Program Information

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.

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.


Average Full-Time Wage

Electrical and electronics engineering technicians had an average annual wage of $61,870 as of May 2015. A skill in machine programming, maintenance and manufacturing is associated with high pay for this job.


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 be able to perform simple mathematical computations correctly.

Estimated Program Length & Cost *

<table>
<thead>
<tr>
<th>Award</th>
<th>Length</th>
<th>Credit Hours</th>
<th>Tuition Fees</th>
<th>Books</th>
<th>Tools</th>
<th>Supplies</th>
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<tbody>
<tr>
<td>Associate Degree</td>
<td>6 Terms</td>
<td>69</td>
<td>$10,695</td>
<td>$1,920</td>
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<td>$300</td>
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<tr>
<td>Certificate</td>
<td>5 Terms</td>
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<td>$9,145</td>
<td>$1,920</td>
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<td>$300</td>
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<tr>
<td>Short Term Certificate</td>
<td>3 Terms</td>
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<td>$4,340</td>
<td>$1,000</td>
<td>$600</td>
<td>$200</td>
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</tbody>
</table>

* 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.
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-200 Ethics in the Workplace 3
PHL-206 Ethics & Society 3
PHL-210 Ethics and the Health Sciences 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-103 Intro to Technical Mathematics 3
MTH-104 Plane Trigonometry 3
MTH-110 Finite Mathematics 3
MTH-112 Prealculus 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
BIO-201 Human Anatomy & Physiology I 4
BIO-202 Human Anatomy & Physiology 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 3
ADM-111 Manufacturing Safety Practices 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
ELT-112 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 Controllers I 3
ELT-232 Adv Programmable Controllers 3

Area V Credit Hours: 53
Total Credit Hours: 69
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-200 Ethics in the Workplace  3
PHL-206 Ethics & Society  3
PHL-210 Ethics and the Health Sciences  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 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-103 Intro to Technical Mathematics  3
MTH-104 Plane Trigonometry  3
MTH-110 Finite Mathematics  3
MTH-112 Pre-calculus 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
BIO-201 Human Anatomy & Physiology I  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  3
ADM-111 Manufacturing Safety Practices  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
ELT-112 Concepts of Alternating Current  3
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 (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-103 Intro to Technical Mathematics 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
- BIO-201 Human Anatomy & Physiology I 4
- BIO-202 Human Anatomy & Physiology 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 to Flexible Manufacturing Cells 4
- ELT-108 DC Fundamentals 3
- ELT-112 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
## Automotive/Advanced Manufacturing - Robotics/Mechatronics

### Course Descriptions

#### Automotive/Advanced Manufacturing

#### Robotics/Mechatronics

<table>
<thead>
<tr>
<th>Course #</th>
<th>Course Title</th>
<th>Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>ADM-101</td>
<td>PRECISION MEASUREMENT</td>
<td>3</td>
</tr>
<tr>
<td><strong>PREREQUISITE:</strong> None</td>
<td></td>
<td></td>
</tr>
<tr>
<td>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. Note: This is a suitable substitute for MTT-127.</td>
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</tr>
</tbody>
</table>

| ADM-111  | MANUFACTURING SAFETY PRACTICES                 | 3            |
| **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. |             |

| ADM-200  | INDUSTRIAL ROBOTICS SAFETY                     | 3            |
| **PREREQUISITE:** None                           |              |
| This course covers safety aspects associated with industrial robots and the procedures to follow when working around them. The topics are approached from maintenance/repair and engineering perspectives. Students have the opportunity to learn common types of accidents associated with robot work and the sources of these accidents. North American and European safety standards including new ANSI/RIA safety standards for Industrial Robots (15.06), risk assessment methodologies, risk reduction methods and the application of various safety products are also covered. |             |

| ADM-234  | APPLIED INDUSTRIAL ROBOTICS (FANUC)            | 3            |
| **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. |             |

| ADM-250  | INTRODUCTION TO FLEXIBLE MANUFACTURING CELLS   | 4            |
| **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. |             |

| ELT-108  | DC FUNDAMENTALS                                 | 3            |
| **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. |             |

| 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. |             |

<p>| ELT-112  | CONCEPTS OF ALTERNATING CURRENT                | 5            |
| <strong>PREREQUISITE:</strong> ELT-108                        |              |
| 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. |             |</p>
<table>
<thead>
<tr>
<th>Course #</th>
<th>Course Title</th>
<th>Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>ELT-117</td>
<td>AC/DC MACHINES</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>PREREQUISITE: ELT-108 and ELT-109</td>
<td></td>
</tr>
<tr>
<td></td>
<td>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.</td>
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<tr>
<td>ELT-119</td>
<td>CONCEPTS OF SOLID STATE ELECTRONICS</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>PREREQUISITE: ELT-112</td>
<td></td>
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<tr>
<td></td>
<td>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.</td>
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</tr>
<tr>
<td>ELT-121</td>
<td>CONCEPTS OF DIGITAL ELECTRONICS</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>PREREQUISITE: ELT-112</td>
<td></td>
</tr>
<tr>
<td></td>
<td>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.</td>
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</tr>
<tr>
<td>ELT-209</td>
<td>MOTOR CONTROLS I</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>PREREQUISITE: ELT-108 and ELT-109</td>
<td></td>
</tr>
<tr>
<td></td>
<td>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.</td>
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<tr>
<td>ELT-212</td>
<td>MOTOR CONTROLS II</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>PREREQUISITE: ELT-108, ELT-109, ELT-209, ELT-117, and MTH-103</td>
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</tr>
<tr>
<td>ELT-231</td>
<td>INTRODUCTION TO PROGRAMMABLE CONTROLLERS</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>PREREQUISITE: ELT-108 and ELT-109</td>
<td></td>
</tr>
<tr>
<td></td>
<td>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.</td>
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<tr>
<td>ELT-232</td>
<td>ADVANCED PROGRAMMABLE CONTROLLERS</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>PREREQUISITE: ELT-108 and ELT-109</td>
<td></td>
</tr>
<tr>
<td></td>
<td>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.</td>
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</tbody>
</table>