



Automotive/Advanced Manufacturing Robotics/Mechatronics

Program Information

System integration is the process of combining several different fields of science, engineering, and technology to meet the needs of a dynamic business and technical environment. Robotics integrates several systems, including, physics, mechanics, fluid, electronics-electrical, and computer programming. Mechatronics began as a body of knowledge that integrated mechanical and electronic systems but has evolved to include other systems. The Automotive/Advanced Manufacturing program with a concentration in Robotics/Mechatronics will prepare graduates for entry-level employment in industrial automation. Concepts covered in the curriculum concentration will include a Mechatronic approach to training; programmable logic controllers; digital fundamentals; interfacing microcomputers to electro-mechanical devices; flexible manufacturing cells; and networking the multiple disciplines into an Advanced Manufacturing process. The Core Technology curriculum includes Industrial Robotics, Flexible and Cellular Manufacturing, Programmable Logic Controllers, Precision Measurements, and electronics-electrical technology.

Occupational Choices

Individuals who graduate with an associate's degree in robotics might be qualified for careers in industries where robotic devices are used, such as manufacturing, defense, electronics, construction and space industries. Individuals can also pursue positions as electronic engineering technicians; manufacturing technicians; robotics technicians and/or quality technicians.

Source: Bureau of Labor and Statistics Occupational Outlook Handbook, 2019-2029 Edition, 2020 Survey

Average Full-Time Wage

Robotics technicians had an average annual wage of \$61,420 as of 2019. A skill in machine programming, maintenance and manufacturing is associated with high pay for this job.

Source: Bureau of Labor and Statistics Occupational Outlook Handbook, 2019-2029 Edition, 2020 Survey

Additional Requirements

- Student must be at least 16 years of age.
- Student must have an official copy of high school transcript or GED certificate and transcript from other colleges on file in the admissions office.
- Student must take the ACCUPLACER test.
- Student must perform mathematical computations correctly.

Estimated Program Length & Cost *

Award	Length	Credit Hours	Tuition/Fees	Books	Tools	Supplies
Associate Degree	6 Terms	67	\$10,787	\$1,920	\$600	\$300
Certificate	5 Terms	59	\$9,499	\$1,920	\$600	\$300
Short Term Certificates (2)	3 Terms	28	\$4,508	\$1,000	\$600	\$200

* Tax not included. Prices are subject to change without prior notice; cost of books may vary considerably among suppliers. Cost of general education books is in addition to the total listed above. The length of the program is based on full-time status of 12-15 credit hours per term. Enrollment in transitional level general education courses will alter the length of the program.

Awards Available

Associate of Applied Science
Automotive/Advanced Manufacturing
Robotics/Mechatronics

Certificate
Automotive/Advanced Manufacturing
Robotics/Mechatronics

Short Term Certificate
Automotive/Advanced Manufacturing
Robotics/Mechatronics

Automotive/Advanced Manufacturing
Robotics/Mechatronics
Industrial Automation

Program Contact

Edward Abrasley
Program Coordinator/Instructor
334-420-4369
Location: Patterson Site - Bldg. M

As part of ongoing planning and evaluation, the College regularly evaluates student learning outcomes for each program.

**Associate of Applied Science
Automotive/Advanced Manufacturing
Robotics/Mechatronics**

General Education Requirements (16 hours)**Area I - Written Composition (3 hours)**

ENG-101*	English Composition I	3
ENG-102	English Composition II	3
ENG-130	Technical Report Writing	3

Area II - Humanities & Fine Arts (3 hours)

(Humanities and Arts disciplines include but are not limited to: Area/Ethnic Studies, Art and Art History, Foreign Languages, Music and Music History, Philosophy, Ethics, Religious Studies, Theater and Dance.)

Note: If SPH-106, SPH-107, SPA-101 or SPA-102 has been taken an additional 3 semester hours in Humanities and Fine Arts must be taken to satisfy requirements in Area II.

Arts:

ART-100	Art Appreciation	3
MUS-101*	Music Appreciation	3

Humanities:

PHL-106	Intro to Philosophy	3
PHL-206	Ethics & Society	3
REL-100	History of World Religions	3
REL-151	Survey of Old Testament	3
REL-152	Survey of New Testament	3
SPA-101	Intro Spanish I	3
SPA-102	Intro Spanish II	3
SPH-106	Fundamentals of Oral Comm	3
SPH-107	Fundamentals of Public Speaking	3

Literature:

ENG-251	American Literature I	3
ENG-252	American Literature II	3
ENG-261	English Literature I	3
ENG-262	English Literature II	3
ENG-271	World Literature I	3
ENG-272	World Literature II	3

Area III - Natural Science & Mathematics (6-7 hours)

(In addition to Mathematics, disciplines in the Natural Sciences include: Astronomy, Biological Sciences, Chemistry, Geology, Physical Geography, Earth Science, Physics, and Physical Science.)

Note: 3 semester hours in MTH must be completed. Additional hours can be taken in the Natural Science area.

Mathematics:

MTH-100	Intermediate Algebra	3
MTH-104	Plane Trigonometry	3
MTH-110	Finite Mathematics	3
MTH-112	Precalculus Algebra	3
MTH-116*	Mathematical Applications	3

Natural Sciences:

BIO-101	Introduction to Biology I	4
BIO-102	Introduction to Biology II	4
BIO-103	Principles of Biology I	4
BIO-104	Principles of Biology II	4
PHS-111	Physical Science I	4
PHS-112*	Physical Science II	4
PHY-120	Introduction to Physics	4

Area IV - History, Social & Behavioral Sciences (3 hours):
(Social and Behavioral Sciences include, but are not limited to: Anthropology, Economics, Geography, Political Science, Psychology, and Sociology.)

Note: Must complete 3 semester hours.

History:

HIS-101	Western Civilization I	3
HIS-102	Western Civilization II	3
HIS-121	World History I	3
HIS-122	World History II	3
HIS-201	United States History I	3
HIS-202	United States History II	3

Social and Behavioral Sciences:

PSY-200*	General Psychology	3
PSY-210	Human Growth and Development	3
SOC-200	Introduction to Sociology	3
POL-200	Introduction to Political Science	3
POL-211	American National Government	3

Area V: Pre-Professional/College Requirements:

(Courses appropriate to the degree requirements and major of the individual student and electives.)

College Requirements:

ORI-101	Orientation to College	1
CIS-146	Microcomputer Applications	3
ADM-101	Precision Measurement Or MTT 147 Intro to Machine Shop I	3
ADM-111	Manufacturing Safety Practices Or ELT-206 OSHA Safety Standards*	3
ADM-234	Applied Industrial Robotics (FANUC)	3
ADM-250	Intro to Flexible Manufacturing Cells	4
ELT-108	DC Fundamentals	3
ELT-110	Wiring Methods	3
ELT112	Concepts of Alternating Current	5
ELT-117	AC/DC Machines	3
ELT-119	Concepts of Solid State Electronics	5
ELT-121	Concepts of Digital Electronics	5
ELT-209	Motor Controls I	3
ELT-212	Motor Controls II	3
ELT-231	Programmable Controls I	3
ELT-232	Adv Programmable Controllers	3
ELT-286	Co-op	1

* Preferred course

Area V Credit Hours: 51

Total Credit Hours: 67

Certificate
Automotive/Advanced Manufacturing
Robotics/Mechatronics

General Education Requirements (9 hours)**Area I - Written Composition (3 hours)**

ENG-101	English Composition I	3
ENG-102	English Composition II	3
ENG-130	Technical Report Writing	3

Area II - Humanities & Fine Arts (0 hours)

(Humanities and Arts disciplines include but are not limited to: Area/Ethnic Studies, Art and Art History, Foreign Languages, Music and Music History, Philosophy, Ethics, Religious Studies, Theater and Dance.)

Note: If SPH-106, SPH-107, SPA-101 or SPA-102 has been taken an additional 3 semester hours in Humanities and Fine Arts must be taken to satisfy requirements in Area II.

Arts:

ART-100	Art Appreciation	3
MUS-101	Music Appreciation	3

Humanities:

PHL-106	Intro to Philosophy	3
PHL-206	Ethics & Society	3
REL-100	History of World Religions	3
REL-151	Survey of Old Testament	3
REL-152	Survey of New Testament	3
SPA-101	Intro Spanish I	3
SPA-102	Intro Spanish II	3
SPH-106	Fundamentals of Oral Comm	3
SPH-107	Fundamentals of Public Speaking	3

Literature:

ENG-251	American Literature I	3
ENG-252	American Literature II	3
ENG-261	English Literature I	3
ENG-262	English Literature II	3
ENG-271	World Literature I	3
ENG-272	World Literature II	3

Area III - Natural Science & Mathematics (6-7 hours)

(In addition to Mathematics, disciplines in the Natural Sciences include: Astronomy, Biological Sciences, Chemistry, Geology, Physical Geography, Earth Science, Physics, and Physical Science.)

Note: 3 semester hours in MTH must be completed. Additional hours can be taken in the Natural Science area.

Mathematics:

MTH-100	Intermediate Algebra	3
MTH-104	Plane Trigonometry	3
MTH-110	Finite Mathematics	3
MTH-112	Precalculus Algebra	3
MTH-116	Mathematical Applications	3

Natural Sciences:

BIO-101	Introduction to Biology I	4
BIO-102	Introduction to Biology II	4
BIO-103	Principles of Biology I	4
BIO-104	Principles of Biology II	4
PHS-111	Physical Science I	4
PHS-112	Physical Science II	4
PHY-120	Introduction to Physics	4

Area IV - History, Social & Behavioral Sciences (0 hours):
(Social and Behavioral Sciences include, but are not limited to: Anthropology, Economics, Geography, Political Science, Psychology, and Sociology.)

Note: Must complete 3 semester hours.

History:

HIS-101	Western Civilization I	3
HIS-102	Western Civilization II	3
HIS-121	World History I	3
HIS-122	World History II	3
HIS-201	United States History I	3
HIS-202	United States History II	3

Social and Behavioral Sciences:

PSY-200	General Psychology	3
PSY-210	Human Growth and Development	3
SOC-200	Introduction to Sociology	3
POL-200	Introduction to Political Science	3
POL-211	American National Government	3

Area V: Pre-Professional/College Requirements:

(Courses appropriate to the degree requirements and major of the individual student and electives.)

College Requirements:

ORI-101	Orientation to College	1
CIS-146	Microcomputer Applications	3
ADM-101	Precision Measurement Or MTT 147 Intro to Machine Shop I	3
ADM-111	Manufacturing Safety Practices Or ELT-206 OSHA Safety Standards*	3
ADM-234	Applied Industrial Robotics (FANUC)	3
ADM-250	Intro to Flexible Manufacturing Cells	4
ELT-108	DC Fundamentals	3
ELT-110	Wiring Methods	3
ELT112	Concepts of Alternating Current	5
ELT-117	AC/DC Machines	3
ELT-119	Concepts of Solid State Electronics	5
ELT-121	Concepts of Digital Electronics	5
ELT-209	Motor Controls I	3
ELT-212	Motor Controls II	3
ELT-231	Programmable Controls I	3

Area V Credit Hours: 50

Total Credit Hours: 59

Short Term Certificate
Automotive/Advanced Manufacturing
Robotics/Mechatronics

General Education Requirements (3 hours)

Area III - Natural Science & Mathematics (3 hours)

(In addition to Mathematics, disciplines in the Natural Sciences include: Astronomy, Biological Sciences, Chemistry, Geology, Physical Geography, Earth Science, Physics, and Physical Science.)

Note: 3 semester hours in MTH must be completed. Additional hours can be taken in the Natural Science area.

Mathematics:

MTH-100	Intermediate Algebra	3
MTH-104	Plane Trigonometry	3
MTH-110	Finite Mathematics	3
MTH-112	Precalculus Algebra	3
MTH-116*	Mathematical Applications	3

Natural Sciences:

BIO-101	Introduction to Biology I	4
BIO-102	Introduction to Biology II	4
BIO-103	Principles of Biology I	4
BIO-104	Principles of Biology II	4
PHS-111	Physical Science I	4
PHS-112	Physical Science II	4
PHY-120	Introduction to Physics	4

Area V: Pre-Professional/College Requirements:

(Courses appropriate to the degree requirements and major of the individual student and electives.)

College Requirements:

ORI-101	Orientation to College	1
ADM-234	Applied Industrial Robotics (FANUC)	3
ADM-250	Intro Flexible Manufacturing Cells	4
ELT-108	DC Fundamentals	3
ELT112	Concepts of Alternating Current	5
ELT-209	Motor Controls I	3
ELT-231	Programmable Controls I	3
ELT-232	Adv Programmable Controllers	3

Area V Credit Hours: 25

Total Credit Hours: 28

Short Term Certificate
Automotive/Advanced Manufacturing
Robotics/Mechatronics
Industrial Automation

General Education Requirements (3 hours)

Area III - Natural Science & Mathematics (3 hours)

(In addition to Mathematics, disciplines in the Natural Sciences include: Astronomy, Biological Sciences, Chemistry, Geology, Physical Geography, Earth Science, Physics, and Physical Science.)

Note: 3 semester hours in MTH must be completed. Additional hours can be taken in the Natural Science area.

Mathematics:

MTH-100	Intermediate Algebra	3
MTH-104	Plane Trigonometry	3
MTH-110	Finite Mathematics	3
MTH-112	Precalculus Algebra	3
MTH-116*	Mathematical Applications	3

Natural Sciences:

BIO-101	Introduction to Biology I	4
BIO-102	Introduction to Biology II	4
BIO-103	Principles of Biology I	4
BIO-104	Principles of Biology II	4
PHS-111	Physical Science I	4
PHS-112	Physical Science II	4
PHY-120	Introduction to Physics	4
MTH-100	Intermediate Algebra	3

Area V: Pre-Professional/College Requirements:

(Courses appropriate to the degree requirements and major of the individual student and electives.)

College Requirements:

ORI-101	Orientation to College	1
ADM-101	Precision Measurement or MTT 147 Intro Machine Shop I	3
ADM-111	Manufacturing Safety Practices Or ELT-206 OSHA Safety Standards*	3
ADM-200	Industrial Robotics Safety	3
ADM-234	Applied Industrial Robotics (FANUC)	3
ADM-250	Intro Flexible Manufacturing Cells	4
ELT-108	DC Fundamentals	3
ELT112	Concepts of Alternating Current	5

* Preferred course

Area V Credit Hours: 25

Total Credit Hours: 28

Course Descriptions Automotive/Advanced Manufacturing Robotics/Mechatronics

Course #	Course Title	Credit Hours
ADM-101	PRECISION MEASUREMENT PREREQUISITE: None This course covers the use of precision measurement instruments utilized in inspection. In addition, basic print reading techniques reverse engineering, and related industry standards required in advanced manufacturing disciplines are covered. Upon completion, students should be able to demonstrate correct use of precision measuring instruments, interpret basic prints and apply basic reverse engineering techniques. This course is also taught as MTT-147.	3
ADM-111	MANUFACTURING SAFETY PRACTICES PREREQUISITE: None This course is an introduction to general issues, concepts, procedures, hazards, and safety standards found in an industrial environment. This safety course is to make technicians aware of safety issues associated with their changing work environment and attempt to eliminate industrial accidents. This course will offer credentialing for NCCER Core and OSHA 10 hour. This course is also taught as ELT-2067.	3
ADM-120	DC FUNDAMENTALS PREREQUISITE: None This course is designed to provide students with a working knowledge of basic direct current (DC) electrical principles. Topics include safety, basic atomic structure and theory, magnetism, conductors, insulators, use of Ohm's law to solve for voltage, current, resistance, electrical sources, power, inductors and capacitors. Students will perform lockout/tagout procedures, troubleshoot circuits and analyze series, parallel, and combination DC circuits using the electrical laws and basic testing equipment to determine unknown electrical quantities. CORE	3
ADM-121	AC FUNDAMENTALS PREREQUISITE: AUT-110 This course is designed to provide students with a working knowledge of basic alternating current (AC) electrical principles. Topics include basic concepts of electricity, electrical components, basic circuits, measurement instruments, the laws of alternating current, and electrical safety with lockout procedures. Hands-on laboratory exercises are provided to analyze various series, parallel, and combination alternating current circuit configurations containing resistors, inductors and capacitors. Upon course completion, students will be able to describe and explain alternating current circuit fundamentals, such as RLC circuits, impedance, phase relationships and power factors. They should also be able to perform fundamental tasks associated with troubleshooting, repairing and maintaining industrial AC systems. This is a CORE course.	3
ADM-234	APPLIED INDUSTRIAL ROBOTICS (FANUC) PREREQUISITE: None This course covers the basic techniques used to write, execute, test, and modify a basic robotic program for an application-specific operation. Topics covered are related safety, robotic systems, computer terminal programming, teach pendant programming, and input/output interfacing. Upon completion, a student should be able to write, test, and evaluate a robotic program.	3
ADM-250	INTRODUCTION TO FLEXIBLE MANUFACTURING CELLS PREREQUISITE: None This course covers techniques involved when grouping related machines for the purpose of completing a series of manufacturing processes in a flexible manufacturing cell. The student will be involved with the computerized integration of programmable control systems such as robotics, machine tools, and other peripheral equipment to emulate real-world manufacturing concepts employed in flexible manufacturing cells.	4
ADM-286	COOPERATIVE EDUCATION PREREQUISITE: As required by college These courses constitute a series wherein the student works on a part-time basis in a job directly related to advanced manufacturing. In these courses the employer evaluates the student's productivity and the student submits a descriptive report of his work experiences. Upon completion, the student will demonstrate skills learned in an employment setting.	1
ELT-108	DC FUNDAMENTALS PREREQUISITE: None This course is designed to provide students with a working knowledge of basic direct current (DC) electrical principles. Topics include safety, basic atomic structure and theory, magnetism, conductors, insulators, use of Ohm's law to solve for voltage, current, and resistance, electrical sources, power, inductors, and capacitors. Students will perform lockout/tagout procedures, troubleshoot circuits and analyze series, parallel, and combination DC circuits using the electrical laws and basic testing equipment to determine unknown electrical quantities. This is a CORE course.	3

Course #	Course Title	Credit Hours
ELT-110	WIRING METHODS	3
	PREREQUISITE: None	
	This course is a study of various tasks, wiring methods, materials, and associated NEC requirements that students will be required to work with in residential and commercial wiring courses. This is a CORE course	
ELT-112	CONCEPTS OF ALTERNATING CURRENT	5
	PREREQUISITE: None	
	This course provides an advanced study of alternating current (AC) concepts and application principles. Specific topics include safety, terms and symbols, AC electrical theory, components, circuits, electrical measurement instruments, laws of AC, and methods for constructing and measuring various types of AC circuits. Students gain hands-on experience through laboratory exercises designed to analyze complex circuits, power requirements, faults, phase relationships, and power factors. Emphasis is placed on the use of scientific calculators and the operation of various types of test equipment used to analyze and troubleshoot AC circuits. This course may serve as a substitute core for DC Fundamentals	
ELT-117	AC/DC MACHINES	3
	PREREQUISITE: ELT-108	
	This course covers the theory and operation of DC motors single and three phase AC motors and the labs will reinforce this knowledge. Emphasis is placed on the various types of single and three phase motors, wiring diagrams, starting devices, and practical application in the lab. This is a CORE course.	
ELT-119	CONCEPTS OF SOLID STATE ELECTRONICS	5
	PREREQUISITE: ELT-112	
	This course is an introduction to semiconductor fundamentals and applications to the electronic devices. Course covers the basic operations and applications to include rectifier circuits, transistors, and thyristors. Coverage is given to safety, use, and care with hazardous materials and personal as well as material and environmental considerations. Upon completion students will be able to construct and test for proper operation of various types of solid state devices.	
ELT-121	CONCEPTS OF DIGITAL ELECTRONICS	5
	PREREQUISITE: ELT-112	
	This course provides instruction in digital electronics. Topics include: number systems and codes, a review of Boolean algebra, logic elements, digital circuits, programmable logic circuits, and memory and computing circuits. This course provides laboratory exercises to analyze, construct, test and troubleshoot digital circuits.	
ELT-209	MOTOR CONTROLS I	3
	PREREQUISITE: ELT-108	
	This course is a study of the construction, operating characteristics, and installation of different motor control circuits and devices. Emphasis is placed on the control of three phase AC motors. This course covers the use of motor control symbols, magnetic motor starters, running overload protection, pushbutton stations, multiple control stations, two wire control, three wire control, jogging control, sequence control, and ladder diagrams of motor control circuits. Upon completion, students should be able to understand the operation of motor starters, overload protection, interpret ladder diagrams using pushbutton stations and understand complex motor control diagrams. This is a CORE course.	
ELT-212	MOTOR CONTROLS II	3
	PREREQUISITE: ELT-108, ELT-209 and MTH-103	
	This course covers complex ladder diagrams of motor control circuits and the uses of different motor starting techniques. Topics include wye-delta starting, part start winding, resistor starting and electronic starting devices. Upon completion, the students should be able to understand and interpret the more complex motor control diagrams and understand the different starting techniques of electrical motors.	
ELT-231	INTRODUCTION TO PROGRAMMABLE CONTROLLERS	3
	PREREQUISITE: ELT-108	
	This course provides an introduction to programmable logic controllers. Emphasis is placed on, but not limited to, the following: PLC hardware and software, numbering systems, installation, and programming. Upon completion, students must demonstrate their ability by developing, loading, debugging, and optimizing PLC programs.	
ELT-232	ADVANCED PROGRAMMABLE CONTROLLERS	3
	PREREQUISITE: ELT-108	
	This course includes the advanced principals of PLC's including hardware, programming, and troubleshooting. Emphasis is placed on developing advanced working programs, and troubleshooting hardware and software communication problems. Upon completion, students should be able to demonstrate their ability in developing programs and troubleshooting the system.	
ELT-286	CO-OP	1
	PREREQUISITE: As required by program.	
	These courses constitute a series wherein the student works on a part-time basis in a job directly related to electrical technology. In these courses the employer evaluates the student's productivity and the student submits a descriptive report of his work experiences. Upon completion, the student will demonstrate skills learned in an employment setting.	