

Advanced Manufacturing

Automation Technology

Program Description

The Automation Technology program provides an introduction to industrial automation including digital electronic, process control and programming of PLCs, robotics and SCADA systems. The program examines applications and examples of automated manufacturing systems including both the theory and function of digital and industrial electronics, hydraulics and pneumatics, robotics systems, digital programming languages and alarm management.

Certificate of Achievement and Associate in Science Degree

A Certificate of Achievement can be obtained upon completion of the 27-28-unit major. The Associate in Science Degree can be obtained by completing the 27-28-unit major, SCC General Education - Option A, and electives. All courses for the major must be completed with a minimum grade of C or a grade of P if the course is taken on a Pass/No Pass basis

Program Outcomes

Students who complete the Automation Technology Certificate of Achievement/ Associate Degree will be able to:

1. Describe and apply current safety rules and regulations while working on various manufacturing and automation systems.
2. Configure and program manufacturing systems and modules including Programmable Logic Controllers (PLCs), Human Machine Interfaces (HMIs), and industrial robots.
3. Demonstrate an understanding of electrical systems and devices related to manufacturing and automation systems

REQUIRED COURSES Units

CIS 001 Introduction to Computer Science	3
IT 151 Vocational Mathematics	3
IT 101 Introduction to Mechatronics	3
MT 162 Robotic Manufacturing Systems	3
MT 163 Advanced Robotics Manufacturing Systems	3
MT 164 Programmable Logic Controllers	3
MT 165 Advanced Programmable Logic Controllers	3
One course from Electronics List	3-4
Three units from Elective List	3
Required Major Total Units	27-28

Electronics List: (select one course)Units

MT 121 Electronics	4
MT 122 Principles of Digital Electronics	3

Elective List (select three units) Units

DRFT 151 3D Modeling with Fusion 360	1.5
IT 174 Making Things 4 – Basic Electronics	1
MT 166 CNC Programming	3
MT 132 Principles of Fluid Power Systems	3
MT 142 Principles of Electrical Machinery	3
OCED 090 Occupational Work Experience	1-3
OCED 070 Occupational Soft Skills	1.5

Solano General Education 21

Electives (as needed to reach 60 units) 11-12

Total Degree Units Solano GE 60

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Maintenance Technician

Program Description

The Maintenance Technician certificate introduces the student to basic electrical and mechanical components used in basic manufacturing systems. Topics covered include functional descriptions, physical properties and operation of electrical and mechanical components and devices. Industrial components and preventative maintenance requirements are also investigated. Students receive hands-on practical experience in the use and application of basic electrical instruments and mechanical measuring devices. An emphasis is placed on safe work habits and procedures, systematic preventive maintenance, localization and correction of malfunctions, and troubleshooting techniques.

Certificate of Achievement

The Certificate of Achievement can be obtained by completing the 18-unit major. All courses for the major must be completed with a minimum grade of C or a grade of P if the course is taken on a Pass/No Pass basis.

Program Outcomes

Students who complete the Automation Technology Certificate of Achievement will be able to:

1. Describe and apply current safety rules and regulations while working on various industrial equipment and machinery.
2. Understand the physical operation of electro-mechanical components such as AC and DC motors, solenoids, relays and various sensors used in basic manufacturing systems.
3. Describe and perform troubleshooting, preventative maintenance and documentation methods associated with basic manufacturing systemstanding of electrical systems and devices related to manufacturing and automation systems

REQUIRED COURSES	Units
IT 101 Introduction to Mechatronics	3
IT 151 Vocational Mathematics	3
MT 130 Principles of Mechanical Power Systems	3
MT 132 Principles of Fluid Power Systems	3
MT 140 Principles of Industrial Electrical Systems	3
MT 142 Principles of Electrical Machinery	3
Required Major Total Units	18

This is a Gainful Employment Program. For additional information, please visit http://www.solano.edu/gainful_employment/ and select "Maintenance Technician."

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Mechatronics

Program Description

Mechatronics is the study of electronics, mechanics, electrical, and control systems to produce a well-rounded technician capable of handling the complex maintenance and operations tasks demanded by modern manufacturing, packaging, processing, transportation, and communication industries.

Individuals with well-rounded knowledge of how electromechanical and automated systems work together are in high demand and qualify to enter occupations such as a technician or specialist in industrial maintenance, automation, engineering, or in testing/research

Certificate of Achievement and Associate in Science Degree

A Certificate of Achievement can be obtained upon completion of the 36-37-unit major. The Associate in Science Degree can be obtained by completing the 36-37-unit major, and SCC General Education - Option A, and electives.

Program Outcomes

Students who complete the Mechatronics Certificate of Achievement/ Associate Degree will be able to:

1. Demonstrate safe work habits around mechanical and electrical industrial equipment.
2. Troubleshoot and solve basic problems involving electrical wiring, connections, and distribution at both the component level.
3. Troubleshoot and solve basic problems involving mechanical and fluid power systems.
4. Demonstrate proficiency in relating and integrating math and science concepts with basic systems found in industry.
5. Demonstrate proficiency in integrating computer use with industrial machinery and control systems

REQUIRED COURSES	Units	List A: (select 6 units)	Units
CIS 001 Introduction to Computer Science	3	DRFT 050 Basic Drafting.....	1.5
IT 101 Introduction to Mechatronics	3	DRFT 079 Blueprint Reading.....	3
IT 151 Vocational Mathematics	3	DRFT 151 3D Modeling with Fusion 360.....	1.5
MT 130 Principles of Mechanical Power Systems.....	3	IT 050 Alternative Energy Technologies	3
MT 132 Principles of Fluid Power Systems.....	3	IT 120 Electrical Safety.....	3
MT 140 Principles of Industrial Electrical Systems.....	3	IT 140 Industrial Materials.....	3
MT 142 Principles of Electrical Machinery.....	3	IT 174 Making Things 4 – Basic Electronics	1
MT 162 Robotic Manufacturing Systems.....	3	MT 163 Advanced Robotics Manufacturing Systems	3
MT 164 Programmable Logic Controllers	3	MT 165 Advanced Programmable Logic Controllers	3
One course from Electronics List	3-4	MT 166 CNC Programming	3
6 -7 units from List A	6	OCED 070 Occupational Soft Skills.....	1.5
Required Major Total Units	36-37	OCED 090 Occupational Work Experience	1-6
Electronics List: (select one course)	Units	Solano General Education	21
MT 120 Principles of Analog Electronics	3	Electives (as needed to reach 60 units)	2-3
MT 121 Electronics	4	Total Degree Units Solano GE	60
MT 122 Principles of Digital Electronics	3		

This is a Gainful Employment Program. For additional information, please visit http://www.solano.edu/gainful_employment/ and select "Mechatronics."

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Industrial Technology

IT 050 Alternative Energy Technologies 3.0 Units

Transferable to CSU

Hours: 48-54 lecture

Introduces the topics of power generation, transmission, and consumption of both conventional and alternative energy sources. Students will be exposed to an in-depth analysis of the design and use of fossil fuel based systems and then compare those systems to alternatives. Energy use in transportation, industrial, commercial, and residential applications will be examined.

IT 101 Introduction to Mechatronics 3.0 Units

Hours: 32-36 lecture, 48-54 lab

Provides an understanding of how mechatronic technology in our lives works using only basic science and math concepts. This course explores basic mechatronic systems commonly found in industry and focuses on their principles of operation, histories, and relationships to one another. Topics will include an exploration of and science behind basic mechanics, fluid power, electrical power, and control systems. Students will learn about these mechatronic technologies through lecture, classroom discussion, and laboratory experiments and projects.

IT 110 Modern Welding 3.0 Units

Hours: 32-36 lecture, 48-54 lab

Acquaints the student with MIG and TIG welding methods and knowledge necessary to weld in all positions utilizing the mild steel, low hydrogen electrodes, metal inert gas and tungsten inert gas techniques.

IT 111 Modern Welding 3.0 Units

Prerequisite: IT 110

Hours: 32-36 lecture, 48-54 lab

Aquaints the student with MIG and TIG welding methods and knowledge necessary to weld in all positions utilizing the mild steel, low hydrogen electrodes, metal inert gas and tungsten inert gas techniques.

IT 120 Electrical Safety 1.0 to 3.0 Units

Hours: 16-54 lecture

A survey of the proper use, handling, and hazards associated with electrical and electronic equipment. The student will be introduced to the current generally accepted (National Electrical Safety Code) safety practices and procedures associated with power transmission, industrial, and consumer electrical and electronic equipment. This is an Open Entry/Open Exit course. Students may take this course up to the maximum number of units over multiple semesters.

IT 140 Industrial Materials 3.0 Units

Hours: 32-36 lecture, 48-54 lab

A broad overview of the characteristics and comparative qualities of naturally occurring, alloyed and man-made materials used in industry. Testing and practical use of materials are required.

IT 151 Vocational Mathematics 3.0 Units

Hours: 48-54 lecture

Focuses on mathematical functions, plane and solid geometry, measurement systems, algebra, and trigonometry applied to specific vocational areas.

IT 171 Making Things 1 - 3D Technology 1.0 Unit

Hours: 16-18 lecture, 8-9 lab

A hands-on course using 3-Dimensional Computer Aided Drafting (CAD) tools to create objects with a 3D printer and Computer Numeric Controlled (CNC) machine. Students will gain a basic understanding of design to product workflow as well as the basics of 3D printing and CNC machines, including applications and use in industry.

IT 172 Making Things 2 - 2D Technology 1.0 Unit

Hours: 16-18 lecture, 8-9 lab

A hands-on course using 2-Dimensional Computer Aided Drafting (CAD) tools to create objects with a laser cutter and vinyl cutter. Students will gain a basic understanding of safety, design, and project workflow as well as the basics of each machine's uses in industry.

IT 173 Making Things 3 - Tool Use and Safety 1.0 Unit

Hours: 16-18 lecture, 8-9 lab

Introduction to Maker Space terminology and safety standards for hand and power tools in a laboratory setting. Students learn proper usage and applications of common hand and power tools pertinent to Maker Space laboratory and some industrial settings.

IT 174 Making Things 4 - Basic Electronics 1.0 Unit

Hours: 16-18 lecture, 8-9 lab

A hands-on introduction to basic electronics and microcontrollers used in a Maker Space environment. Students will learn basic soldering techniques, electronic terminology and circuitry, and simple programming of devices such as Arduino and Raspberry Pi.

IT 175 Maker Space Technology Lab 1.5 Units

Prerequisite: A minimum grade of C in IT 171, IT 172, IT 173, and IT 174

Hours: 72-81 lab

Utilize the full range of Maker Space equipment to create and design projects in the Maker Space laboratory. Students will create designs using instructor-given parameters in order to gain more skill on machines used in IT 171, IT 172, IT 173 and IT 174.

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IT 176 Maker Space Technology Lab II 1.5 Units

Prerequisite: A minimum grade of C in IT 175 and IT 179
Hours: 72-81 lab

Utilize the full range of Maker Space equipment to create and design projects in the Maker Space laboratory. An emphasis will be given to multiple tooled projects (3D printing and electronics or laser cutting and woodworking, for example). Students will create designs using instructor-given parameters, plan projects and analyze results.

IT 179 Making Things 5 - Sewing Fundamentals 1.0 Unit

Hours: 16-18 lecture, 8-9 lab

Introduces students to industry sewing techniques with an emphasis on safe and appropriate operation of consumer and industrial sewing machines and tools. Students produce projects by applying the techniques taught in the course as a foundation to the understanding of pattern construction, manufacturing, and production. Designed for students with little to no sewing experience.

IT 181 Introduction to Drones 3.0 Units

Hours: 48-54 lecture

An introduction to Drones and Unmanned Aerial Vehicles. Provides a starting point to use drones for multiple purposes and careers. Topics include the basics of aviation and flight, classes of drone systems, applications, required equipment, maintenance, mission planning, control systems, recovery systems and regulations. Intended for those looking to become licensed to use drones for commercial purposes such as aerial cinematography, photography, surveying, and imaging.

IT 182 Basic Drone Operations 3.0 Units

Prerequisite: IT 181 with a minimum grade of C
Hours: 32-36 lecture, 48-54 lab

Basic flight operation, drone controls, and equipment as well as safety procedures. Students will understand the varied uses of unmanned aviation vehicles (UAV) and learn the Federal Aviation Administration (FAA) guidelines for commercial usage.

IT 183 Drone Photography and Video 3.0 Units

Prerequisite: IT 182 with a minimum grade of C
Hours: 32-36 lecture, 48-54 lab

Covers the use of cameras and sensors to capture and analyze aerial photos and video. Camera and sensor mounting, settings, accessories, image analysis, options, software, and best practices will be explored.

IT 184 Remote Pilot Exam Prep 1.5 Units

Prerequisite: IT 182 with a minimum grade of C.
Hours: 24-27 lecture.

Covers the aeronautical knowledge required to fly drones for commercial purposes. Prepares the student to take the Federal Aviation Administration (FAA) Part 107 examination.

Maintenance Technology

MT 120 Principles of Analog Electronics 3.0 Units

Hours: 32-36 lecture, 48-54 lab

Introduces the topic of analog electronics as it applies to mechatronics. Studies include an introduction to DC and AC circuitry as well as advanced electronic components, instruments used in the operation, installation, and troubleshooting of electronic systems, schematic diagrams, and breadboarding. Students will construct several kits as part of the class.

MT 121 Electronics 4.0 Units

Hours: 40-45 lecture, 72-81 lab

Introduces the topics of analog and digital electronics. Studies include an introduction to DC and AC circuitry as well as specific analog and digital electronic components, circuits, and instruments used in the operation, installation, and troubleshooting of electronic systems.

MT 122 Principles of Digital Electronics 3.0 Units

Hours: 32-36 lecture, 48-54 lab

Introduces the topic of digital electronics as it applies to mechatronics. Studies include an introduction to digital numbering systems, digital codes and logic, registers, memories, Boolean Algebra, and integrated circuits as well as advanced topics in computerized control systems. Students will construct several kits as part of the class.

MT 130 Principles of Mechanical Power Systems 3.0 Units

Hours: 32-36 lecture, 48-54 lab

Introduces the topic of mechanical power systems and mechanical power transmission as it applies to mechatronics. Studies include mechanical theory, mechanical power, thermal systems, hand tools, precision measuring instruments, and mathematics applied to mechanical power systems. Includes studies in manufacturing technology using modern manufacturing equipment and software simulators.

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MT 132 Principles of Fluid Power Systems 3.0 Units

Hours: 32-36 lecture, 48-54 lab

Introduces the topic of hydraulic and pneumatic systems as they apply to mechatronics. Studies include fluid power systems theory, pumps, actuators, accumulators, filters, meters, valves, control devices, and mathematics applied to fluid power systems. Includes studies in manufacturing technology using modern manufacturing equipment and software simulators.

MT 140 3.0 Units

Principles of Industrial Electrical Systems

Hours: 32-36 lecture, 48-54 lab

Introduces the topic of DC, single-phase and three-phase AC circuits as they apply to mechatronics. Introduces commercial/industrial electrical installations that meet National Electrical Code requirements. Students will complete labs and wiring projects. Lab, electrical and worksite safety is emphasized.

MT 142 Principles of Electrical Machinery 3.0 Units

Prerequisite: MT 120 or MT 140 with a minimum grade of C

Hours: 32-36 lecture, 48-54 lab

Introduces the topic of electrical machinery as it applies to mechatronics. Studies include direct-current and alternating-current generators, alternators, transmission equipment, and motors. Students will complete labs and electrical machinery projects. Lab, electrical and worksite safety is emphasized.

MT 162 Robotic Manufacturing Systems 3.0 Units

Hours: 32-36 lecture, 48-54 lab

Presentation of physical principles applied to automated manufacturing systems. Students will develop solutions to manufacturing problems using robots, programmable logic controllers (PLC) and computer numerical control (CNC) manufacturing machines. Students will also apply safety-oriented work habits to the completion of laboratory projects while working individually and in groups.

MT 163 3.0 Units

Advanced Robotics Manufacturing Systems

Prerequisite: MT 162 with a minimum grade of C

Hours: 32-36 lecture, 48-54 lab

Advanced programming, vision recognition systems, PLC and HMI integration, and hardware concepts associated with industrial robots. Students in this course will program several robots to work together and with other common automation systems to increase the efficiency and throughput of industrial automation processes. Robot safety procedures including Dual Check Safety (DCS) and other industry standards will be emphasized throughout the course.

MT 164 Programmable Logic Controllers 3.0 Units

Hours: 32-36 lecture, 48-54 lab

Introduces the student to process control via Programmable Logic Controllers (PLC's). Content includes the popular Allen-Bradley PLC systems and the most common command instructions for the RSLogix 5, RSLogix 500, RSLogix 5000, Micrologix 1000, SLC5 and SLC 500 as well as ControlLogix processors. Troubleshooting and electrical safety are emphasized.

MT 165 3.0 Units

Advanced Programmable Logic Controllers

Prerequisite: MT 164 with a minimum grade of C

Hours: 32-36 lecture, 48-54 lab

For PLC (Programmable Logic Controllers) programmers, electricians, maintenance and instrumentation technicians, automation students and professionals that have some experience with basic PLC programming. Topics include Tag-Based programming with ControlLogix PLCs along with the RSLogix 5000 programming suite, process control methods, variable frequency drives, SCADA (Supervisory Control and Data Acquisition), and HMI's (Human Machine Interface).

MT 166 CNC Programming 3.0 Units

Course Advisory: DRFT 151 with a minimum grade of C

Hours: 32-36 lecture, 48-54 lab

Operational and theory of Computer Numerical Control (CNC) machinery, with a focus on skill building, safety practices and maintenance to work as an operator. Includes integration of Computer-Aided Design and Computer-Aided Manufacturing (CAM) as well as manual programming techniques.

MT 167 Advanced CNC Programming 3.0 Units

Prerequisite: MT 166 with a minimum grade of C

Hours: 32-36 lecture, 48-54 lab

Exposes the beginning CNC Machinist to advanced programming techniques for creating basic macro programs, tool and work probing methods, sub programs, sub-routines, 2-axis lathes, 3 + 2 axis mill programming, and 5 axis mill simultaneous programming. Includes preparatory skill and knowledge development in preparation for Haas CNC Operator and/or National Institute for Metalworking Skills (NIMS) certification exams.