Trenholm State COMMUNITY COLLEGE
The College for Real Careers

Automotive/Advanced Manufacturing Industrial Systems & Automation

Program Information

The Industrial Systems & Automation Program at Trenholm State Community College is a multi-craft curriculum. Many crafts are a part of the training process. Craft related instructors teach their respective crafts. HVAC (Heating and Air Conditioning) instructors teach two HVAC classes. The Machine Tool class is taught by the Machine Tool instructor. Basic Electrical and Mechanical classes are taught by the Maintenance Department instructors. As a Multi-Craft Technician in an industrial setting, knowledge and skills in the areas of Basic Electrical, Plant Automation, and Basic Robotic Maintenance and Programmable Logic Controller are required. Limited Machine Tool Technology. Hydraulics and Pneumatics are a major area of related skills included in the curriculum.

Occupational Choices

Overall employment of industrial machinery mechanics, machinery maintenance workers, and millwrights is projected to grow 7 percent from 2016 to 2026, about as fast as the average for all occupations. Employment growth will vary by occupation. The increased adoption of sophisticated manufacturing machinery will require more mechanics and millwrights to keep machines in good working order. Increased automation, including the use of many computer-controlled machines in factories and manufacturing plants, should raise the demand for machinery maintenance workers in order to keep the machines functioning properly. The increased use of machinery in manufacturing will require millwrights to install and disassemble this equipment, as well as perform some repair work on it. Job prospects will be good, particularly for applicants with a broad range of skills in machine repair as older workers retire or otherwise leave the occupation.

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

Average Full-Time Wage

The median annual wage for industrial machinery mechanics, machinery maintenance workers, and millwrights was $50,440 in May 2017. 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 $32,280, and the highest 10 percent earned more than $76,940.

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

Awards Available

Associate of Applied Science
Automotive/Advanced Manufacturing
Industrial Systems & Automation
Mechanical

Certificate
Automotive/Advanced Manufacturing
Industrial Systems & Automation
Mechanical

Short Term Certificate
Automotive/Advanced Manufacturing
Industrial Systems & Automation
Mechanical

Associate of Applied Science
Automotive/Advanced Manufacturing
Industrial Systems & Automation
Instrumentation

Certificate
Automotive/Advanced Manufacturing
Industrial Systems & Automation
Instrumentation

Program Contact

Michael Barnette
Program Coordinator/Instructor
334-420-4284
Location: Patterson Site - Bldg. Q

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

Estimated Program Length & Cost *

Award	Length	Credit Hours	Tuition Fees	Books	Tools	Supplies
Associate Degree 1	6 Terms	61	$9,455	$800	$650	0
Associate Degree 2	6 Terms	65	$10,075	$800	$650	0
Certificate 1	2 Terms	51	$7,905	$600	0	0
Certificate 2	2 Terms	55	$8,525	$600	0	0
Short Term Certificate	1Terms	25	$3,875	$600	0	0

* 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
Industrial Systems and Automation
Mechanical

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 (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 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-149	Intro to Computers	3
ADM-101	Precision Measurement	3
ADM-105	Fluid Systems	3
ADM-110	Blueprint Reading	3
ADM-111	Manufacturing Safety Practices	3
AUT-161	MSSC Safety Course	3
AUT-162	MSSC Quality Control Concepts	3
INT-101	DC Fundamentals	3
INT-103	AC Fundamentals	3
INT-117	Principles of Industrial Mechanics	3
INT-126	Preventive Maintenance	3
INT-127	Principles of Pumps & Piping	3
INT-218	Special Lab Hydraulics & Pneumatics	2
MTT-147	Introduction to Machine Shop I	3
MTT-148	Introduction to Machine Shop Lab I	3

Area V Credit Hours: 45
Total Credit Hours: 61

Certificate
Automotive/Advanced Manufacturing Industrial Systems and Automation
Mechanical

General Education Requirements (6 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 (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-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 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-149	Intro to Computers	3
ADM-101	Precision Measurement	3
ADM-105	Fluid Systems	3
ADM-110	Blueprint Reading	3
ADM-111	Manufacturing Safety Practices	3
AUT-161	MSSC Safety Course	3
AUT-162	MSSC Quality Control Concepts	3
INT-101	DC Fundamentals	3
INT-103	AC Fundamentals	3
INT-117	Principles of Industrial Mechanics	3
INT-126	Preventive Maintenance	3
INT-127	Principles of Pumps & Piping	3
INT-218	Special Lab Hydraulics & Pneumatics	2
MTT-147	Introduction to Machine Shop I	3
MTT-148	Introduction to Machine Shop Lab I	3

Area V Credit Hours: 45
Total Credit Hours: 51

Short Term Certificate
Automotive/Advanced Manufacturing
Industrial Systems and Automation
Mechanical

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	3
ADM-105	Fluid Systems	3
ADM-110	Blueprint Reading	3
ADM-111	Manufacturing Safety Practices	3
ILT-114	Instr Operation & Calibration	3
INT-101	DC Fundamentals	3
INT-103	AC Fundamentals	3
INT-215	Troubleshotting Techniques	3

Total Credit Hours: 25

Associate of Applied Science
Automotive/Advanced Manufacturing
Industrial Systems and Automation
Instrumentation

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 (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 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-149	Intro to Computers	3
ADM-101	Precision Measurement	3
ADM-105	Fluid Systems	3
ADM-110	Blueprint Reading	3
ADM-111	Manufacturing Safety Practices	3
AUT-161	MSSC Safety Course	3
AUT-162	MSSC Quality Control Concepts	3
ILT-114	Instr Operation & Calibration	3
INT-101	DC Fundamentals	3
INT-103	AC Fundamentals	3
INT-105	Introduction to Process Technology	3
INT-113	Industrial Motor Control I	3
INT-184	Introduction to PLCs	3
INT-206	Industrial Motors I	3
INT-215	Troubleshooting Techniques	3
INT-288	Appld Prin of PLCs	3

Area V Credit Hours: 49
Total Credit Hours: 65

Certificate
Automotive/Advanced Manufacturing Industrial Systems and Automation
Instrumentation

General Education Requirements (6 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 (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-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 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.)

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-149	Intro to Computers	3
ADM-101	Precision Measurement	3
ADM-105	Fluid Systems	3
ADM-110	Blueprint Reading	3
ADM-111	Manufacturing Safety Practices	3
AUT-161	MSSC Safety Course	3
AUT-162	MSSC Quality Control Concepts	3
ILT-114	Instr Operation & Calibration	3
INT-101	DC Fundamentals	3
INT-103	AC Fundamentals	3
INT-105	Introduction to Process Technology	3
INT-113	Industrial Motor Control I	3
INT-184	Introduction to PLCs	3
INT-206	Industrial Motors I	3
INT-215	Troubleshooting Techniques	3
INT-288	Appld Prin of PLCs	3

Area V Credit Hours: 49
Total Credit Hours: 55

Course Descriptions
Automotive/Advanced Manufacturing
Industrial Systems and Automation

Course #	Course Title	Credit Hours

ADM-101 PRECISION MEASUREMENT **3**
Prerequisite: As determined by college.
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.

ADM-105 FLUID SYSTEMS **3**
Prerequisite: As determined by college.
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.

ADM-110 BLUEPRINT READING **3**
Prerequisite: As determined by college.
This course is designed to provide students with a comprehensive understanding of blueprint reading. Topics include identifying types of lines and symbols used in mechanical drawings; recognition and interpretation of various types of views, tolerance, and dimensions.

ADM-111 MANUFACTURING SAFETY PRACTICES **3**
Prerequisite: As determined by college.
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.

AUT-161 MSSC SAFETY COURSE **3**
PREREQUISITE: None COREQUISITE: AUT-162, AUT-163, AUT-164
This course is designed to provide students with knowledge and skills related to safety in a manufacturing environment. Topics covered include: Work in a safe and productive manufacturing workplace; perform safety and environmental inspections; perform emergency drills and participate in emergency teams; identify unsafe conditions and take corrective action; provide safety orientation for all employees; train personnel to use equipment safely; suggest process and procedures that support safety of work environment; fulfill safety and health requirements for maintenance, installation and repair; monitor safe equipment and operator performance; utilize effective, safety-enhancing workplace practices. Students completing this course will receive an MSSC certificate in Safety. Students completing courses AUT- 161, 162, 163 and 164 will receive the Certified Production Technician credential.

AUT-162 MSSC QUALITY CONTROL CONCEPTS **3**
PREREQUISITE: None COREQUISITE: AUT-161, AUT-163, AUT-164
This course is designed to provide students with knowledge and skills related to safety in a manufacturing environment. Topics covered include: participate in periodic internal quality audit activities; check calibration of gages and other data collection equipment; suggest continuous improvements; inspect materials and product/process at all stages to ensure they meet specifications; document the results of quality problems; communicate quality problems; take corrective actions to restore or maintain quality; record process outcomes and trends; identify fundamentals of blueprint reading; use common measurement systems and precision measurement tools. This course is equivalent to ADM 106. Students completing this course will receive an MSSC certificate in quality practices and measurement. Students completing courses AUT 161 , 162, 163 and 164 will receive the Certified Production Technician credential.

ILT-114 INSTRUMENTATION OPERATION AND CALIBRATION **3**
PREREQUISITE: As determined by college.
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.

Course #	Course Title	Credit Hours

INT-101 DC FUNDAMENTALS 3
PREREQUISITE: None
This course provides an in depth study of direct current (DC) electronic theory. Topics include atomic theory, magnetism, properties of conductors and insulators, and characteristics of series, parallel, and series-parallel circuits. Inductors and capacitors are introduced and their effects on DC circuits are examined. Students are prepared to analyze complex DC circuits, solve for unknown circuit variables and to use basic electronic test equipment. This course also provides hands on laboratory exercises to analyze, construct, test, and troubleshoot DC circuits. Emphasis is placed on the use of scientific calculator and the operation of common test equipment used to analyze and troubleshoot DC and to prove the theories taught during classroom instruction. This is a CORE course. Supports CIP Codes: 15.0303, 47.0105, 46.0302, and 47.0609. This course is also taught as ETC-101, EET-103, ILT-160, ELT-108.

INT-103 AC FUNDAMENTALS 3
PREREQUISITE: None
This course provides an in depth study of alternating current (AC) electronic theory. Students are prepared to analyze complex AC circuit configurations with resistors, capacitors, and inductors in series and parallel combinations. Topics include electrical safety and lockout procedures, specific AC theory functions such as RLC, impedance, phase relationships, and power factor. Students will be able to define terms, identify waveforms, solve complex mathematical problems, construct circuits, explain circuit characteristics, identify components, and make accurate circuit measurements using appropriate measurement instruments. They should also be able to perform fundamental tasks associated with troubleshooting, repairing, and maintaining industrial AC systems. This is a CORE course. Supports CIP Codes: 15.0303, 47.0105, 46.0302, and 47.0609. This course is also taught as ILT-143, AUT-112.

INT-105 INTRODUCTION TO PROCESS TECHNOLOGY 3
PREREQUISITE: None
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.

INT-113 INDUSTRIAL MOTOR CONTROL I 3
PREREQUISITES: None
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.

INT-117 PRINCIPLES OF INDUSTRIAL MECHANICS 3
PREREQUISITE: None
This course provides instruction in basic physics concepts applicable to mechanics of industrial production equipment. Topics include the basic application of mechanical principles with emphasis on power transmission, specific mechanical components, alignment, and tension. Upon completion, students will be able to perform basic troubleshooting, repair and maintenance functions on industrial production equipment. This is a CORE course.

INT-126 PREVENTIVE MAINTENANCE 3
PREREQUISITE: None
This course focuses on the concepts and applications of preventive maintenance. Topics include the introduction of alignment equipment, job safety, tool safety, preventive maintenance concepts, procedures, tasks, and predictive maintenance concepts. Upon course completion, students will demonstrate the ability to apply proper preventive maintenance and explain predictive maintenance concepts.

INT-127 PRINCIPLES OF INDUSTRIAL PUMPS AND PIPING SYSTEMS 3
PREREQUISITE: None
This course provides instruction in the fundamental concepts of industrial pumps and piping systems. Topics include pump identification, operation, and installation, maintenance and troubleshooting, and piping systems, and their installation. Upon course completion, students will be able to install, maintain, and troubleshoot industrial pumps and piping systems.

Course #	Course Title	Credit Hours

INT-184 INTRO TO PROGRAMMABLE LOGIC CONTROLLERS 3
PREREQUISITE: None
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. This course is also taught as AUT-114, ATM-211, ENT-204, ELT-231, ILT-194, IAT-160, and IET-231.

INT-206 INDUSTRIAL MOTORS I 3
PREREQUISITE: None
This course focuses on basic information regarding industrial electrical motors. Upon completion students will be able to troubleshoot, remove, replace, and perform routine maintenance on various types of motors.

INT-215 TROUBLESHOOTING TECHNIQUES 3
PREREQUISITES: None
This course is designed to allow students an opportunity to study directly-related topics of particular interest which require the application of technical knowledge and technical skills. Emphasis is place on the application of skills and knowledge with practical experiences. Upon, completion, students should be able to solve job related problems using technical skills and knowledge.

INT-218 SPECIAL LAB IN HYDRAULICS AND PNEUMATICS 2
PREREQUISITE: Permission of instructor.
This course provides specialized instruction in maintaining and troubleshooting Hydraulic and Pneumatic systems. Topics include safe component removal and installation, schematic reading and diagramming, and theoretical calculations.

INT-288 APPLIED PRIN OF PROGRAMMABLE CONTROLLERS 3
PREREQUISITE: None
This course provides a comprehensive study in the theory and application of specific models of programmable logic controllers. Topics include hardware configuration, memory and addressing detail function of software, instruction types, system troubleshooting, and simple programming techniques.

MTT-147 INTRODUCTION TO MACHINE SHOP I 3
PREREQUISITE: None
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. MTT-100 is a suitable substitute for MTT-147/148. This course is also taught as AUT-150.

MTT-148 INTRODUCTION TO MACHINE SHOP I LAB 3
PREREQUISITE: None COREQUISITE: None
This course provides practical application of the concepts and principles of machining operations learned in MTT 147. 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. MTT-100 is a suitable substitute for MTT-147/148. This course is aligned with NIMS certification standards. This course is also taught as AUT-151.