



# Electro-Mechanical Technology

Program No: 10-620-1

Associate Degree in Applied Science

Degree Completion Time: Four Terms

In general, an academic year consists of two terms; however, degree completion time may vary based on student scheduling needs and class availability.

2013-2014

Catalog No.	Class Title	Credit(s)
<b>Term 1</b>		
10620120	Basic Tools and Measurement	1.00
10620122	Practical Wiring Applications	1.00
10620103	Fluid Power 1	2.00
10660105	DC Fundamentals	3.00
10804115	College Technical Mathematics 1	5.00
10809196	Introduction to Sociology OR 10809195 Economics	3.00
10801195	Written Communication OR 10801197 Technical Reporting	3.00
	<b>Total</b>	<b>18.00</b>
<b>Term 2</b>		
10620138	Programmable Controllers - Allen Bradley	3.00
10620130	Mechanisms Mechanics Introduction to	3.00
10620104	Fluid Power 2	3.00
10660110	AC Fundamentals	3.00
10806154	General Physics 1	4.00
	<b>Total</b>	<b>16.00</b>
<b>Term 3</b>		
10620140	Programmable Controllers - Allen Bradley Advanced	3.00
10620141	Industrial Controls and Motors	3.00
10620147	Electronic Devices/Transducers	3.00
10620164	Electromechanical Systems	3.00
10620194	Touch Screen Applications	3.00
10801196	Oral/Interpersonal Communication	3.00
	<b>Total</b>	<b>18.00</b>
<b>Term 4</b>		
10620168	Intro to Fanuc Robot Programming	3.00
10620192	Industrial Codes Troubleshooting and Frequency Drive Procedures	3.00
10620196	Industrial Applications	4.00
10620198	Industrial Networks	3.00
10809198	Introduction to Psychology	3.00
	<b>Total</b>	<b>16.00</b>
	<b>Program Total</b>	<b>68.00</b>

**Note:** Program start dates vary; check with your counselor for details.

Curriculum and program acceptance requirements are subject to change.

## About the Career

Change is constant. Change is rapid. In the world of manufacturing technology change brings more complex systems of assembly, control measurement, and material processing of manufactured products. If you're good at problem solving, like working with automated manufacturing equipment, and you're looking forward to work that continuously challenges you to keep growing your knowledge and skills—consider an always-evolving career in electro-mechanical technology.

## Careers

- Apprentice Electrician
- Electro-Mechanical Technician
- Field Service Technician
- Industrial Electrical Technician
- Machine Electrical Assembly Technician
- Maintenance Electrician
- Mechanical Maintenance Technician

## Admissions Steps

- Submit Application and \$30 Processing Fee
- Complete an Assessment for Placement (Accuplacer or ACT)
- Submit Official Transcripts (High School and Other Colleges)
- Meet with Program Advisor
- Complete Functional Ability Statement of Understanding Form

## Program Outcomes

You'll learn to:

- Understand electrical, mechanical, hydraulic, and pneumatic components and systems.
- Install, test, service, and repair electro-mechanical equipment.
- Perform complex inspection or assembly work.
- Provide technical assistance to engineers.
- Troubleshoot and maintain PLC systems.
- Troubleshoot and maintain control systems.
- Troubleshoot and maintain operator interface.

## Approximate Costs

- \$132 per credit (resident)
- \$198 per credit (out-of-state resident)
- Other fees vary by program (books, supplies, materials, tools, uniforms, health-related exams, etc.)

## Functional Abilities

Functional abilities are the basic duties that a student must be able to perform with or without reasonable accommodations. At the postsecondary level, students must meet these requirements, and they cannot be modified. Please see website for program-specific functional abilities.

## Placement Scores

Accuplacer/ACT scores will be used to develop your educational plan. Please contact your program counselor/advisor at 920-693-1109.

# Transfer agreements are available with the following institutions:

Bellevue University  
 Capella University  
 Concordia University  
 Excelsior College  
 Franklin University  
 Herzing University

Lakeland College  
 Marian College  
 Ottawa University  
 Silver Lake College  
 University of Phoenix  
 Upper Iowa University

UW-Green Bay  
 UW-Oshkosh  
 UW-Stout

**IMPORTANT:** For more information on these agreements, visit [gotoltc.edu/transfer](http://gotoltc.edu/transfer).

## 10620103 Fluid Power 1

...prepares the learner to identify hydraulic and pneumatic component symbols; adjust a pressure relief valve; analyze the operation of a pilot operated relief valve; analyze Pascal's law; evaluate flow, velocity, work and power in industrial hydraulic and pneumatic circuits; analyze meter-in, meter-out, and bypass flow control circuits; identify basic hydraulic and pneumatic control valves; and assemble hydraulic circuits.

**COREQUISITES:** 10804121 College Technical Math 1

## 10620104 Fluid Power 2

...enhances the learner's ability to read schematics containing fluid power component symbols; assemble systems using schematics; analyze system's operation using a schematic; evaluate the general characteristics and terms of fluids under pressure, fluid conditioning, conductors, reservoirs, accumulators, pressure control; and troubleshoot malfunctioning pressurized systems.

**PREREQUISITE:** 10620103 Fluid Power 1

## 10620120 Basic Tools and Measurement

...prepares the learner to use hand tools, precision measuring instruments, and torque tools.

## 10620122 Practical Wiring Applications

...prepares the learner to construct electrical circuits; measure electrical quantities using a VOM and/or DVM; analyze measured values using electrical circuit laws; construct typical residential circuits; and analyze typical residential electrical circuits.

**COREQUISITES:** 10660105 DC Fundamentals (3 cr) or 10660105C1 DC Fundamentals (3 cr)

## 10620130 Mechanisms Mechanics Introduction to

...prepares the learner to use tools and fasteners safely; identify belt and chain drive components; install and adjust belt and chain drives; apply bearing and lubrication information; perform coupling alignment using straight edge, feeler gauge, and dial indicator and laser methods; identify various gear drives; calculate gear ratios; and analyze first-, second-, and third-class levers.

## 10620138 Programmable Controllers - Allen Bradley

...prepares the student to understand basic PLC structure and terminology; learn to create and troubleshoot basic PLC programs using the RSLOGIX 500 software and the RSLINX communication software; become familiar with communicating with programming SLC -500 and Micrologix PLCs. This course is highly computer based.

## 10620140 Programmable Controllers - Allen Bradley Advanced

...prepares the student to develop applications utilizing subroutine instructions, analog modules; gain a basic understanding of creating and troubleshooting programs using the ControlLogix, RSLOGIX5000 software. This course is highly computer based.

**PREREQUISITE:** 10620138 Prog Cntrls/AB or 10620138C1 Prog Cntrls/AB (3 cr)

## 10620141 Industrial Controls and Motors

...prepares the learner to select control devices by function and operation; illustrate electrical circuits using symbols, diagrams, and abbreviations; explain the operation of magnetic solenoids; apply motor control techniques; select relay type for industrial application; apply the basic rules of line and wiring diagrams; compare the types of timers and timing circuits used in control and explain the coding systems used; explain each type of control device and how it is used in an electrical circuit. Also prepares the learner to verify DC motor operational theories; select DC and AC motor types for general applications; identify AC motor components and wiring applications; verify single-phase operational theory; identify three phase motor components and wiring applications; verify three-phase motor operational theory; identify motor starting methods for industrial applications; verify electro-mechanical motor starting principals of operation; select the motor breaking method for industrial applications; verify the operational theory of speed and acceleration methods for motors used in industrial applications; design three-phase power motor circuits for industrial applications; design control circuits for three phase power motor circuits.

**PREREQUISITES:** 10660110 AC Fundamentals or 10660110C1 AC Fundamentals (3 cr) or 10605110 AC Fundamentals or 10605110C1 AC Fundamentals (3 cr)

## 10620147 Electronic Devices/Transducers

...prepares the student to relate numbering systems with their functions in Electrical Ladder Diagrams and Data Transmission; gain an understanding of temperature and temperature sensing devices, weighing systems, ultrasonic and radar level detection, measuring flow, and pressure. The student will develop the ability to explain the operation of transducers that measure process variables and the transmitters that interface to industrial control systems. Transmitters will be analyzed, configured and calibrated to properly indicate the physical characteristic being measured and provide the information to control systems.

**PREREQUISITES:** 10660110 AC Fundamentals or 10660110C1 AC Fundamentals (3 cr) or 10605110 AC Fundamentals or 10605110C1 AC Fundamentals (3 cr)

## 10620164 Electromechanical Systems

...prepares the student to communicate with, tune, run and troubleshoot Allen-Bradley Ultra 3000 servos; utilize electrical control of hydraulic systems; explore PID control of motor speed; and investigate open loop and closed loop control systems.

**PREREQUISITES:** 10620160 Hydraulics 2 or 10620160C1 Hydraulics 2 (2 cr) and 10620161 Pneumatics 2 or 10620162 Pneumatics or 10620104 Fluid Power 2 or **CONDITION:** 104821 Wind Energy Technology program requirements met

## 10620168 Intro to Fanuc Robot Programming

...prepares the learner to identify the component parts of a robot; describe teach pendant and robot functions; power up the robot control in proper sequence; jog in Joint and Cartesian movement; establish robot axis soft limits; identify axis movements; navigate the teach pendant to set up the robot for desired movement; demonstrate working knowledge of arm speed and inching control; define the Frames of reference used by the coordinate system; create multiple Tool Frames; create a program file; write a functional motion instruction; edit an existing program; demonstrate the use of a wait statement; demonstrate the use of a Call statement; demonstrate the use of an Output statement; and upload and download program memory files. This course is highly computer based.

## 10620192 Industrial Codes Troubleshooting and Frequency Drive Procedures

...prepares the learner to conduct effective machine control troubleshooting techniques; apply proper methods and specifications to install or replace a motor; and apply the National Electrical Code and the NFPA to practical motor installations. It also prepares the learner to explain the function and construction of a variable speed drive as well as program and modify the operational characteristics of the drive for practical applications.

**PREREQUISITES:** 10620141 Motor Operation & Control or 10620141C1 Motor Operation & Control (3 cr)

## 10620194 Touch Screen Applications

...prepares the student to create, edit, and troubleshoot screens, objects and I/O related to the RSView32, FactoryTalkME and Wonderware software applications. Students will create, edit and communicate with Allen-Bradley PLC programs for real-time control utilizing the touchscreen applications. This course is highly computer based.

**COREQUISITES:** 10620140 Programmable Controls AB Advanced or 10620140C1 Programmable Controls AB Advanced (3 cr)

## 10620196 Industrial Applications

...prepares the learner to configure, install, troubleshoot and maintain automation equipment in a "real world" setting. This course will include writing and configuring automation equipment, wiring and configuring industrial networks, wiring, programming and troubleshooting PLCs and touchscreens. These practices will be applied to create and maintain a manufacturing process. This course is highly computer based.

**PREREQUISITE:** 10620140 Program Cntrls AB Adv or 10620140C1 Program Cntrls AB Adv (3 cr) and 10620104 Fluid Power 2 and 10620194 Touch Screen Appl and **COREQUISITE:** 10620168 Intro Fanuc Robot Program and 10620192 Ind Codes Trblshst Freq Drives

## 10620198 Industrial Networks

...prepares the learner to configure, install and troubleshoot device-level, control-level and enterprise-level industrial communication networks. This course is highly computer based.

**PREREQUISITES:** 10620140 Programmable Controls AB Advanced or 10620140C1 Programmable Controls AB Advanced (3 cr)

## 10660105 DC Fundamentals

...prepares the student to follow safety procedures; maintain a safe and healthy work environment; convert values to scientific and engineering notations; calculate math quantities; describe basic atomic theory; identify basic electrical terms; use established symbols standards; describe DC voltage characteristics and current sources and electrical resistance; measure and analyze electrical quantities in series and parallel circuits; and desolder/solder single lead components.

**COREQUISITES:** 10804121 College Technical Math 1

## 10660110 AC Fundamentals

...prepares the student to analyze electrical circuits using phasers and AC math, analyze AC waveforms, measure and analyze AC power, analyze capacitors and inductors in DC and AC circuits, analyze AC circuits containing reactance and calculate resonance, apply the elements and properties of basic measuring circuits, and describe transformer characteristics.

**PREREQUISITES:** 10660105 DC Fundamentals or 10660105C1 DC Fundamentals (3 cr) or 10605105 DC Fundamentals or 10605105C1 DC Fundamentals (3 cr)

## 10801195 Written Communication

...teaches the writing process, which includes prewriting, drafting, revising, and editing. Through a variety of writing assignments, the student will analyze audience and purpose, research and organize ideas, and format and design documents based on subject matter and content. Keyboarding skills are required for this course. It also develops critical reading and thinking skills through the analysis of a variety of written documents.

**PREREQUISITE:** 10831103 Intro to College Wrtg or **CONDITION:** Written Comm Prepared Learner (Accuplacer Wrtg min score of 86 or Equivalent) and **COREQUISITE:** 10838105 Intro Rdg & Study Skills or **CONDITION:** Reading Accuplacer min score of 74 or equivalent

## 10801196 Oral/Interpersonal Comm

...provides students with the skills to develop speaking, verbal and nonverbal communication, and listening skills through individual speeches, group activities, and other projects.

**COREQUISITE:** 10838105 Intro Reading and Study Skills or **CONDITION:** Reading accuplcer minimum score of 74 or equivalent

## 10804115 College Technical Mathematics 1

...prepares the student to solve linear, quadratic, and rational equations; graphing; formula rearrangement; solve systems of equations; percent; proportions; measurement systems; computational geometry; right and oblique triangle trigonometry; trigonometric functions on the unit circle; and operations on polynomials. Emphasis will be on the application of skills to technical problems. This course is the equivalent of successful completion of College Tech Math 1a and 1b.

**PREREQUISITES:** Accuplacer Math score of 79 and Accuplacer Algebra score of 55 or equivalent or 10834110 Elementary Algebra w Apps and **COREQUISITE:** 10838105 Intro Reading and Study Skills or **CONDITION:** Reading Accuplacer minimum score of 74 or equivalent

## 10806154 General Physics 1

...presents the applications and theory of basic physics principles. This course emphasizes problem-solving, laboratory investigation, and applications. Topics include unit conversions and analysis, vectors, translational and rotational kinematics, translational and rotational dynamics, heat and temperature, and harmonic motion and waves.

**COREQUISITE:** 10804197 College Tech Math 1B or 10804114 College Tech Math 1B or 10804114M1 College Tech Math 1B Mod 1 & 10804114M2 College Tech Math 1B Mod 2 or 10804115 College Tech Math 1 or 10624105 Hlth Phys Calc & Stats and 10804118 Intern Algebra

## 10809196 Introduction to Sociology

...introduces students to the basic concepts of sociology: culture, socialization, social stratification, multi-culturalism, and the five institutions, including family, government, economics, religion, and education. Other topics include demography, deviance, technology, environment, social issues, social change, social organization, and workplace issues.

**COREQUISITE:** 10838105 Intro Reading and Study Skills or Accuplacer Reading score of 74 or equivalent

## 10809198 Intro to Psychology

...introduces students to a survey of the multiple aspects of human behavior. It involves a survey of the theoretical foundations of human functioning in such areas as learning, motivation, emotions, personality, deviance and pathology, physiological factors, and social influences. It directs the student to an insightful understanding of the complexities of human relationships in personal, social, and vocational settings. **COREQUISITE:** 10838105 Intro Reading and Study Skills or Accuplacer Reading score of 74 or equivalent