

Electronics

Associate in Applied Science Degree

Applied Engineering Technologies Program Cluster

School of Agriscience and Technologies

Program offered at the Madison Truax Campus

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.

New program students without prior coursework in mathematics and/or English are required to complete the appropriate COMPASS test. Advisement and course placement in mathematics and English is based on test results, prior coursework or transfer credits.

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 (look for COMPASS in the "A-Z Index"). Applicants are advised to view this material prior to taking the test.

Curriculum

The courses listed below outline the requirements for graduation for students entering this program in the 2012-2013 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

		Hrs/week	
First Semester		Credits	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
10-605-171	Applied Electronics Mathematics 1.....	2	3-3
10-605-172	Applied Electronics Mathematics 2.....	2	3-3
10-801-195	Written Communication.....	3	3-0
Semester Total		16	

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
10-605-123	Embedded Device Concepts.....	3	2-3
10-809-195	<u>Economics</u>	3	3-0
Semester Total		15	

SECOND YEAR

First Semester

10-605-116*	Advanced Analog Circuits.....	3	2-3
10-605-151*	Instrumentation & Troubleshooting.....	3	2-3
10-605-152*	Digital Systems Analysis.....	3	2-3
10-801-197	Technical Reporting.....	3	3-0
10-806-143	College Physics 1.....	3	2-2
	<u>Elective*</u>	3	3-2
Semester Total		18	

Second Semester*

10-605-143**	Motors and Control Systems.....	3	2-3
10-605-150**	Electronic Data Transmission.....	3	2-3
10-605-178**	Networks, Interfacing and Programming.....	3	2-3
10-809-199	Psychology of Human Relations.....	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	<u>Introduction to Sociology***</u>	(3)	(3-0)
Semester Total		18	

Recommended Electives

10-605-136	Biomedical Electronics	3 credits
10-605-160	Virtual Reality and Telerobotics	3 credits
10-605-173	Embedded Programming	3 credits
10-605-176	Microcontrollers	3 credits
20-605-252	Introduction to Computer Engineering	3 credits
20-605-270	AC/DC Circuit Principles & Techniques	3 credits

*Offered in the Fall Semester only

**Offered in Spring Semester only

***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.

Note: Students are assessed for correct placement in English or mathematics courses based on their scores on the COMPASS test, prior coursework and/or transfer credits. 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 test equipment. Prerequisite: Satisfactory mathematics placement via COMPASS test, prior coursework or transfer credit.

10-605-113 Analog Circuit Techniques 3 credits

Introductory electronic course covering devices, circuits and applications. Uses analog electronics devices — diodes, field effect and bipolar transistors and operational amplifiers to learn basic theory and use of test equipment 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 via COMPASS test, prior coursework or transfer credit; or concurrent enrollment in 10-605-112.

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. Prerequisite: 10-605-112.

10-605-115 Analog Circuit Principles 3 credits

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

10-605-116 Advanced Analog Circuits 3 credits

Project based course centering on analog circuit applications. Emphasizes hands-on skills, assembly, testing and troubleshooting, documentation, working in groups and presentations. Prerequisites: 10-605-115 and 10-605-118.

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 * through hole and surface mount (SMT) soldering, lead free RoHS soldering and rework training, IPC-610 * 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 as well as Field Programmable Gate Arrays (FPGA). Lab work includes individual project design, layout, construction, testing and documentation. Prerequisite: 10-605-112 and 10-605-118, or consent of instructor.

10-605-123 Embedded Device Concepts 3 credits

Programmed devices covers with a hardware emphasis. Covers algorithms, event sequencing, flow diagrams, visual programming and Embedded C programming. Compiling, downloading embedded code into a target hardware and basic troubleshooting of simple embedded programs in C. Also covers variables, memory management, conditionals, mathematical operations, functions and loops. Emphasis on troubleshooting. Prerequisite: 10-605-118 or consent of instructor.

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. Prerequisite: 10-605-115 and 10-605-123 or 10-605-173.

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: 10-605-115 and 10-605-119.

10-605-151 Instrumentation and Troubleshooting 3 credits

Covers the approach, methodology and techniques in troubleshooting electronic circuits and systems as well as the calibration, uses and limitations of common electronic test equipment. Prerequisites: 10-605-115 and 10-605-119.

10-605-152 Digital Systems Analysis 3 credits

Project based course focusing on digital circuits, embedded controllers and interfacing. Emphasizes hands-on skills, assembly, testing and troubleshooting, documentation, working in groups and presentations. Prerequisites: 10-605-118, 10-605-119, and 10-605-123.

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: Placement via COMPASS test, prior coursework or transfer credit.

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. Prerequisite: 10-605-171 or placement via COMPASS test, prior coursework or transfer credit.

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: 10-605-152 or 10-605-176.

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

Alternate Math Selections

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

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: During the open enrollment period, continuing education students can enroll in almost any Electronics class, space permitting, based on their professional experience and with consent of instructor

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

Recommended Elective:

20-605-252	Introduction to Computer Engineering	3 credits
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More detailed and updated information on this program may be available at: 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.