Trenholm State COMMUNITY COLLEGE
The College for Real Careers

Automotive/Advanced Manufacturing
Automotive Manufacturing & Automation

Program Information

Manufacturing & Automation is a rapidly growing career in one of Alabama's highest-growth industries, manufacturing. With high demand for skilled workers in this industry, Trenholm State offers highly informative programs to prepare students to become Multi-Craft Technicians. This program will give students knowledge in the following areas using the most up-to-date modern equipment: metrology, welding, electrical, programmable logic controllers, machine tool, troubleshooting assembly lines, and robotics maintenance.

The multi-craft technician is responsible for setup, installation, troubleshooting, repair, and testing of complex mechanical /electrical equipment, including automatic machines and process controls, motor control centers and related controls, computer control systems, some with man/machine interfaces, as well as basic plant electrical equipment. This includes preventive maintenance activities related to production and building equipment, machinery and components.

At Trenholm State, the Manufacturing & Automation program is designed to equip a student with the skills and technical knowledge needed to be a success in this interesting and growing field. The students are assigned to specific lab projects which must be completed while studying the theory directly related to the projects.

Occupational Choices

Manufacturing & Automation graduates should find exceptional job opportunities in this field. As the economy grows, the demand for skilled and qualified Multi-Craft employees will increase. Demand for technicians will grow as the number of vehicles in operation increases, reflecting continued growth in the number of multi-car families. Growth in demand will be offset somewhat by slowing population growth and the continuing increase in the quality and durability of automobiles, which will require less frequent service. Additional job openings will be due to the need to replace a growing number of retiring technicians, who tend to be the most experienced workers.

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

Average Full-Time Wage

The median annual wage for assemblers and fabricators was $31,850 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 $21,270, and the highest 10 percent earned more than $53,120.

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

Awards Available

Associate of Applied Science
Automotive/Advanced Manufacturing
Automotive Manufacturing & Automation

Certificate
Automotive/Advanced Manufacturing
Automotive Manufacturing & Automation

Short Term Certificate
Automotive/Advanced Manufacturing
Automotive Manufacturing & Automation
Certified Production Technician
Manufacturing Systems Technician
Manufacturing Maintenace Technician I
Manufacturing Maintenace Technician I

Program Contact

Michael Barnette
Program Coordinator/Instructor
334-420-4289
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	6 Terms	65	$10,075	$1000	$500	$0
Certificate	5 Terms	55	$8,525	$850	$500	$0
Short Term Certificate	3 Terms	28	$4,340	$600	$500	$0
		27	$4,185			
		19	$2,945			
		13	$2,015			

* 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
Automotive Manufacturing & Automation

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	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
ADM-101	Precision Measurement	3
ADM-105	Fluid Systems	3
ADM-110	Blueprint Reading	3
ADM-111	Manufacturing Safety Practices	3
AUT-100	Introduction to Automotive Concepts	3
AUT-110	DC Fundamentals	3
AUT-111	AC Fundamentals	3
AUT-114	Intro to Prog Logic Controllers	3
AUT-116	Introduction to Robotics	3
AUT-161	MSSC Safety Course	3
AUT-162	MSSC Quality Ctrl Concepts	3
AUT-178	Gas Tungsten Arc Welding	3
AUT-180	Gas Tungsten Arc Welding Lab	3
AUT-221	Adv Programmable Logic Controllers	3
AUT-230	Preventive Maintenance	3
AUT-234	Industrial Motor Controls I	3

Electives:

CIS-146	Microcomputer Applications	3

Area V Credit Hours: 49
Total Credit Hours: 65

Certificate
Automotive/Advanced Manufacturing
Automotive Manufacturing & Automation

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.)

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
ADM-101	Precision Measurement	3
ADM-105	Fluid Systems	3
ADM-110	Blueprint Reading	3
ADM-111	Manufacturing Safety Practices	3
AUT-100	Introduction to Automotive Concepts	3
AUT-110	DC Fundamentals	3
AUT-111	AC Fundamentals	3
AUT-114	Programmable Logic Controllers	3
AUT-116	Introduction to Robotics	3
AUT-161	MSSC Safety Course	3
AUT-162	MSSC Quality Ctrl Concepts	3
AUT-178	Gas Tungsten Arc Welding	3
AUT-180	Gas Tungsten Arc Welding Lab	3
AUT-221	Adv Programmable Logic Controllers	3
AUT-230	Preventive Maintenance	3
AUT-234	Industrial Motor Controls I	3

Electives:

CIS-146	Microcomputer Applications	3

Area V Credit Hours: 49
Total Credit Hours: 55

Short Term Certificate
Automotive/Advanced Manufacturing
Automotive Manufacturing & Automation

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
AUT-100	Intro to Automotive Concepts	3
AUT-103	Occupational Health and Safety	2
AUT-104	Blueprint Reading for Manufacturing	3
AUT-106	Quality Ctrl & Inspection Techniques	3
AUT-114	Programmable Logic Controllers	3
AUT-116	Introduction to Robotics	3
AUT-130	Fund of Ind Hydraulic and Pneumatics	3
AUT-150	Introduction to Machine Shop 1	3
AUT-151	Introduction to Machine Shop 1 Lab	3

Total Credit Hours: 27

Short Term Certificate
Automotive/Advanced Manufacturing
Automotive Manufacturing & Automation
Certified Production Technician

(This award is not Pell Grant Eligible)

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
AUT-161	MSSC Safety Course	3
AUT-162	MSSC Quality Ctrl Concepts	3
AUT-163	MSSC Mnf Proc & Production	3
AUT-164	MSSC Maintenance Awareness	3

Total Credit Hours: 13

Short Term Certificate
Automotive/Advanced Manufacturing
Automotive Manufacturing & Automation
Manufacturing Systems Technician

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
AUT-104	Blueprint Reading for Manufacturing	3
AUT-150	Introduction to Machine Shop 1	3
AUT-151	Introduction to Machine Shop 1 Lab	3
AUT-161	MSSC Safety Course	3
AUT-162	MSSC Quality Ctrl Concepts	3
AUT-163	MSSC Mnf Proc & Production	3
AUT-164	MSSC Maintenance Awareness	3
AUT-186	Prin of Ind Maint Welding & Mtl Cut	3
AUT-178	Robotic Programming & Welding	3

Total Credit Hours: 28

Short Term Certificate
Automotive/Advanced Manufacturing
Automotive Manufacturing & Automation
Manufacturing Maintenance Technician I

(This award is not Pell Grant Eligible)

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
AUT-110	DC Fundamentals	3
AUT-111	AC Fundamentals	3
AUT-114	Programmable Logic Controllers	3
AUT-234	Industrial Motor Controls I	3
AUT-251	Intro to Variable Frequency Drives & Servo Controls	3

Total Credit Hours: 19

Short Term Certificate
Automotive/Advanced Manufacturing
Automotive Manufacturing & Automation
Manufacturing Maintenance Technician II

(This award is not Pell Grant Eligible)

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-110	Blueprint Reading	3
AUT-116	Introduction to Robotics	3
AUT-138	Principles of Industrial Maintenance	3
AUT-208	Auto Systems Diagnosis & Trblshtg	3
AUT-235	Industrial Motor Controls II	3
AUT-278	Robotic Programming and Welding	3

Total Credit Hours: 19

Course Descriptions
Automotive/Advanced Manufacturing
Automotive Manufacturing & Automation

Course #	Course Title	Credit Hours

ADM-101 PRECISION MEASUREMENT **3**
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. Note: This is a suitable substitute for MTT 127.

ADM-105 FLUID SYSTEMS **3**
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.

ADM-110 BLUEPRINT READING **3**
PREREQUISITE: None
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: 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.

AUT-100 INTRODUCTION TO AUTOMOTIVE CONCEPTS **3**
PREREQUISITE: None
An introduction to automotive manufacturing concepts is the focus of this course. This course reviews the history of automotive manufacturing and discusses the automotive manufacturing processes for various automotive assembly and sub-assembly plants. It outlines the historical development of automotive manufacturing in Alabama. Finally, the electro-mechanical systems and body components of a typical vehicle will be examined. This is a CORE course.

AUT-103 OCCUPATIONAL HEALTH AND SAFETY **2**
PREREQUISITE: None
This course will cover safety rules and procedures concerning personal safety in the workplace. The course provides both Classroom and performance based hands on training to inform personnel on OSHA rules and techniques to ensure safety.

AUT-104 BLUEPRINT READING IN MANUFACTURING **3**
PREREQUISITE: None
This course provides the students with terms and definitions, theory of orthographic projection, and other information required to interpret drawings used in the manufacturing and industrial trade areas. Topics include multi-view projection, pictorial drawings, dimensions and notes, lines and symbols, tolerances, industrial applications, scales and quality requirements. Upon completion, students should be able to interpret blueprint drawings used in the manufacturing and industrial trades. This course may be tailored to meet specific local industry needs. This is a CORE course. This course is also taught as INT-261.

AUT-106 QUALITY CONTROL & INSPECTION TECHNIQUES **3**
PREREQUISITE: None
This course provides the student with a basic understanding of quality assurance including the history of the quality movement in the United States; national and international standards for quality management systems; the impact of quality on an organization's performance; group problem solving; and statistical methods such as statistical process control (SPC); process capability studies, quality tools, idea generating tools, and corrective and preventive actions.

Course #	Course Title	Credit Hours

AUT-110 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. This course is also taught as INT-221, ILT-160, and ELT-108. Suitable substitutes for this course are ELT-111, ILT-106, and INT-120.

AUT-111 AC FUNDAMENTALS **3**
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 course is also taught as INT-223, ILT-161, and ELT-109. Suitable substitutes for this course are ELT-112, ILT-107, and INT-122.

AUT-114 INTRO TO PROGRAMMABLE LOGIC CONTROLLERS **3**
PREREQUISITE: AUT-234
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 is a CORE course. This course is taught as INT-184, ILT-194, AND ELT-231.

AUT-116 INTRODUCTION TO ROBOTICS **3**
PREREQUISITE: None
This course provides instruction in concepts and theories for the operation of robotic servo motors and power systems used with industrial robotic equipment. Emphasis is on the application of the computer to control power systems to perform work. Student competencies include understanding of the functions of hydraulic, pneumatic, and electrical power system components, ability to read and interpret circuitry for proper troubleshooting and ability to perform preventative maintenance. This is a CORE course. This course is also taught as INT-253 and ILT-218.

AUT-130 FUND OF INDUSTRIAL HYDRAULICS & PNEUMATICS **3**
PREREQUISITE: None
This course provides an introduction to hydraulics/pneumatics. Topics include hydraulic pumps, pneumatic compressors work and system components such as valves, filters, regulators, actuators, accumulators, and lubricators. The lab enables students to test, troubleshoot and repair hydraulic pumps, pneumatic compressors work and system components such as valves, filters, regulators, actuators, accumulators, and lubricators. Upon completion, students will be able to apply principles of hydraulic/pneumatics. This course is also taught as ILT-169.

AUT-138 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.

AUT-150 INTRODUCTION TO MACHINE SHOP I **3**
PREREQUISITE: AUT-104 or AUT-166 COREQUISITE: AUT-151
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 course is also taught as MTT-147.

Course #	Course Title	Credit Hours

AUT-151 INTRODUCTION TO MACHINE SHOP I LAB 3
PREREQUISITE: None COREQUISITE: AUT-150
This course provides practical application of the concepts and principles of machining operations learned in AUT 150. 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 course is also taught as MTT-148. (AUT-152 is a suitable substitute for AUT-150 and AUT-151.)

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.

AUT-163 MSSC MANUFACTURING PROCESSES AND PRODUCTION COURSE 3
PREREQUISITE: None COREQUISITE: AUT-161, AUT-162, AUT-164
This course is designed to provide students with knowledge and skills related to safety in a manufacturing environment. Topics covered include: identify customer needs; determine resources available for the production process; set up equipment for the production process; set team production goals; make job assignments; coordinate work flow with team members and other work groups; communicate production and material requirements and product specifications; preform and monitor the process to make the product; document product and process compliance with customer requirements; Prepare final product for shipping or distribution. Students completing this course wi ll receive an MSSC certificate in manufacturing processes and production. Students completing courses AUT 161 , 162, 163 and 164 will receive the Certified Production Technician credential.

AUT-164 MSSC MAINTENANCE AWARENESS 3
PREREQUISITE: None COREQUISITE: AUT-161, AUT-162, AUT-163
This course is designed to provide students with knowledge and skills related to safety in a manufacturing environment. Topics covered include: prepare preventative maintenance and routine repair; monitor indicators to ensure correct operations; perform all housekeeping to maintain production schedule; recognize potential maintenance issues with basic production systems, including knowledge of when to inform maintenance personnel about problems with: electrical systems, pneumatic systems, hydraulic systems, machine automation systems, lubrication systems, bearings and couplings. This course is equivalent to MET 220. Students completing this course wi ll receive an MSSC certificate in maintenance awareness. Students completing courses AUT 161 , 162, 163 and 164 will receive the Certified Production Technician credential.

AUT-178 GAS TUNGSTEN ARC WELDING 3
PREREQUISITE: None COREQUISITE: AUT-180
This course provides student with knowledge needed to perform gas tungsten arc welds using ferrous and/or non-ferrous metals, according to applicable welding codes. Topics include safe operating practices, equipment identification and set-up, correct selection of tungsten type, polarity, shielding gas and filler metals. Upon completion, a student should be able to identify safe operating practices, equipment identification and setup, correct selection of tungsten type, polarity, shielding gas, filler metals, and various welds on ferrous and/or non-ferrous metals, using the gas tungsten arc welding process according to applicable welding codes. This course is also taught as WDT-228.

Course #	Course Title	Credit Hours

AUT-180 GAS TUNGSTEN ARC WELDING LAB 3
PREREQUISITE: None COREQUISET: AUT-178
This course provides student with skills needed to perform gas tungsten arc welds using ferrous and/or non-ferrous metals, according to applicable welding codes. Topics include safe operating practices, equipment identification and set-up, correct selection of tungsten type, polarity, shielding gas and filler metals. Upon completion, a student should be able to identify safe operating practices, equipment identification and setup, correct selection of tungsten type, polarity, shielding gas, filler metals, and various welds on ferrous and/or non-ferrous metals, using the gas tungsten arc welding process according to applicable welding codes. This course is also taught as WDT-268.

AUT-186 PRINCIPLES OF INDUSTRIAL MAINTENANCE WDLING & METAL CUTTING TECHNIQUES 3
PREREQUISITE: None COREQUISET: AUT-178
This course provides instruction in the fundamentals of acetylene cutting and the basics of welding needed for the maintenance and repair of industrial production equipment. Topics include oxy-fuel safety, choice of cutting equipment, proper cutting angles, equipment setup, cutting plate and pipe, hand tools, types of metal welding machines, rod and welding joints, and common welding passes and beads. Upon course completion, students will demonstrate the ability to perform metal welding and cutting techniques necessary for repairing and maintaining industrial equipment. This course is also taught as INT-134.

AUT-208 AUTOMATED SYSTEMS DIAGNOSIS AND TROUBLESHOOTING 3
PREREQUISITE: None
This course focuses on systematically solving problems in automated systems. Emphasis is placed on safety, test equipment, basic troubleshooting techniques and hands on problem solving. Upon completion, students will be able to use a systematic process to solve complex malfunctions.

AUT-221 ADVANCED PROGRAMMABLE LOGIC CONTROLLERS 3
PREREQUISITE: None
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. This course is also taught as ATM-212, ELT-232, ENT-205, IAT-260, IET-232, ILT-196, INT-284.

AUT-230 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. This course is also taught as INT-126.

AUT-234 INDUSTRIAL MOTOR CONTROLS I 3
PREREQUISITE: 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. This course is also taught as INT-212, ELT-209, ILT-209.

AUT-235 INDUSTRIAL MOTOR CONTROLS II 3
PREREQUISITE: AUT-234
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. This course is also taught as ELT-212, INT-213.

Course #	Course Title	Credit Hours

AUT-251 INTRODUCTION TO VARIABLE FREQUENCY DRIVES & SERVO CONTROLS 3
PREQUISITE: None
This course provides an introduction to variable frequency drives (VFD) and servo drive technology. Topics include the purpose of VFDs, general operating principles, analog and digital servo drives, and characteristics of practical servo systems. The Lab enables students to program, test, and run drives and motors. The removal and replacement of servo drives will also be discussed. Upon completion students will be able to apply principles of VFD and servo drives. This course is also taught as IAT-243.

AUT-278 ROBOTIC PROGRAMMING AND WELDING 3
PREREQUISITE: As determined by program
This program introduces students to the safety and programming associated with robotic welding technology. Topics include robotic weld station familiarity, safety, robotic motions, programming, and welding inspection. Upon completion, the student should be able to setup and program a robot to weld parts in an efficient and safe manner. This course is also taught as WDT 160.

AUT-291 AUTOMOTIVE COOPERATIVE EDUCATION 1
PREREQUISITE: Completion of 50% of course requirements
This course is designed to give students practical, on-the-job experiences in all phases of automotive manufacturing under the supervision of a qualified professional. Grades are based on the successful completion of the work experience as judged by the students' work, supervisor, and faculty coordinator.

AUT-292 AUTOMOTIVE COOPERATIVE EDUCATION 2
PREREQUISITE: Completion of 50% of course requirements
This course is designed to give students practical, on-the-job experiences in all phases of automotive manufacturing under the supervision of a qualified professional. Grades are based on the successful completion of the work experience as judged by the students' work, supervisor, and faculty coordinator.

AUT-293 AUTOMOTIVE COOPERATIVE EDUCATION 3
PREREQUISITE: Completion of 50% of course requirements
This course is designed to give students practical, on-the-job experiences in all phases of automotive manufacturing under the supervision of a qualified professional. Grades are based on the successful completion of the work experience as judged by the students' work, supervisor, and faculty coordinator.