

# Electrical Engineering Technology

## Associate in Applied Science Degree

Applied Engineering Technologies Program Cluster

Center for Agriscience and Technologies

Program offered at Madison Truax Campus

For information call: (608) 246-6800 or  
(800) 322-6282 Ext. 6800

### About the Program

The electronics industry offers many opportunities with high salaries and steady advancement for people with strong mathematics and analytical skills. This program offers an opportunity to develop abilities in a practical, hands-on curriculum. Employer demand for people who can analyze problems and implement solutions is always high. Computers, cellular phones, wireless services and other fields of electronics continue to expand.

This program offers excellent opportunities for articulation into four-year colleges and universities. A graduate of this program can articulate as a junior into the Milwaukee School of Engineering Bachelor of Science Electrical Engineering Technology program. Partial articulation can be arranged to the UW System with the assistance of a program advisor. COMPASS test is required for enrollment.

### Unique Requirements for Admission:

Students must earn a grade of C or better in high school courses Algebra 1, Algebra 2, Chemistry and Physics. (Equivalent courses will be considered.)

The Electrical Engineering Technology Program participates in MAAP (Mandatory Assessment, Advising and Placement). This requires new students to complete the COMPASS test. Advisement and course placement in English and mathematics is done based on test results. Applicants can receive advanced standing for Applied Electronics Math 1 by scoring a 46 on the College Algebra section of the COMPASS test. Advanced placement for Applied Electronics Math 2 can be obtained by scoring a 46 in the Trigonometry section of the COMPASS test. Study guides, review material and sample questions for the COMPASS test are available online at [madisoncollege.org](http://madisoncollege.org) (look for COMPASS in the "A-Z Index"). Applicants are advised to view this material prior to taking the test. Calculus AP may be applicable after consultation with a program advisor.

## Curriculum

The courses listed below outline the requirements for graduation for students entering this program in the 2011-2012 academic year. Requirements for graduation may vary depending on the semester in which a student is admitted to their program. Current/continuing students should consult their degree progress report available through their student center account for specific graduation requirements. Program requirements are subject to change.

### FIRST YEAR

First Semester	Credits	Hrs/week Lec-Lab
10-605-112 AC-DC Electronics 1.....	3	2-3
10-605-113 Analog Circuit Techniques.....	3	2-3
10-605-118 Digital Circuit Techniques.....	3	2-3
10-801-195 Written Communication.....	3	3-0
10-605-172 <u>Applied Electronics Mathematics 2</u> .....	2	3-3
<b>Semester Total</b>	<b>14</b>	

### Second Semester

10-605-114 AC-DC Electronics 2.....	3	2-3
10-605-115 Analog Circuit Principles.....	3	2-3
10-605-119 Digital Circuit Principles.....	3	2-3
10-605-173 Embedded Programming.....	3	2-3
10-804-196 Trigonometry with Applications OR.....	3	3-0
20-804-213 Trigonometry.....	(3)	(2-2)
10-809-199 <u>Psychology of Human Relations</u> .....	3	3-0
<b>Semester Total</b>	<b>18</b>	

### SECOND YEAR

#### First Semester

10-605-131 <sup>1-3</sup> Technical Calculus 1.....	4	3-2
10-605-176 <sup>1</sup> Microcontrollers.....	3	2-3
10-662-112 <sup>1</sup> AC/DC Electronics 3.....	3	2-3
10-801-197 Technical Reporting.....	3	3-0
10-806-143 College Physics 1.....	3	2-2
10-809-195 <u>Economics</u> .....	3	3-0
<b>Semester Total</b>	<b>19</b>	

#### Second Semester

10-605-132 <sup>2-3</sup> Technical Calculus 2.....	4	3-2
10-605-143 <sup>2</sup> Motors and Control Systems.....	3	2-3
10-605-150 <sup>2</sup> Electronic Data Transmission.....	3	2-3
10-605-178 <sup>2</sup> Networks, Interfacing & Programming.....	3	2-3
10-662-124 <sup>2</sup> Advanced Circuit Analysis.....	3	2-3
20-809-203 <u>Intro to Sociology</u> .....	3	3-0
<b>Semester Total</b>	<b>19</b>	

#### Alternate Math Selections<sup>3</sup>

20-804-231 Calculus and Analytic Geometry 1	5 credits
20-804-232 Calculus and Analytic Geometry 2	5 credits
20-804-233 Calculus and Analytic Geometry 3	5 credits

<sup>1</sup>Offered in Fall Semester only

<sup>2</sup>Offered in Spring Semester only

<sup>3</sup>In place of Technical Calculus 1 and 2, students who intend to transfer into the UW System should substitute Calculus & Analytic Geometry 1,2,& 3. When selecting this alternative, all three Calculus and Analytic Geometry courses are required for EET degree completion. Other options exist for additional UW transfer credits. Please contact an advisor for more information.

For all other alternatives, approval of an Electronics Department advisor is required. Students should also contact the receiving college or university about transferring credits as soon as they develop their course plans. Courses from the Liberal Studies Program-College Transfer Option (800-series) can be used in lieu of required courses.

*Note: Students are assessed for correct placement in English or mathematics courses based on their scores on the COMPASS test or on completion of the appropriate prerequisite(s). Additionally, there may be courses in other subject areas that may use COMPASS scores as prerequisites when reading, writing, math, or critical thinking competencies are required.*



# Madison Area Technical College Electrical Engineering Technology

## Program Courses

### 10-605-112 AC-DC Electronics 1 3 credits

Course covers basic concepts of electric circuits including: Ohm's Law; Kirchhoff's Voltage and Current Laws; power calculations; and components such as resistors, switches, fuses, conductors, insulators, capacitors, inductors, relays, and other basic electronic components. Also covers use of test equipment. Prerequisite: Concurrent enrollment in 10-605-171 or satisfactory mathematics placement score on COMPASS test.

### 10-605-113 Analog Circuit Techniques 3 credits

Introductory electronic course covering devices, circuits and applications. Uses analog electronics devices — diodes, (rectifier, zener, LED), field effect and bipolar transistors and operational amplifiers to learn basic theory and use of test equipment (DMM, oscilloscope, function generators) in testing and troubleshooting. Lab procedures emphasize use of documentation (schematics, layout diagrams, parts lists, data sheets) and troubleshooting procedures. Prerequisite: satisfactory mathematics placement score on COMPASS test, or concurrent enrollment in 10-605-112.

### 10-605-114 AC-DC Electronics 2 (transfer) 3 credits

Continuation of 10-605-112. Covers RL, RC, RLC circuits; transformers; filters; series and parallel resonance; bridge circuits; Thevenin and Norton theorems; wave shaping; internal resistance; motors; generators; three phase power; power factor and corrections; reactive and apparent power; wye and delta systems. A formal lab reporting required. Prerequisite: 10-605-112 and satisfactory mathematics placement score on COMPASS test.

### 10-605-115 Analog Circuit Principles 3 credits

Continuation of 10-605-113. Covers theory and application of field effect and bipolar transistor amplifiers, oscillators and operational amplifiers. Emphasis on circuits including gain, impedance and frequency response. Lab procedures emphasize increased proficiency with electronic test equipment. Prerequisite: 10-605-113; Corequisite: 10-605-114.

### 10-605-118 Digital Circuit Techniques 3 credits

Covers schematics, component identification, engineering notation, basic gates, IC numbering systems, through hole and surface mount footprint identification, IPC-610-D\* through hole and surface mount (SMT) soldering, lead free RoHS soldering and rework training, IPC-610-D\* and RoHS rework criteria, dual source de-soldering training, surface mount fine pitch drag soldering training, and electronic assembly training.

*\*IPC certification is not automatic upon course completion. IPC certification is awarded separately from the academic credits.*

### 10-605-119 Digital Circuit Principles 3 credits

Course covers digital logic circuits including basic gates, flip-flops, decoders, counters, shift registers, multiplexing circuits, comparators and other similar devices. It also covers Boolean algebra and Karnaugh map minimization techniques and Field Programmable Gate Arrays (FPGA). Lab work includes individual project design, layout, construction, testing and documentation. Prerequisites: 10-605-112 and 10-605-118.

### 10-605-131 Technical Calculus 1 4 credits

This is an introductory course that examines analytic geometry, binomial series, differentiation of algebraic, exponential, logarithmic and trig. Functions and integration of algebraic functions. An emphasis is placed on the application of each of these topics to problems in science and engineering. Prerequisite: 20-804-213.

### 10-605-132 Technical Calculus 2 4 credits

This course is a continuation of Technical Calculus 1. Topics include integration techniques, partial derivatives, graphing conics, double integrals, polar coordinates, and first and second order differential equations. Emphasis is placed on applications to problems in science and engineering. Prerequisite: 10-605-131.

### 10-605-143 Motors and Control Systems 3 credits

Course covers AC and DC motors, stepping motors, feedback systems, servo controllers, sensors, relays, SCRs, Triacs, MOSFETs, programmable logic controllers, industrial controllers and applied systems and online microcomputer controls. Prerequisites: 10-605-115, 10-605-173 and 10-605-176.

### 10-605-150 Electronic Data Transmission 3 credits

Covers theory, systems and basic circuits for radio frequency and digital communications systems. Includes transmission, reception, encoding, decoding and information retrieval. Circuits include oscillators, filters, AM, FM, SSB and pulse modulation, PLLs, codecs, transmission lines, and interfacing. Prerequisites: 10-605-113, 10-605-114, and 10-605-119.

### 10-605-171 Applied Electronics Mathematics 1 2 credits

First of a two-part applied electronics mathematics sequence. Focuses on math concepts most needed by technicians. Closely tied to the other first-semester electronics courses. Laboratory sessions focus on math associated with electronic applications. Course is 8 weeks long, offered only in the 1st half of each semester. Prerequisite: satisfactory score on the math portion of the COMPASS test. Test out options are available.

### 10-605-172 Applied Electronics Mathematics 2 2 credits

This course continues to develop the mathematics skills needed by technicians to be successful in their field. Closely tied to the other second-semester electronics courses. Laboratory sessions continue to integrate math with electronic applications. Course is 8 weeks long, offered only in the 2nd half of each semester. Concurrent registration in 10-605-112 and prerequisite of 10-605-171 or equivalent competency level. Test out options are available.

### 10-605-173 Embedded Programming 3 credits

Introduction to the fundamentals of electronic computer language, systems and structure. Embedded processor hardware will be covered from a system level perspective. Programming structures such as loops, branching, data storage, bit-level processing (masking), functions, arrays, pointers and structures will be covered. Languages include ANSI C, Embedded C Language and principles of assembly language. Prerequisite: 10-605-118.

### 10-605-176 Microcontrollers 3 credits

Course covers a study of microcontrollers and digital systems. Topics include Embedded C programming of Microcontrollers, Basic architectural concepts, parallel and serial I/O, Interrupts, Timer Subsystems, Analog to Digital conversion, Asynchronous Serial Communications (USART), CAN Bus communications, Synchronous Serial Communications (MSSP/SPI/IC2 Bus), Pulse Width Modulation (PWM), and basic control concepts. Prerequisites: 10-605-173 and 10-605-119.

### 10-605-178 Networks, Interfacing and Programming 3 credits

Networking fundamentals and implementation with an emphasis on Linux. Course will explore Network layers and Protocols, LabView and FPGA Programming, wireless standards, and Hardware Configuration and programming of various Ethernet connected devices (computers, microcontrollers, remote sensors, control equipment and other hardware). Prerequisites: 10-605-173 and concurrent registration in 10-605-176 or 10-605-123 and concurrent enrollment in 10-605-152.

### 10-662-112 AC-DC Electronics 3 3 credits

Topics include analysis of series and parallel AC RLC circuits, utilizing series and parallel equivalent circuits, superposition, Delta-Wye transformations, and Nodal Analysis. Real, reactive, and apparent power in AC circuits along with ideal loads in both single and three phase circuits are studied. Lab work includes analysis, computer simulation and actual measurements. Prerequisite: 10-605-114.

### 10-662-124 Advanced Circuit Analysis 3 credits

Topics include variable frequency analysis of RLC circuits, first order Bode plots, and correlation of time and frequency response. Semiconductor devices and circuits, including diodes, bipolar transistors and field effect transistors are studied. The time and frequency response of single stage BJT and FET amplifiers is examined. Lab work includes analysis, computer simulation, and actual measurements. Prerequisites: 10-662-112 and 10-605-115.

## Career Potential:

- Engineering Assistant
- Electronic Development Technician
- Electronic Technician
- Electronic Maintenance Technician
- Electronic Test Technician
- Field Service Technician

With additional education and/or work experience, graduates may find employment as:

- Electrical Engineer
- Electronic Engineer
- Computer Engineer
- Electronic Production Supervisor
- Electronic Maintenance Supervisor
- Field Service Engineer
- Network Engineer

Note: Students wishing to transfer to the UW system or other 4-year college should contact a program advisor and the receiving college or university about transferring credits.

Note: Courses from the Liberal Studies Program-College Transfer Option (800-series) can be used in lieu of required courses.

### Recommended Elective:

20-805-270 AC/DC Circuit Techniques and Principles 3 credits

*More detailed and updated information on this program may be available at: [madisoncollege.org](http://madisoncollege.org). The college reserves the right to make changes in the regulations and courses announced in this publication without notice.*

*Madison Area Technical College provides equal opportunity in education and employment.*

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