



Automotive/Advanced Manufacturing Electrical

Program Information

Electrical wiring is an integral part of industry, commercial enterprises, and residential homes. The Electrical curriculum integrates basic electrical skills and high tech instrumentation for a wide range of industrial employment. The term “instrumentation” refers to instruments used to measure and control manufacturing conversions or treating processes. Knowledge of electricity and process control gives a person a more marketable skill to offer all industries. These fields expand into SMART instruments, PLC/DCS interface and AC variable frequency motor controls. The Electrical Technology program is designed to teach the basic principles of electricity, the National Electric Code, and the safe installation of electrical wiring and equipment. Electrical/Instrumentation Technology is designed to teach basic instrumentation for measurement and control in manufacturing. Through the various courses, a student will gain knowledge and practical hands-on experience in both technologies for servicing, troubleshooting and monitoring these systems and equipment.

Occupational Choices

Employment of electrical and electronics installers and repairers of commercial and industrial equipment, which represents about half of this profile’s 2016 employment, is projected to grow 2 percent from 2016 to 2026, slower than the average for all occupations. As the industrial sectors of the economy expand, these workers will be needed to service and repair equipment.

Employment of powerhouse, substation, and relay electrical and electronics installers and repairers is projected to grow 4 percent from 2016 to 2026, slower than the average for all occupations. Although the installation of new, energy-efficient technologies will likely spur demand for some new workers, slow employment growth in the utilities industries is expected to temper demand for these workers.

Employment of electric motor, power tool, and related repairers is projected to grow 7% from 2016 to 2026, about as fast as the average for all occupations. Improvements in electrical and electronic equipment design, as well as the increased use of disposable tool parts, are expected to result in slow employment growth. Overall job opportunities should be good for qualified workers who are familiar with electronics, especially those with an associate’s degree in electronics.

Source: Bureau of Labor and Statistics Occupational Outlook Handbook, 2016-2026 Edition, 2018 Survey

Average Full-Time Wage

The median annual wage for electricians was \$55,190 in May 2018. The median wage is the wage at which half the workers in an occupation earned more than that amount and half earned less. The lowest 10 percent earned less than \$32,940, and the highest 10 percent earned more than \$94,620.

Source: Bureau of Labor and Statistics Occupational Outlook Handbook, 2016-2026 Edition, 2018 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 be able to perform simple mathematical computations correctly.

Awards Available

Associate of Applied Science
Automotive/Advanced Manufacturing
Electrical
Residential/Commercial Electrician
Electrical Technician
Instrumentation

Short Term Certificate
Automotive/Advanced Manufacturing
Electrical
Entry Level Technician Concentration
Instrumentation Concentration

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.

Estimated Program Length & Cost *

<u>Award</u>	<u>Length</u>	<u>Credit Hours</u>	<u>Tuition/Fees</u>	<u>Books</u>	<u>Tools</u>	<u>Supplies</u>
Associate Degrees	6 Terms	72	\$11,448	\$1,920	\$600	\$300
	6 Terms	71	\$11,289	\$1,920	\$600	\$300
Short Term Certificates	3 Terms	27	\$4,293	\$1,000	\$600	\$200
	3 Terms	24	\$3,816	\$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.

**Associate of Applied Science
Automotive/Advanced Manufacturing
Electrical
Residential/Commercial Electrician**

General Education Requirements (15 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 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
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-111	Manufacturing Safety Practices or ELT-206 OSHA Safety Standards	3
ADM-120	DC Fundamentals	3
ADM-121	AC Fundamentals	3
ELT-104	Distribution Systems	3
ELT-110	Wiring Methods	3
ELT-114	Residential Wiring I	3
ELT-117	AC/DC Machines	3
ELT-118	Commercial/Industrial Wiring	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-241	National Electric Code	3
ELT-286	Co-op	1
MTT-147	Introduction to Machine Shop I	3

Area V Credit Hours: 57

Total Credit Hours: 72

**Associate of Applied Science
Automotive/Advanced Manufacturing
Electrical
Electrical Technician**

General Education Requirements (15 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.)

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MUS-101	Music Appreciation	3

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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:

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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.

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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

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

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CIS-146	Microcomputer Applications	3
ADM-111	Manufacturing Safety Practices or ELT-206 OSHA Safety Standards	3
ADM-120	DC Fundamentals	3
ADM-121	AC Fundamentals	3
ELT-104	Distribution Systems	3
ELT-110	Wiring Methods	3
ELT-114	Residential Wiring I	3
ELT-117	AC/DC Machines	3
ELT-118	Commercial/Industrial Wiring	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	Intro to Prog Logic Controllers	3
ELT-232	Advanced Programmable Controllers	3
ELT-234	P L C Applications	3
ELT-286	Co-op	1
MTT-147	Introduction to Machine Shop I	3

Area V Credit Hours: 56**Total Credit Hours: 71**

**Associate of Applied Science
Automotive/Advanced Manufacturing
Electrical
Instrumentation**

General Education Requirements (15 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.

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SPH-107	Fundamentals of Public Speaking	3

Literature:

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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	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-111	Manufacturing Safety Practices or ELT-206 OSHA Safety Standards	3
ADM-120	DC Fundamentals	3
ADM-121	AC Fundamentals	3
AUT-210	Industrial Robotics	3
AUT-211	Industrial Robotics Lab	2
ELT-110	Wiring Methods	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	Intro to Prog Logic Controllers	3
ELT-232	Advanced Programmable Controllers	3
ELT-234	P L C Applications	3
ILT-108	Intro to Instruments & Process Ctrl	3
ILT-110	Adv Industrial Process Control Tech	3
ELT-286	Co-op	1
MTT-147	Introduction to Machine Shop I	3

Area V Credit Hours: 56

Total Credit Hours: 71

Short Term Certificate
Automotive/Advanced Manufacturing
Electrical
Entry Level Technician Concentration

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-111	Manufacturing Safety Practices	3
ADM-120	DC Fundamentals	3
ADM-121	AC Fundamentals	3
ELT-110	Wiring Methods	3
ELT-119	Concepts of Solid State Electronics	5
ELT-209	Motor Controls 1	3

Total Credit Hours: 24

Short Term Certificate
Automotive/Advanced Manufacturing
Electrical
Instrumentation Concentration

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-105	Fluid Systems	3
ADM-111	Manufacturing Safety Practices or ELT 206 OSHA Safety Standards or ADM 291 MSSC Safety Course	3
ADM-120	DC Fundamentals	3
ADM-121	AC Fundamentals	3
ELT-119	Concepts of Solid State Electronics	5
ILT-110	Advanced Industrial Process Control Tech	3
ILT-114	Instrumentation Operation and Calibration	3
INT-105	Introduction to Process Technology	3

Total Credit Hours: 27

Course Descriptions Automotive/Advanced Manufacturing Electrical

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.	3
ADM-105	FLUID SYSTEMS PREREQUISITE: None This course includes the fundamental concepts and theories for the safe operation of hydraulic and pneumatic systems used with industrial production equipment. Topics include the physical concepts, theories, laws, air flow characteristics, actuators, valves, accumulators, symbols, circuitry, filters, servicing safety, and preventive maintenance and the application of these concepts to perform work. Upon completion, students should be able to service and perform preventive maintenance functions on hydraulic and pneumatic systems.	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.	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, inducers 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
AUT-210	INDUSTRIAL ROBOTS PREREQUISITE: None This course covers principles of electro-mechanical devices. Topics include the principles, concepts, and techniques involved in interfacing microcomputers to various electro-mechanical devices to produce geographical movement. Upon completion, students should be able to apply the principles of electro-mechanical devices. This course is also taught as ILT 216.	3
AUT-211	INDUSTRIAL ROBOTS LAB PREREQUISITES: None This lab covers the principles, concepts, and techniques involved in interfacing microcomputers to various electro-mechanical devices to produce geographical movement. Upon completion students should be able to apply the principles of electro-mechanical devices. This course is also taught as ILT 217.	

- ELT-104 DISTRIBUTION SYSTEMS** 3
PREREQUISITE: ELT-108 and ELT-109
This course involves the theory, applications, calculations, and connections associated with transformers and power distribution systems commonly used in the electrical field.
- 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-114 RESIDENTIAL WIRING METHODS** 3
PREREQUISITE: None
This course is a study of residential wiring practices and methods, the NEC requirements and residential blueprint interpretations. This is a CORE course.
- ELT-117 AC/DC MACHINES** 3
PREREQUISITE: ELT-108 and ELT-109
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-118 COMMERCIAL/INDUSTRIAL WIRING I** 3
PREREQUISITE: ELT-108 and ELT-109
This course focuses on principles and applications of commercial and industrial wiring. Topics include electrical safety practices, an overview of National Electric Code requirements as applied to commercial and industrial wiring, conduit bending, circuit design, pulling cables, transformers, switch gear, and generation principles. 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 and ELT-109
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-109, ELT-209, ELT-117, 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 and ELT-109
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.

Course #	Course Title	Credit Hours
ELT-232	ADVANCED PROGRAMMABLE CONTROLLERS PREREQUISITE: ELT-108 and ELT-109 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.	3
ELT-234	PLC APPLICATIONS PREREQUISITE: ELT-108, ELT-109, ELT-209, ELT-117, ELT-231, ELT-232, and MTH-103 This course introduces advanced PLC programming techniques. Topics include tags, parallel processing, program optimization, and advanced math instructions. Emphasis is placed on optimizing PLC functions. Upon completion students will be able utilize advanced instructions to control PLC functions.	3
ELT-241	NATIONAL ELECTRIC CODE PREREQUISITE: ELT-108 and ELT-109 This course introduces the students to the National Electric Code and text and teaches the student how to find needed information within this manual. Emphasis is placed on locating and interpreting needed information within the NEC code manual. Upon completion, students should be able to locate, with the NEC code requirements for a specific electrical installation.	3
ELT-286	CO-OP 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.	1
ILT-108	INTRODUCTION TO INSTRUMENTS AND PROCESS CONTROL PREREQUISITE: As required by program. This course is an introductory study of the control devices and methods used in industry for the control and transmission of information pertaining to process variables. This study includes an introduction to instrumentation and control mathematics. This course also provides instruction in the fundamental concepts of pressure, force, weight, motion, liquid level, fluid flow and temperature.	3
ILT-110	ADVANCED INDUSTRIAL PROCESS CONTROL TECHNOLOGY PREREQUISITE: As required by program. This course is an advanced study of the principles governing methods of using process variables in the control of industrial processes. The study includes methods and procedures for measuring, displaying and transmitting process variables according to industry standards. The course also includes an in-depth study of mathematics pertaining to industrial control instruments.	3
ILT-114	INSTRUMENTATION OPERATION AND CALIBRATION PREREQUISITE: As required by program. The hardware used to measure and control process variables is presented. The student learns the principles of operation, servicing, maintenance, calibration, and troubleshooting procedures used on mechanical, pneumatic, electronic and digital based industrial transmitters, recorders, controllers, valves, and other control devices. The course is broken down into theory and laboratory work on actual process measuring and control equipment.	3
INT-105	INTRODUCTION TO PROCESS TECHNOLOGY PREREQUISITE: As required by program. This course is designed to provide students with an introduction to process control technology and various instruments used to control processes. Upon completion, students should be able to comprehend principles of process control technology and the application of various instruments used to control processes in an industrial setting.	3
MTT-147	INTRODUCTION TO MACHINE SHOP I PREREQUISITE: As required by program. This course introduces machining operations as they relate to the metalworking industry. Topics include machine shop safety, measuring tools, lathes, saws, milling machines, bench grinders, and layout instruments. Upon completion, students will be able to perform the basic operations of measuring, layout, drilling, sawing, turning, and milling. This is a CORE course.	3