course is designed to provide basic knowledge of manual machining equipment including grinders and sanders, drill press, lathes, and mills. Course topics include safety, speeds and feeds, drill press operation, Grinder operation and Saw operation

### **Mechanical Systems and Lubrication – CMNF 8295 - 40 hours**

*Prerequisite: None*

This forty (40) hour course is designed to provide skills in mechanical power transmission systems. The course provides an understanding of mechanical equipment. Course topics include safety, chain drives, sprockets, belt drives, gears, motors, clutches, and couplings. This course will also cover lubrication. Participants will learn the importance of following lubrications schedules, how to handle and store lubricants to prevent contamination.

## FLUID POWER COURSES

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### **Pneumatics Fundamentals – CMNF 8207 – 40 hours**

*Prerequisite: CMTH 8008/Shop Math*

This forty (40) hour course is designed to provide skills in pneumatics fundamentals. The course provides an understanding of pneumatics circuits and applications. Course topics include basic laws, pneumatic components and troubleshooting common pneumatic components.

## FLUID POWER COURSES CONTINUED...

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### **Hydraulics Fundamentals – CMNF 8053 – 40 hours**

*Prerequisite: CMTH 8008/Shop Math*

This forty (40) hour course is designed to provide the participant with the understanding of hydraulics technology, componentry, component variables, symbology, fundamental print reading, simple and moderate circuit dynamics and fluids/filtration fundamentals.

### **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.

## ROBOTIC COURSES

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### **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.

### **FANUC Robotics Paint Operations – CMNF 8298 – 40 hours**

*Prerequisite: None*

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

### **ABB Robotics Operations – CMNF 0011 – 40 hours**

*Prerequisite: None*

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

### **Advanced Robotic Operations – CMNF 8270 - 40 hours**

*Prerequisite: CMNF 8241/FANUC Robotics Operations*

This forty (40) hour course is designed to provide the advanced skills needed to operate and program Fanuc robots. Course topics include collision guard, condition monitor function, executing multiple program (multi-tasking), program shift utility and systems operations.

### **Robotics Electrical Troubleshooting and Maintenance – CMNF 8090 – 40 hours**

*Prerequisite: CELC 8012/Electrical Fundamentals*

This forty (40) hour course is designed to provide the basic skills needed to troubleshoot electrical repair and maintenance procedures of robotic electrical systems. Course topics include robot electrical component identification and function of robot electrical controller.



## ROBOTIC COURSES CONTINUED...

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### **HandlingPRO (ROBOGUIDE) Workcell Simulation – CMNF 8283 – 16 hours**

*Prerequisite: CMNF 8241/FANUC Robotics Operations*

This sixteen (16) hour course is designed to provide the skills needed for creating a computer 3D simulated robotic workcell using FANUC ROBOGUIDE. Course topics include: Creating a Workcell; Add Parts to the Workcell; Edit Robot Properties; Add End-of-Arm Tooling to the Robot; Add a Pick and Place Fixture to the Workcell; Create/Run a Robot Program; Create an AVI of the Workcell.

### **FANUC iRVision 2D – CMNF 8273 - 24 hours**

*Prerequisite: CMNF 8241/FANUC Robotics Operations*

This twenty-four (24) hour course provides an understanding of how to program a vision system as a stand-alone solution and integrated into robotic systems. The student will understand general vision concepts, including camera setup, lighting, lensing, 2D Single & 2D Multiple View Process and perform hands-on programming with industrial vision systems.

### **Robotics Mechanical – CMNF 8242 – 40 hours**

*Prerequisite: CMNF 8241/FANUC Robotics Operations*

This forty (40) hour course is designed to provide the detailed instructions and procedures necessary for complete disassembly, inspection, and reassembly of a FANUC robot mechanical unit.

## AUTOMATION CONTROL/PLC COURSES

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### **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 trouble-shooting.

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

*Prerequisite: CMNF 8247/Basic PLC*

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 8285/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 is included in this course.

## AUTOMATION CONTROL/PLC COURSES CONTINUED...

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

*Prerequisite: CMNF 8279/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, advanced software programming and troubleshooting.

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

*Prerequisite: None*

This forty (40) hour course is designed to provide skills in Human Machine Interface (HMI) fundamentals. This course provides an understanding of HMI functions hardware and applications. Course topics include Programmable Logic Controllers (PLC) to HMI instructions, hardware, HMI graphics, and creating troubleshooting messages displayed on HMI. This course is specific to Allen Bradley HMIs.

### **Siemens HMI Programming – CMNF 0001 - 24 hours**

*Prerequisite: None*

This twenty-four (24) 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 Bradley 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.

## MAINTENANCE COURSES

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### **Rigging and Machine Leveling - CMNF 8236 – 40 hours**

*Prerequisite: None*

This forty (40) hour course is designed to provide skills in Rigging and Machine leveling. The course provides an understanding of rigging safety and equipment used in rigging applications. Course topics include rigging gear, inspection, load calculations, leveling equipment, planning and manipulating equipment moves.

## MAINTENANCE COURSES CONTINUED...

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### **Shaft Alignment/ Alignment and Vibration Analysis – CMNF 8271 - 16 hours**

*Prerequisite: None*

This sixteen (16) hour course is designed to provide the necessary skills needed to identify components and best practices used in machine alignment. The students will obtain an understanding to machine equipment layout, leveling fundamentals, and laser alignment techniques. Also, an overview of vibration analysis will be provided for the students to understand how to collect basic vibration analysis data using vibration analysis equipment.

### **Lubrication – CMNF 8266 - 16 hours**

*Prerequisite: None*

This sixteen (16) hour training course will provide trainees with an understanding of pumps, seals, bearings, and lubrication. Through lecture and hands on exercises, trainees will develop an understanding of the use of these components, including the properties of different lubricants. Trainees will recognize various types of lubrication systems and their maintenance requirements, as well as understand how they operate. Participants also learn the importance of following lubrication schedules. Trainees will also understand how to handle and store lubricants to prevent lubricant contamination.

### **Mechanical Teardown and Rigging – CMNF 8296 - 40 hours**

*Prerequisite: None*

This forty (40) hour course is designed to provide the detailed instructions and procedures necessary for complete disassembly, inspection, and reassembly of a FANUC robot mechanical unit. Also includes rigging to provide an understanding of rigging safety and equipment used in rigging applications

### **Systems Troubleshooting/ Automated Systems Troubleshooting – CMNF 8239 - 40 hours**

*Prerequisite: CELC 8013/ Electrical Fundamentals  
CMNF 8241/ FANUC Robotics Ops*

*CMNF 8053/ Hydraulics  
CMNF 8207/ Pneumatics*

This forty (40) hour training course covers system level training and system integration fundamentals. Course topics include trouble-shooting programmable logic controllers (PLC's) integrated with electro-mechanical systems; Trouble-shooting integrated fluid power systems; Trouble-shooting integrated welding systems; Using electrical and fluid/pneumatic power schematics in trouble-shooting.

## CERTIFICATIONS

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### **Siemens Mechatronic Systems Level 1 Review - CMNF 8275 – 8 hours**

*Prerequisite: Controls Technician Pathway or equivalent knowledge*

This course consisting of an 8 hour review and a two hour exam is designed to provide a review of mechatronic systems to prepare students for the Siemens Mechatronic Systems Certification Program (SMSCP) Level 1 exam.

### **Siemens Mechatronic Systems Level 1 Exam- CMNF 8290 – 2 hours**

*Prerequisite: CMNF 8275/ Siemens Mechatronic Systems Level 1 Review*

The SMSCP Level 1 certification provides a comprehensive industry skill certification that tests your knowledge in complex mechatronic systems, troubleshooting and foreseeing problems. The exam is included in the cost of this class and takes place on day two.



Student Name: \_\_\_\_\_

## AUTOMATED SYSTEMS COURSE REGISTRATION FORM

PLEASE COMPLETE FORM **(One form per student)** AND FAX to 586.498.4101.  
For more information, call Macomb's Workforce & Continuing Education Department at 586.498.4100.

Operations/Core Courses					
	OSHA 10	OSHA 8001	1/23/20–1/24/20	\$ 590	
	** OSHA 10	OSHA 8001	2/24/20–2/27/20	\$ 710	
	Shop Math	CMTH 8008	1/8/20–1/10/20 3/25/20–3/27/20	\$ 885	
	**Shop Math	CMTH 8008	2/28/20–3/6/20	\$ 1065	
	Blueprint Reading, GD&T Metrology	CBPR 8013	1/3/20–1/17/20 3/30/20–4/3/20	\$ 1,475	
	**Blueprint Reading, GD&T Metrology	CBPR 8013	3/9/20–3/20/20	\$ 1,775	
Electrical Courses					
	Electrical Fundamentals	CELC 8013	1/27/20–1/31/20	\$ 1,475	
	Motor Controls & Drives	CELC 8012	2/3/20–2/7/20	\$ 1,475	
	Digital Electronics	CELC 8016	2/10/20–2/14/20	\$ 1,475	
	Electronic Sensors	CELC 8022	4/6/20–4/8/20	\$ 885	
	Electro Hydraulics and Pneumatics	CELC 8020	5/11/20–5/15/20	\$ 1,475	
Mechanical Courses					
	Pipefitting & Tube Bending	CMNF 8240	6/8/20–6/12/20	\$ 1,475	
	Machine Tool	CMNF 8276	6/15/20–6/19/20	\$ 1,475	
	Mechanical Systems & Lubrication	CMNF 8295	5/18/20–5/22/20	\$ 1,475	
	Mechanical Essentials	CMNF 8293	1/22/20–1/24/20	\$ 885	
Robotics Courses					
	FANUC Robotics Operations	CMNF 8241	2/24/20–2/28/20	\$ 1,475	
	**FANUC Robotics Operations	CMNF 8241	3/23/20–4/3/20	\$ 1,775	

*Schedule is subject to change without notice.*

**Classes are held Mon-Fri 8:00am-4:30pm unless otherwise noted**

**\*\*Class runs Mon-Fri 5pm-9pm**

**Additional classes will be scheduled as needed.**

Student Name: \_\_\_\_\_

FANUC Paint Operations	CMNF 8298	3/16/20–3/20/20	\$ 1,475	
ABB Robotics Operations	CMNF 0011	4/20/20–4/24/20	\$ 1,475	
**Advanced Robotics Operations	CMNF 8270	4/13/20–4/24/20	\$ 1,775	
Robotics Electrical Troubleshooting & Maintenance	CMNF 8090	TBD	\$ 1,475	
Robotics Mechanical	CMNF 8242	1/13/20–1/17/20	\$ 1,475	
**FANUC IR Vision 2D	CMNF 8273	4/27/20–5/4/20	\$ 1065	
**HandlingPRO (ROBOGUIDE) Workcell Simulation	CMNF 8283	4/6/20–4/9/20	\$ 710	

### Automation Controls/PLC Courses

Basic PLC	CMNF 8247	1/27/20–1/31/20 3/2/20–3/6/20	\$ 1,475	
Intermediate PLC-1	CMNF 8285	3/9/20–3/13/20	\$ 1,475	
Intermediate PLC-2	CMNF 8279	3/16/20–3/20/20	\$ 1,475	
Advanced PLC Maintenance and Troubleshooting	CMNF 8280	3/23/20–3/27/20	\$ 1,475	
Allen Bradley HMI Programming	CMNF 8287	3/30/20–4/3/20	\$ 1,475	
Siemens HMI Programming	CMNF 0001	5/6/20–5/8/20	\$ 885	
VFD Programming and Troubleshooting–WFD Power Flex	CMNF 8282	4/13/20–4/14/20	\$ 590	
RFID– Radio Frequency Identification	CMNF 8281	4/15/20–4/17/20	\$ 885	

### Fluid Power Courses

Fluid Power Fundamentals	CMNF 8269	1/6/20–1/10/20 2/17/20–2/21/20	\$ 1,475	
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### Maintenance Courses

Mechanical Teardown & Rigging	CMNF 8296	5/11/20–5/15/20	\$ 1,775	
Systems Troubleshooting/Automated Systems Troublingshooting	CMNF 8239	6/22/20–6/26/20	\$ 1,775	

*Schedule is subject to change without notice.*

**Classes are held Mon-Fri 8:00am-4:30pm unless otherwise noted**

**\*\* Class runs Mon-Fri 5pm-9pm**

**Additional classes will be scheduled as needed.**

Student Name: \_\_\_\_\_

Certifications					
	Siemens Mechatronic Systems Level 1 Review and Exam	CMNF 8275	4/9/20 and 4/20/20	\$ 525	
Additional Courses					
Call for additional courses to meet your training needs.					
Total:					

*Schedule is subject to change without notice.*

***Classes are held Mon-Fri 8:00am-4:30pm unless otherwise noted***

***\*\* Class runs Mon-Fri 5pm-9pm***

***Additional classes will be scheduled as needed.***





PO #	PO Date
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# Workforce & Continuing Education Engineering and Advanced Technology Automated Systems Pathway

FOR THESE OCCUPATIONS		TAKE THESE COURSES OR PROGRAMS					WITH OPTIONAL CERTIFICATIONS	
	CORE SKILLS	ELECTRICAL	MECHANICAL	ROBOTIC	AUTOMATION CONTROLS	FLUID POWER	MAINTENANCE	
Manufacturing Essentials ➡	Manufacturing Safety Computer Literacy Teamwork for Mfg. Manufacturing Processes Shop Math	Electrical Fundamentals	Mechanical Systems Pipefitting & Tube Bending			Hydraulics Pneumatics	Blueprint Reading & GD&T Metrology-Basic Skills	MSSC-CPT
Robot Programmer ➡	Shop Math Manufacturing Safety			FANUC Operations Advanced Robotic Operations FANUC iRVision 2D Handling PRO (RoboGuide)				FANUC CERT 1-Handling Tool FANUC CERT 2-iRVision
Maintenance Technician ➡	Shop Math Manufacturing Safety Blueprint Reading & GD&T Metrology	Electrical Fundamentals Motor Controls & Drives	Mechanical Systems Pipefitting & Tubebending Machine Tool	FANUC Operations	PLCs and Communication Devices	Hydraulics Pneumatics	Automated Systems Troubleshooting	FANUC CERT 1-Handling Tool
Robotics Technician ➡	Shop Math Manufacturing Safety	Electrical Fundamentals Motor Controls & Drives Digital Electronics Electro-Hydraulics	Mechanical Systems FANUC Mechanical	FANUC Operations FANUC Electrical Troubleshooting & Maintenance Advanced Robotic Operations Handling PRO (RoboGuide) FANUC iRVision 2D	PLCs and Communication Devices	Hydraulics Pneumatics	Automated Systems Troubleshooting	FANUC CERT 1-Handling Tool FANUC CERT 2-iRVision
Controls Technician ➡	Shop Math Manufacturing Safety	Electrical Fundamentals Motor Controls & Drives Digital Electronics	Mechanical Systems	FANUC Operations	PLCs and Communication Devices Intermediate PLCs I Intermediate PLCs II Advanced PLCs VFD Programming & Troubleshooting HMIs RFID	Hydraulics Pneumatics	Automated Systems Troubleshooting	FANUC CERT 1-Handling Tool Siemens Level 1

Workforce & Continuing Education Engineering and Advanced Technology  
Macomb Community College Michigan Technical Education Center (M-TEC<sup>SM</sup>)  
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