

Electronics

Associate in Applied Science Degree

Applied Engineering Technologies Program Cluster

Center for Agriscience & Technologies

Program offered at Madison and Watertown Campuses

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

About the Program

The electronics industry offers a wide range of job opportunities installing and maintaining electronic equipment in manufacturing, research, development, medicine and communications. Communications, computers and industrial electronics continue to expand, and there is a high demand for technicians and engineering assistants.

Unique Requirements for Admission

High school course recommendations: We strongly recommend that students take the math sequence of Algebra 1 and Algebra 2 to best prepare them for this program. In addition, a high school physical science course is highly recommended. Students must earn a 2.0 (C) or better in the high school courses.

The COMPASS test is required for all applicants. Advisement and course placement in English and mathematics is done based on COMPASS 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 matcmadison.edu (look for COMPASS in the "A-Z Index"). Applicants are advised to view this material prior to taking the test.

Curriculum

FIRST YEAR

		Hrs/week	
		Credits	Lec-Lab
First Semester			
10-605-112	AC-DC Electronics 1.....	3	2-3
10-605-113	Analog Solid State Devices 1.....	3	2-3
10-605-118	Digital Electronics 1.....	3	2-3
10-605-171	Applied Electronics Mathematics 1.....	3	2-3
10-801-195	Written Communication.....	3	3-0
Semester Total		15	

Second Semester

10-605-114	AC-DC Electronics 2.....	3	2-3
10-605-119	Digital Electronics 2.....	3	2-3
10-605-172	Applied Electronics Mathematics 2.....	3	2-3
10-605-173	Embedded Programming.....	3	2-3
10-801-197	Technical Reporting.....	3	3-0
Semester Total		15	

SECOND YEAR

First Semester

10-605-115	Analog Solid State Devices 2.....	3	2-3
10-605-176	Microcontrollers.....	3	2-3
10-806-143	College Physics 1.....	3	2-2
10-809-195	Economics.....	3	3-0
10-809-199	Psychology of Human Relations.....	3	3-0
Semester Total		15	

Second Semester

10-605-143	Motors and Control Circuits.....	3	2-3
10-605-152	Microprocessor Applications.....	3	2-3
10-605-178	Technical Programming.....	3	2-3
10-809-166	Intro to Ethics: Theory & Applications.....	3	3-0
10-809-197	Contemporary American Society* OR.....	3	3-0
20-809-203	Introduction to Sociology.....	(3)	3-0
Elective		3	E
Semester Total		18	

*Substitution of Intro to Sociology, 10-809-203, for Contemporary American Society is recommended for any student who may wish to transfer into the Electrical Engineering Technology program.

Recommended Electives

10-605-116	Advanced Analog Solid State Circuits	3 credits
10-605-136	Biomedical Electronics	3 credits
10-605-150	Electronic Data Transmission	3 credits
10-605-151	Troubleshooting and Maintenance	3 credits
10-605-160	Virtual Reality and Telerobotics	3 credits

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. In addition, 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.

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 digital multimeters (DMM); phase relationships; use of oscilloscopes on AC waveforms. Prerequisite: satisfactory mathematics placement score on COMPASS test.

10-605-113 Analog Solid State Devices 1 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.

10-605-114 AC-DC Electronics 2 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. Prerequisites: 10-605-112 and 10-605-171.

10-605-115 Analog Solid State Devices 2 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. Prerequisites: 10-605-113 and 10-605-114.

10-605-118 Digital Electronics 1 3 credits

Course covers schematic digital component identification, PCB component identification, Engineering Notation, Basic Gates, IC Numbering Systems, Through hole and surface mount footprint identification, IPC-610-D Hole Through and Surface Mount (SMT) soldering and rework training, 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.

10-605-119 Digital Electronics 2 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 as well as Field Programmable Gate Arrays (FPGA). Lab work includes individual project design, layout, construction, testing and documentation. Prerequisites: 10-605-112 and 10-605-118.

10-605-143 Motors and Control Circuits 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.

10-605-152 Microprocessor Applications 3 credits

This senior capstone course is project based. The class is structured as a Research and Development Corporation. Students will exercise their digital electronics, embedded C programming, electronics assembly and microcontroller systems skills. A final project presentation will allow students to share their experiences with the rest of the department. Previous projects include: RPM meters, Golf Club head speed meters, GPS-microcontroller interface. Prerequisites: 10-605-118, 10-605-119, 10-605-173 and 10-605-176.

10-605-171 Applied Electronics Mathematics 1 3 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 circuits, instruments and computers to help students appreciate the connections between math and electronic circuits. Prerequisite: satisfactory score on the math portion of the COMPASS test.

10-605-172 Applied Electronics Mathematics 2 3 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. Prerequisite: 10-605-171 or equivalent competency level.

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 Technical Programming 3 credits

Programming in specialized environments like Lab View, Simulink and Visual Basic. Hardware and programming aspects of Ethernet interconnected computers, microcontrollers, remote sensors, control equipment and hardware. Prerequisites: 10-605-173 and 10-605-176. Prerequisite or concurrent enrollment in 10-605-152.

Alternate Math Selections

10-804-196	Trigonometry with Applications	3 credits
20-804-213	Trigonometry	3 credits
10-605-131	Technical Calculus 1	4 credits
10-605-132	Technical Calculus 2	4 credits

**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.*

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

Career Potential:

- Computer Technician
- Network Technician
- Electronic Development Technician
- Electronic Maintenance Technician
- Electronic Test Technician
- Electronics Technician
- Field Service Technician

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

- Computer Field Service Supervisor
- Electronics Production Supervisor
- Electronics Maintenance Supervisor
- Electrical Engineer
- Network Manager

More detailed and updated information on this program may be available at: matcmadison.edu. 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.

Rev. 05/09