## Associate of Applied Science - Robotics Technology

Program Director: [Steve Shen](mailto:steve.shen@missoulacollege.edu)

### Suggested Sequence of Courses*

**First Year:**

<table>
<thead>
<tr>
<th>Course #</th>
<th>Course Title</th>
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<tbody>
<tr>
<td>CSCI 105</td>
<td>Computer Fluency</td>
<td>3</td>
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<tr>
<td>ETEC 105</td>
<td>DC Circuit Analysis</td>
<td>4</td>
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<tr>
<td>M 121</td>
<td>College Algebra</td>
<td>3</td>
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<tr>
<td>ROBT 120</td>
<td>Introduction to Robotics</td>
<td>3</td>
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<tr>
<td>WRIT 101</td>
<td>College Writing I**</td>
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<tr>
<td>CSCI 113</td>
<td>Programming with C++</td>
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<td>ETEC 106</td>
<td>AC Circuit Analysis</td>
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<td>ROBT 150</td>
<td>3D Printing and SolidWorks</td>
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<tr>
<td>ETEC 250</td>
<td>Solid State Electronics I</td>
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<tr>
<td>SCN 175N</td>
<td>Integrated Physical Science I</td>
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<tr>
<td>ETEC 251</td>
<td>Solid State Electronics II</td>
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<td>ETEC 245</td>
<td>Digital Electronics</td>
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<td>ETEC 265</td>
<td>Control Systems</td>
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<td>PSYX 100S</td>
<td>Introduction to Psychology</td>
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<td>ROBT 255</td>
<td>Integration of Robotics Systems</td>
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<td>ELCT 275</td>
<td>Microprocessors and Microcontrollers</td>
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<tr>
<td>M 122</td>
<td>College Trigonometry</td>
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<td>ROBT 299</td>
<td>Robotic Systems Project</td>
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<td>M 162</td>
<td>Applied Calculus</td>
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Minimum Required Grade: C-

Total Credits: **64**

*This recommended schedule may not be appropriate for all students.

**or WRIT 121 (Intro to Technical Writing I)

### Course Descriptions

**CSCI 105 Computer Fluency, 3 cr.** *Offered autumn and spring.* Introduces the skills and concepts of information technology, both from practical and a more theoretical point of view. During lectures and interactive computer labs, students will explore a wide range of digital and information technologies, including common PC applications, networking, databases, privacy, and security. Credit not allowed for both CSCI 105 and CRT 111 and CS 111.

**CSCI 113 Programming with C++, 3 cr.** *Offered spring.* Prereq., M 090 (MAT 005) or equivalent. Object oriented programming using C++. Implementation of structured programming concepts along with construction of classes to create data types for defining objects.
ETEC 105 DC Circuit Analysis, 4 cr. Offered autumn and spring. Prereq. M 090. An introduction to direct current (DC) and analysis of series, parallel, and series-parallel circuits. Topics include electrical quantities, units of measurement, measurement instruments, resistors, current, voltage, power, energy, network theorems, equivalent circuits, magnetism, and electromagnetism. Laboratory experiments include circuit analysis; the proper use of measurement equipment and techniques; and troubleshooting.

ETEC 106 AC Circuit Analysis, 3 cr. Offered autumn and spring. Prereq. ETEC 105. Analysis of alternating current (AC) circuits and the behavior of capacitors, inductors, reactance, impedance, transformers, and signal filters. Laboratory experiments include circuit analysis; the use of proper measurement equipment, and troubleshooting.

ELCT 245 Digital Electronics, 4 cr. Offered autumn. Prereq., ETEC 105. Explores digital electronic circuits and devices that make up a computer system. Topics include binary and hexadecimal number systems, Boolean algebra and digital logic theory, simple logic circuits, combinational logic, and sequential logic. Also covered is the analog-to-digital and digital-to-analog interfaces between a digital system and the real (analog) world. Includes hands-on labs.

ETEC 250 Solid State Electronics I, 4 cr. Offered spring. Prereq. ETEC 105. An introduction to semiconductor technologies used in solid state electronics with an emphasis on diodes and transistors. Classroom concepts are reinforced through lab-based experiments.

ETEC 251 Solid State Electronics II, 3 cr. Offered autumn. Prereq. ETEC 250. An introduction to semiconductor technologies used in solid state electronics with an emphasis on amplifier circuits, field effect transistors, thyristors, and operational amplifiers. Classroom concepts are reinforced through lab-based experiments.

ETEC 265 Control Systems, 4 cr. Offered autumn. Prereq., ETEC 250 Solid State Electronics I. The course provides a comprehensive coverage of components, circuits, instruments, and control techniques used in continuous and discrete automatic control systems, and focuses on basic principles, operation and applications. Programming, interfacing, and applications of programmable logic controllers are emphasized, including PLC hardware components, ladder logic diagram, fundamentals of PLC programming, and PLC interfacing and troubleshooting. Laboratory experiments and course projects are included in the course.

ETEC 275 Microprocessors and Microcontrollers, 4 cr. Offered spring. Prereq., ETEC 250 Solid State Electronics I, Prereq. or Co-req., CSCI 113 Programming with C++. The course introduces the fundamental concepts, basic principles of the architecture, organization, operation and applications of microprocessors and microcontrollers. Programming in assembly language and in C, and interfacing of microprocessor systems are emphasized. Laboratory experiments and course projects are included in the course to increase the hands-on skills of the students.

M 121 College Algebra, 3 cr. Offered autumn and spring. Prereq., M 095 or ALEKS placement >4. Intended to strengthen algebra skills. The study of functions and their inverses: polynomial, rational, exponential, and logarithmic functions. Graphing calculator required.

M 122 College Trigonometry, 3 cr. Offered autumn and spring. Prereq., M 121 or appropriate placement score. Preparation for calculus based on college algebra. Review of functions and their inverses, exponential and logarithmic functions. Trigonometric functions and identities, polar coordinates and an optional topic such as conic sections or parametric functions.

M 162 Applied Calculus, 4 cr. Offered spring. Prereq., M 121, M 122, M 151, or ALEKS placement >5. Introduction to differentiation and integration of elementary functions. Emphasis is on applications in technical fields including electronics technology. Graphing calculators used.

PSYX 100 Introduction to Psychology, 4 cr. Offered every term. Introduction to the scientific study of behavior in humans and other animals.

ROBT 120 Introduction to Robotics, 3 cr. Offered autumn.

The course introduces fundamental concepts in robotics with a hands-on approach. Topics include, but are not limited to the evolution of robotics technology, generations of agile robotics as characterized by remotely piloted mobile robots.

ROBT 150 3D Printing and SolidWorks, 3 cr. Offered spring.
The course is to prepare students with theoretical knowledge and practical skills in 3D printing technology and SolidWorks.

**ROBT 255 Integration of Robotics Systems, 3 cr.** Offered autumn. Prereq. ROBT 120.
Robotics systems are multidisciplinary and complex. This course covers the topics of cooperative/swarming robotic behavior, robot vision concepts, inertial measurement techniques, global positioning systems (GPS), and telemetry techniques. Complex robotic applications along with contemporary topics in robotics technology are emphasized.

**ROBT 299 Robotic System Project, 3 cr.** Offered spring. Prereq. ROBT 255.
This is the capstone project at the program-level. The course integrates learning objectives of the robotics technology program along with project management principles.

**SCN 175N Integrated Physical Science I, 3 cr.** Offered every term. Prereq., or coreq., M 095. An introduction to the basic principles of physics, chemistry, environmental and earth sciences with emphasis on the scientific method and process. (Suitable for students with little science background.)

**WRIT 101 College Writing I, 3 cr.** Offered every term. Prereq., WRIT 095 or passing score on placement test.
Instruction and practice in expository writing, argumentation and research processes. Emphasis on the use of specific writing strategies to develop style, unity, clarity, and force of ideas, and structure. Students are expected to write without major errors in sentence structure or mechanics. Grading A-F, or NC.

**WRIT 121 Introduction to Technical Writing, 3 cr.** Offered every term. Course assumes a basic computer literacy. Passing score on placement test or consent of instructor. Introduction to technical writing situations with appropriate formats. Emphasizing on writing with document design and graphic placement introduced. Students are expected to write without major faults in grammar or usage.

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## Robotics Technology

**Program Director:** Steve Shen

### Program Description

Robotics Technology is a multi-disciplinary program which combines a variety of fields in engineering technology, such as automation, electronics, and software to create machines to take over work that humans have traditionally done, especially dangerous work and large-scale manufacturing work. 

*The Robotics Technology is a Science, Technology, Engineering, and Mathematics (STEM) program.*

The Robotics Technology Program offers students a broad foundation in electronics, semiconductor devices and circuits, digital logic, microprocessors, control systems and industrial automation, robotics, human-robots interfacing, instrumentation, high and low-level programming and interfacing, and software applications.

The program utilizes a focused hands-on instructional approach with an emphasis on real world applications. The curriculum includes numerous lab experiments, problem-based projects, and a capstone project at the program level.

The program offers a comprehensive technical foundation for individuals seeking an education involving the entry level skills required of a successful technician in the broad field of engineering technology.

The Robotics Technology Associate of Applied Science (AAS) degree program prepares students for careers as an electronic engineering technician or manufacturing technician in all sectors of engineering technology industry in which electronic and robotic devices and systems are employed. In addition, the program provides the opportunities for the graduates to continue their study to a 4-year baccalaureate university in engineering or engineering technology.

### Student Outcomes
Upon completion of the program, a student will:

- Demonstrate an understanding of the fundamentals in robotics technology and its applications
- Demonstrate a solid understanding of electricity and electronics circuit theory
- Demonstrate ability and hands-on skills to design, implement, test and troubleshoot electronics devices, circuits, and systems
- Demonstrate the ability to clearly articulate technical concepts using written language.
- Develop safe workplace practices
- Effectively utilize information technology as a research and productivity tool
- Employ logic, critical thinking, and problem solving skills in the troubleshooting of electronic components and systems
- Solve technical problems involving mathematics at the level of college algebra, trigonometry, and applied calculus
- Programming, interfacing, and integration of analog and digital systems in robotics applications
- Demonstrate an understanding of engineering design processes
- Use of design software tools such as Solid Works and 3-D CADD
- Troubleshoot and repair of robotic components and systems
- Demonstrate an understanding of economic principles and the role of robotics to future economy
- Demonstrate ability to solve technical problems with application of robotic devices and systems
- Demonstrate an understanding of behavioral programming on various robotic platforms

**Related Job Titles**

- Computer Control Operator/Programmer
- Electrical Engineering Technician
- Electronics Technician
- Robotics Technician
- Instrumentation Technician
- Home Entertainment System Technician
- Laboratory Technician
- Residential Appliance Technician
- Security System Technician
- Telecommunications/Radio Technician
- Automated Systems Technician
- Robotics Maintenance Technician
- Intelligent Automation Technician
- Computer Aided Design and 3D Printing Technician
- Programmable Controllers and Robotics Technician
- Manufacturing Technician
- Machine Line Operator

**Related Occupations (US-DOL Occupations Handbook)**