

# Automated Manufacturing Systems Technology

Program Number: 10-628-3

## Associate in Applied Science Degree

Manufacturing Program Cluster

School of Applied Science, Engineering, and Technology

Program offered at Madison Campuses

For information call:

(608) 246-6800 or (800) 322-6282 Ext. 6800

## About the Program

The two-year Associate Degree Automated Manufacturing Systems Technology Program provides students with the knowledge and skills to use computer-driven control systems and mechanisms. This program emphasizes programming, design, updating, servicing, and operation of automated equipment and robotics systems. The specialist is involved with many stages and aspects of an automation system.

## Admissions Requirements

To review admissions program requirements and application processing dates visit the programs website at: <http://madisoncollege.edu/program-info/automated-manufacturing-systems-technology>.

## Unique Requirements for Graduation

Please note: A minimum grade of C is required for all technical studies courses in order to graduate.

## Program Courses

**10-106-186 Project Management and Coordination 2 credits**  
Plan and coordinate projects, develop timelines, determine priorities, increase individual and team productivity, control the workday and allocate resources using graphic tools such as MS Project or MS Excel software. Project management and coordination techniques and concepts are learned by participating in a team project and completing a personal project plan.

**10-414-100 DC/AC Circuits for Industry 3 credits**  
Study of practical DC concepts with and introduction to AC concepts. Course topics include electrical quantities and components and measurement instruments with an emphasis on DC circuits. Students analyze and construct circuits and measure voltage, current, resistance and power for both AC and DC sources. Studies principles of electricity AC components and circuits. Coverage includes combination circuits that contain Resistive Inductive and/or Capacitive properties. Emphasis on circuit troubleshooting and efficiencies. Course introduces theory and application of three-phase circuits, single phase, transformers, generators, and motors. Covers fundamentals of NEC wiring, soldering and relay ladder logic.

**10-414-201 Electricity & Controls for Industry 4 credits**  
Studies basic principles of physics specific to electro-mechanical systems. Studies motors, transformers and various electro-mechanical devices to enhance AC power distribution and control topics. Introduces programmable logic controllers in the on/off mode. Studies basic principles related to electro-mechanical systems as well as motors, transformers, frequency drives and various electro-mechanical devices to enhance AC power distribution and control systems. Introduces programmable logic controllers in the on/off mode.



## Curriculum

The courses listed below outline the requirements for graduation for students entering this program in the 2013-2014 academic year. Requirements for graduation may vary depending on the semester in which a student is admitted to their program. Current/continuing students should consult their Academic Requirements report available through student center account for specific graduation requirements. Program requirements are subject to change.

FIRST YEAR		Credits		Hrs/week	
First Semester				Lec-Lab	
10-414-100	DC/AC Circuits for Industry.....	3		0.5	5
10-414-201	Electricity & Controls for Industry.....	4		0.5	7
10-623-300	Fluid Power 1 for Industry.....	1		0	2
10-623-301	Fluid Power 2 for Industry.....	2		0	4
10-623-310	Mechanisms for Industry.....	1		0	2
10-628-420	Introduction to Logic & Circuits.....	1		0	2
10-801-195	Written Communication.....	3		3	0
10-804-107	College Math.....	3		3	0
<b>Semester Total</b>		<b>18</b>			

Second Semester		Credits		Hrs/week	
10-106-186	Project Management and Coordination.....	2		2	0
10-420-126	Manufacturing Materials.....	2		1	2
10-623-100	Safety for Industry.....	1		0	2
10-628-170	Robotics for Industrial Automation 1.....	1		0	1
10-623-200	Interpreting Engineering Drawings.....	2		0	4
10-628-302	Fluid Power 3 for Industry.....	2		0	4
10-628-401	PLCs for Industrial Automation 1.....	1		0.5	1
10-628-402	PLCs for Industrial Automation 2.....	1		0.5	1
10-628-408	Computer-Assisted Design-2D.....	2		0.5	1.5
10-809-195	Economics.....	3		3	0
<b>Semester Total</b>		<b>17</b>			

SECOND YEAR		Credits		Hrs/week	
First Semester				Lec-Lab	
10-628-168	Robotics for Industrial Automation 2.....	2		0.5	1.5
10-628-403	Programmable Automation Controller 1.....	2		1	2
10-628-409	Computer-Assisted Design-3D.....	2		0.5	1.5
10-628-450	Integration of Mechanisms and Controls 1.....	4		0	8
10-801-197	Technical Reporting.....	3		3	0
10-809-199	Psychology of Human Relations.....	3		3	0
<b>Semester Total</b>		<b>16</b>			

Second Semester		Credits		Hrs/week	
10-628-172	Vision for Robotics in Industrial Automation.....	2		0	2
10-628-404	Programmable Automation Controller 2.....	2		1	2
10-628-451	Integration of Mechanisms and Controls 2.....	4		0.5	7
10-628-500	Introduction to HMI and SCADA Development.....	2		0	4
10-809-166	Intro to Ethics: Theory and Applications.....	3		3	0
10-809-197	Contemporary American Society.....	3		3	0
<b>Semester Total</b>		<b>16</b>			

*Note: Students are placed in English or mathematics courses based on their scores on the COMPASS or ASSET test or on completion of the appropriate prerequisite/s.*

## Career Potential:

- Automation Technician
- Robotics Technician
- Robotic Programmer
- Electro-Mechanical Tech
- Field Service Technician
- Automated Manufacturing Systems Analyst
- Computer Integrated Manufacturing Technician
- Technical Sales Account Manager

## Program Courses, continued

### 10-420-126 Manufacturing Materials 2 credits

Instructional units include safety, oxy-acetylene welding, brazing and cutting, shielded metal arc welding, gas metal arc welding, gas tungsten arc welding, flux cored arc welding, plasma arc cutting and conventional machining.

### 10-623-100 Safety for Industry 1 credit

Comprehensive safety program designed for anyone involved in general industry. Specifically devised for safety directors, foremen, and field supervisors; the program provides complete information on OSHA compliance issues.

### 10-623-200 Interpreting Engineering Drawings 2 credits

Basic principles of engineering drawings and manufacturing procedures. Through interpretation and sketching, students learn to visualize the part, section or assembly. Uses drawings pertinent to the trades with examples in Welding, Facilities, Piping and Instrumentation (P & ID's), Sheet Metal, Equipment Manuals (technical documents, installation/repair manuals), Electrical Symbols, and Fluid Power Symbols.

### 10-623-300 Fluid Power 1 for Industry 1 credit

Fundamentals of fluid power (hydraulic and pneumatic) and is intended to gain an understanding of components and terminology as well as principles and functions. This course has a heavy emphasis on recognizing hydraulic and pneumatic symbols and circuits.

### 10-623-301 Fluid Power 2 for Industry 2 credits

Intended to develop an understanding of basic Fluid Power Circuits. Covers the application of basic fluid power systems to various machines along with maintenance and troubleshooting. The maintaining and design considerations of both hydraulic and pneumatic systems will be explored in this course with an emphasis on component selection and circuit efficiencies.

### 10-623-310 Mechanisms for Industry 1 credit

Emphasizes measurement, lubrication, energy, power, machines and fluid and chemical properties, as well as installation, timing and synchronization of machine drive components. Includes hands-on disassembly and assembly of industrial components.

### 10-628-168 Robotics for Industrial Automation 2 2 credits

FANUC Robotics based advanced study of applications, operation, programming and troubleshooting of Industrial Robots. Prepares the learner to establish and modify robot axis soft limits; navigate the teach pendant to set up the robot for automatic operation; define the Frames of reference used by the coordinate system; create multiple Tool Frames; create a program file; write a functional motion instruction; edit, copy and delete an existing program; demonstrate the use of a wait statement; demonstrate the use of a Call statement; demonstrate the use of an Output statement; and upload and download program memory files. Backup and restore the Controller image. Prerequisite: Intro to Robotics, 10628170

### 10-628-170 Robotics for Industrial Automation 1 1 credit

FANUC Robotics based introductory study of applications, operation, programming and troubleshooting of Industrial Robots. Prepares the learner to identify the component parts of a robot; describe teach pendant and robot functions; power up the robot control in proper sequence; jog in Joint and Cartesian movement; identify axis movements; navigate the teach pendant to set up the robot for desired movement; demonstrate working knowledge of arm speed and inching control; select the Frames of reference used by the coordinate system; edit an existing program.

### 10-628-172 Vision for Robotics in Industrial Automation 2 credits

This course prepares the learner to program a vision system as a stand-alone solution and integrate into robotic systems. The student will receive instruction on general vision concepts, including camera setup, lighting, lensing, 2D Single & 2D Multiple View Process and perform hands-on programming with industrial vision systems.

### 10-628-302 Fluid Power 3 for Industry 2 credits

The use of electro-pneumatic components recognizing and drawing electro-pneumatic symbols and representation of motion sequences and operating status drawing of pneumatic and electrical circuit diagrams. Logical AND/OR function of switch-on signals time-dependent controls with the time delay relay troubleshooting in simple electro-pneumatic controls. Prerequisite: Fluid Power 2 for Industry, 10623301

### 10-628-401 PLCs for Industrial Automation 1 1 credit

Introductory study of PLC Programming overview (parts, principles of operation, size and applications), PLC components (I/O modules, specifications, CPU, memory, programming options), Number systems and codes (binary, decimal, hexadecimal, BCD, ASCII, binary arithmetic), Fundamentals of Logic (binary concept, AND, OR, NOT functions, Boolean algebra, logic gates, word level instructions), Basics of programming in RSLogix500 (memory organization, program scan, programming languages, instruction addressing, XIC, XIO, OTE instructions, creating ladder logic), PLC installation practices, editing, and troubleshooting (enclosures, electrical noise, grounding, voltages, program editing, program monitoring, preventive maintenance, troubleshooting, connecting to your PLC to your PC).

### 10-628-402 PLCs for Industrial Automation 2 1 credit

Intermediate knowledge of programmable logic controller (PLC) installation, interfacing, operation, and programming in RSLogix500. Timer instructions (ON-delay, OFF-delay, RTO, cascading timers), Counter instructions (Counter-up, Counter-down, cascading counters, combining counter and timer functions), Data manipulation (Math instructions), Program control instructions (MCR, jump, subroutines, forcing, safety circuit, temporary end, fault routine), computer controlled machines and processes (communication fundamentals) RSLink communications, Introduction to RSLogix5000 and ControlLogix programming). Prerequisite: PLCs for Industrial Automation 1, 10628401

### 10-628-403 Programmable Automation Controller 1 2 credits

Advanced programmable logic controller (PLC) installation, interfacing, operation, and programming (RSLogix5000). Students learn how to connect advanced PLCs in a typical industrial PLC network utilizing Ethernet, ControlNet, DeviceNet, RS232 and RIO communication paths. Data sharing and distributed PLC programming techniques along with fundamentals of touch panel programming, VFD integration and operation are studied. Prerequisite: PLC Industrial Automation 2, 10628402

### 10-628-404 Programmable Automation Controller 2 2 credits

Advanced programmable logic controller (PLC) programming (RSLogix5000). Students learn how to connect advanced PLCs in a typical industrial network, integrating touch panel programming, VFD and Servo motion control. Programming PLCs utilizing Function Block Diagram are studied. Students gain an understanding of SCADA and MES system and P&ID loops. Prerequisite: Programmable Automation Controller 1, 10628403

### 10-628-408 Computer-Assisted Design-2D 2 credits

Learn to visualize, sketch and create 2D drawings in a wide variety of disciplines using AutoCad. The course will introduce the creation and revision drawings pertinent to the trades with examples in Welding, Facilities, Piping and Instrumentation (P & ID's), Sheet Metal, Equipment Manuals (technical documents, installation/repair manuals), Electrical, and Fluid Power Facilities and Mechanical Drawings. Prerequisite: Interpreting Engineering Drawings, 10623200

### 10-628-409 Computer-Assisted Design-3D 2 credits

Introductory study of working with simple 3D sketches and partly, creation. Strong emphasis on working with existing assemblies, and understanding component relationships. Students will work with OEM component 3D models and manipulating them into assemblies. Students will gain an understanding of drawing sets, and bill of materials.

### 10-628-420 Introduction to Logic & Circuits 1 credit

The learner is introduced to basic troubleshooting tools, tips and techniques and will be interpreting electrical schematics, Boolean logic, truth tables, and number systems. The course uses software simulations and labs to introduce relays and relay ladder logic, and students apply common troubleshooting techniques for technicians.

### 10-628-450 Integration of Mechanisms And Controls 1 4 credits

The student will apply the concepts of robots and automation by building a small automation system. This automation cell will be accomplished within the framework of an assigned team of students. Student will apply learned concepts studied in previous classes. These concepts will assist in building, testing, and running their automated work cell. Student will develop, and apply project planning, time management and cooperative methods with their team members to build their work cell. Student will learn how to design and make parts for this project. Student also will specify and purchase parts as well as, analyze system malfunctions, which may occur to the modular level. Student will practice the skills needed to interface and make repairs. Prerequisite: Electricity & Controls for Industry, 10414201; Manufacturing Materials, 10420126; Robotics for Industrial Automation 1, 10628170; PLCs Industrial Automation 2; 10628402; Safety for Industry, 10628420; Co-requisite: Robotics for Industrial Automation 2, 10628172; Computer-Assisted Design-2D, 10623400; Fluid Power 3 for Industry, 10628302; Programmable Automation Controller 1, 10628403

### 10-628-451 Integration of Mechanisms And Controls 2 4 credits

Focuses on integration of a complete manufacturing cell. Typical components include programmable controllers, robot, sensors, drives, conveyors, pneumatics, hard automation, control wiring and vision. Students plan, wire, program, troubleshoot and develop documentation for the whole system. Prerequisite: Computer-Assisted Design-3D, 10623401; Introduction to HMI and SCADA, 10628500; Vision for Robotics in Industrial Automation, 10620172; Programmable Automation Controller 2, 10628404

### 10-628-500 Introduction to HMI and SCADA Development 2 credits

This class is designed to give students the knowledge necessary to troubleshoot and maintain a SCADA (supervisory control and data acquisition) system. This includes control strategies, controllers and IO, as well as system software database connections and HMIs. Prerequisite: Programmable Automation Controller 1, 10628403

*More detailed and updated information on this program may be available at: [madisoncollege.edu](http://madisoncollege.edu). The college reserves the right to make changes in the regulations and courses announced in this publication without notice.*

*Madison Area Technical College provides equal opportunity in education and employment.*

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