

"Robotics & Automation"

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

"Robotics and Automation" is the primary focus of the two-year Associate Degree - Automated Manufacturing Systems Technology (AMST) program. The AMST program is designed to prepare engineering technologists for employment in the field of robotics, automation and manufacturing. Students master automation fundamentals by taking courses in engineering design, manufacturing processes, robotics and programmable logic controllers (PLC), DC/AC circuits, electric and motor controls, troubleshooting and safety. Emphasis is also placed on the study of mathematics and physical science while English and social science courses broaden and improve the student's communication skills. A series of more advanced/specialized courses focus on the application and integration of new and existing technologies to both product design and product manufacture. Topics include robotics, machine vision, process automations, programmable automation controllers (PAC), motion control, human machine interface (HMI), supervisory control and data acquisition (SCADA) and the use of computers for design and manufacture. Whether it is diagnosing and quickly solving problems so production flow is maintained or assisting engineers in the development and modification of new and existing designs, you will be prepared for a career that is set to grow as technology advances.

Admissions Requirements

To review admissions program requirements and application processing dates visit the programs website at: <http://madisoncollege.edu/amst>

Unique Requirements for Graduation

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

Program Courses

10-103-186 MS Project 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. Use project management software to plan a project, create a project schedule, communicate project information, assign resources and costs, and track the project's progress through completion.

10-462-320 DC/AC Circuits 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.

10-462-201 Electricity & Controls 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 2016-2017 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		Hrs/week	
First Semester	Credits	Lec-Lab	
10-628-408 Computer-Assisted Design-2D.....	2		0.5-1.5
10-628-401 PLCs for Industrial Automation 1	1		0.5-1
10-628-170 Robotics for Industrial Automation 1	1		0-1
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 & Troubleshooting	1		0-2
10-801-195 Written Communication	3		3-0
10-804-107 College Math.....	3		3-0
Semester Total	15		
Second Semester			
10-628-168 Robotics for Industrial Automation 2	2		0.5-1.5
10-462-320 DC/AC Circuits.....	3		0.5-5
10-103-186 MS Project	2		2-0
10-420-126 Manufacturing Materials	2		1-2
10-623-100 Safety for Industry	1		0-2
10-623-200 Interpreting Engineering Drawings.....	2		0-4
10-628-302 Fluid Power 3 for Industry	2		0-4
10-628-402 PLCs for Industrial Automation 2	1		0.5-1
10-809-195 Economics	3		3-0
Semester Total	18		
SECOND YEAR			
First Semester			
10-462-322 Electricity & Controls	4		0.5-7
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
Semester Total	18		
Second Semester			
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
Semester Total	16		

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:

- Manufacturing Engineering Technician
- Automation & Controls Specialist
- Robotics Technician
- Robotics Programmer
- Electro-Mechanical Tech
- Field Service Technician
- Computer Integrated Manufacturing Technician
- Technical Sales Account Manager
- Controls Engineering Technician
- System Integration Specialist
- PLC Programmer
- Machine Design Technician
- Manufacturing Execution Specialist



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 .

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) RSLinx communications. Prerequisite: PLCs for Industrial Automation 1, 10628401

10-628-403 Programmable Automation Controller 1 2 credits
This course is part of the Rockwell Automation Associate ControlLogix Maintainer Certificate. Upon completion of this course, students should be able to troubleshoot a previously operational ControlLogix system and restore normal operation. Students will have the opportunity to develop and practice these skills by learning basic concepts and terminology, practicing a systematic strategy for diagnosing and troubleshooting problems, and performing hands-on programming exercises. RSLinx Ethernet, ControlNet and DeviceNet Communications. Prerequisite: PLC Industrial Automation 2, 10628402

10-628-404 Programmable Automation Controller 2 2 credits
This course is part of the Rockwell Automation Associate ControlLogix Maintainer Certificate. Advanced programmable automation controller (PAC) programming (Studio5000). Students learn how to connect PACs in a typical industrial network, integrating touch panel programming, VFD and Servo motion control. Function Block Diagram, Sequential Function Chart & Structured Text are studied. Students gain an understanding of SCADA and MES system and P&ID loops and Micro850 controllers. 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 & Troubleshooting 1 credit
The course introduces basic troubleshooting tools, methods 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. Students apply common troubleshooting techniques and root cause analysis.

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. 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.