



AUTOMATION & INSTRUMENTATION TECHNOLOGY

Associate in Applied Science (AAS)
Program Code: 10-605-4
Total Credits: 60

Unique in the Wisconsin Technical College System, the Automation & Instrumentation Technology program at Mid-State prepares graduates to measure and control industrial processes in today's high-tech manufacturing environments. In this program you'll apply mathematical skill and basic laws of physical sciences to design, install, calibrate, maintain, troubleshoot, and repair industrial control systems. You'll learn to use a variety of different forms of instrumentation and have access to state-of-the-art equipment. Field trips to businesses that have process control systems as an integral part of operations extend your hands-on experience into the real world.

Estimated tuition and fees: mstc.edu/programcosts

ACADEMIC ADVISOR

To schedule an appointment with an academic advisor, call 715.422.5300. Academic advisors will travel to other campuses as necessary to accommodate student needs. For more information about advising, visit mstc.edu/advising.

CHECKLIST:

This section will be completed when meeting with your academic advisor.

- FAFSA (www.fafsa.gov)
- Financial Aid Form(s)
Form(s): _____
- Follow-Up Appointment:
Where: _____
When: _____
With: _____
- Official Transcripts
Mid-State Technical College
Student Services Assistant
1001 Centerpoint Drive
Stevens Point, WI 54481
- Other: _____



mstc.edu • 888.575.6782 • TTY: 711



ADAMS CAMPUS
401 North Main
Adams, WI 53910

MARSHFIELD CAMPUS
2600 West 5th Street
Marshfield, WI 54449

STEVENS POINT CAMPUS
1001 Centerpoint Drive
Stevens Point, WI 54481

WISCONSIN RAPIDS CAMPUS
500 32nd Street North
Wisconsin Rapids, WI 54494

CAREER PATHWAY • BEGIN AT ANY POINT

HIGH SCHOOL STUDENT

COLLEGE TRANSFER

RETURNING ADULT

CREDIT FOR PRIOR LEARNING AND EXPERIENCE

CREDIT FOR PRIOR LEARNING AND EXPERIENCE

- Certifications and Licenses
- High School Credit
- Military Experience
- National/Standardized Exams
- Transfer Credit
- Work and Life Experience

Learn about Credit for Prior Learning at mstc.edu/cpl.

ASSOCIATE IN APPLIED SCIENCE (AAS)

AUTOMATION & INSTRUMENTATION TECHNOLOGY

Associate in Applied Science (AAS) • 60 Credits

Start Your Career

- Automation/Controls Engineering Technician
- Electrical and Instrumentation Technician
- Instrument Technician
- Apprenticeship

BACHELOR'S DEGREE

BACHELOR'S DEGREE OPTIONS

For more information and additional opportunities, visit mstc.edu/transfer.

OTHER OPTIONS

RELATED PROGRAMS

- Civil Engineering Technology-Highway Technician

APPRENTICESHIP OPPORTUNITIES

- Electrical & Instrumentation Technician Apprenticeship

PROGRAM OUTCOMES

Employers will expect you, as an Automation & Instrumentation Technology graduate, to be able to:

- Apply safety standards.
- Utilize troubleshooting strategies.
- Optimize instrumentation systems.
- Optimize hardware and output devices.
- Demonstrate programming in ladder logic.
- Demonstrate networking principles.

TECHNICAL SKILLS ATTAINMENT

The Wisconsin Technical College System (WTCS) has implemented a requirement that all technical colleges measure program outcomes attained by students. This requirement is called Technical Skills Attainment (TSA). The main objective of TSA is to ensure graduates have the technical skills needed by employers. Students are notified of TSA reporting in their final few courses of the program.

STUDENT HANDBOOK

Visit mstc.edu/studenthandbook to view Mid-State's student handbook, which contains information about admissions, enrollment, appeals processes, services for people with disabilities, financial aid, graduation, privacy, Mid-State's Student Code of Conduct, and technology.

NOTES:

GRADUATION REQUIREMENT

The GPS for Student Success course is required for all Mid-State program students and is recommended to be completed before obtaining 12 credits. (Not counted in the total credit value for this program.) Some students are exempt from this requirement. Please see your program advisor for more information.

GPS for Student Success ☑

10890102 1 credit

Integrate necessary skills for student success by developing an academic plan, identifying interpersonal attributes for success, adopting efficient and effective learning strategies, and utilizing Mid-State resources, policies, and processes. This course is recommended to be completed prior to obtaining 12 credits and is a graduation requirement unless you receive an exemption from your program advisor.

ADDITIONAL COURSES AS NEEDED

The following courses may be recommended or required if the student does not achieve minimum Accuplacer scores.

College Reading and Writing 1

10831104 3 credits

Provides learners with opportunities to develop and expand reading and writing skills to prepare for college-level academic work. Students will employ critical reading strategies to improve comprehension, analysis, and retention of texts. Students will apply the writing process to produce well-developed, coherent, and unified written work.

Pre-Algebra

10834109 3 credits

Provides an introduction to algebra. Includes operations on real numbers, solving linear equations, percent and proportion, and an introduction to polynomials and statistics. Prepares students for elementary algebra and subsequent algebra-related courses.

Prerequisite: Accuplacer Math score of 65, Accuplacer Algebra score of 30, ABE Math Prep V 76854785 and ABE Math Prep VI 76854786 with a grade of "S." (Note: ABE Math Prep V and VI courses cannot be used to satisfy program completion requirements at Mid-State.)

SAMPLE FULL-TIME CURRICULUM OPTION

Term		16 credits
10605105	Electrical Circuits I ☑	3
10605112	Process Documentation ☑	1
10605131	Process Equipment	2
10605169	Instrumentation Principles ☑	3
10801136	English Composition 1 ☑	3
10804118	Intermediate Algebra with Applications ☑	4
Term		15 credits
10150110	Networking I ☑	3
10462107	Industrial Safety ☑	2
10605110	Electrical Circuits II	3
10605117	Automation 1 - Beginning PLC ☑	3
10623106	Intro to AutoCAD	1
10804196	Trigonometry with Applications	3
Term		16 credits
10462133	Electric Controls for Industrial Automation	3
10605100	Process Measurements Instrumentation	2
10605118	Automation 2 - Advanced PLC	3
10605121	Process Control Strategies	2
10804195	College Algebra with Applications ☑	3
10809188	Developmental Psychology ☑ -or-	
10809198	Intro to Psychology ☑	3
Term		13 credits
10462131	Industrial Electric Power Applications	2
10605119	Automation 3 - HMI's & Robotics	2
10605133	Process Troubleshooting Strategies	1
10605172	Process Systems	2
10801196	Oral/Interpersonal Communication ☑ -or-	
10801198	Speech ☑	3
10809122	Intro to American Government ☑ -or-	
10809166	Intro to Ethics: Theory & Application ☑	3
Total credits 60		

☑ This course has options available to receive credit for prior learning (CPL) or work experience. Visit the website at mstc.edu/cpl or contact your advisor for details.

Please Note:

- This curriculum sequence is only for student planning. Actual student schedules will vary depending on course availability.
- Program completion time may vary based on student scheduling and course availability. For details, go to mstc.edu/schedule.

SAMPLE PART-TIME CURRICULUM OPTION

Term		10 credits
10605105	Electrical Circuits I ☑	3
10605169	Instrumentation Principles ☑	3
10804118	Intermediate Algebra with Applications ☑	4
Term		8 credits
10462107	Industrial Safety ☑	2
10605110	Electrical Circuits II	3
10804196	Trigonometry with Applications	3
Term		6 credits
10605112	Process Documentation ☑	1
10605131	Process Equipment	2
10801136	English Composition 1 ☑	3
Term		7 credits
10605117	Automation 1 - Beginning PLC ☑	3
10623106	Intro to AutoCAD	1
10150110	Networking I ☑	3
Term		8 credits
10605118	Automation 2 - Advanced PLC	3
10605121	Process Control Strategies	2
10804195	College Algebra with Applications ☑	3
Term		7 credits
10462131	Industrial Electric Power Applications	2
10605119	Automation 3 - HMI's & Robotics	2
10801196	Oral/Interpersonal Communication ☑ -or-	
10801198	Speech ☑	3
Term		8 credits
10462133	Electric Controls for Industrial Automation	3
10605100	Process Measurements Instrumentation	2
10809188	Developmental Psychology ☑ -or-	
10809198	Intro to Psychology ☑	3
Term		6 credits
10605133	Process Troubleshooting Strategies	1
10605172	Process Systems	2
10809122	Intro to American Government ☑ -or-	
10809166	Intro to Ethics: Theory & Application ☑	3
Total credits 60		

COURSE DESCRIPTIONS

Automation 1 - Beginning PLC ☑

106051173 credits

An overview of programmable logic controllers (PLCs) that provides a foundation of knowledge of the programming techniques, operation, and maintenance of PLCs used in typical industrial automation.

Automation 2 - Advanced PLC

106051183 credits

A lab intensive course covering advanced PLC topics and programming techniques, analog I/O, VFDs, basic HMI interfaces, industrial robotics and troubleshooting.

Prerequisite: Automation 1 - Beginning PLC 10605117 or consent of instructor

Automation 3 - HMI's & Robotics

106051192 credits

A lab intensive course covering advanced PLC programming techniques, HMI programming, industrial robotic systems interface, networking basics and troubleshooting of automation systems.

Prerequisite: Automation 1 - Beginning PLC 10605117

College Algebra with Applications ☑

108041953 credits

Covers the skills needed for success in calculus and many application areas on a baccalaureate level. Topics include the real and complex number systems, polynomials, exponents, radicals, solving equations and inequalities (linear and nonlinear), relations and functions, systems of equations and inequalities (linear and nonlinear), matrices, graphing, conic sections, sequences and series, combinatorics, and the binomial theorem.

Prerequisite: Trigonometry with Applications 10804196 with a grade of "C" or better or Intermediate Algebra with Applications 10804118 with a grade of "C" or better. Students without Trigonometry with Applications are encouraged to bring transcripts for individual course evaluation.

Developmental Psychology ☑

10809188.....3 credits

Studies human development throughout the lifespan and explores developmental theory and research with an emphasis on the interactive nature of the biological, cognitive, and psychosocial changes that affect the individual from conception to death. Application activities and critical thinking skills enable students to gain an increased knowledge and understanding of themselves and others.

Prerequisite: High School GPA of 3.0 or Accuplacer Reading Skills of 236, Writing of 237 or ACT of 15 Reading/16 Writing. Students are encouraged to bring transcripts for further evaluation if they do not meet these requirements.

Electric Controls for Industrial Automation

10462133.....3 credits

Introduces the fundamentals of industrial motor controls, relay logic, ladder diagrams, industrial automation, and integrated manufacturing systems. The purpose of the course is to familiarize students with the terminology, capabilities, applications, and limitations of automated industrial controls through classroom and lab activities.

Prerequisite: Electrical Circuits 1 10605105

Electrical Circuits I ☑

106051053 credits

The study of Ohm's Law and its application to D.C. circuits. Major topics include: Ohm's Law, series circuits, parallel circuits, combination circuits, Kirchhoff's Laws, and power relationships.

Corequisite: Intermediate Algebra with Applications 10804118

Electrical Circuits II

106051103 credits

Continues the study of AC/DC circuits started in Electrical Circuits I. Introduces advanced DC circuit analysis techniques such as Thevenin's Theorem and nodal analysis. Includes discussion of voltage and power theorems used in the analysis of AC circuits consisting of both resistance and reactance. The complex plane and construction of phasor diagrams are also discussed. Concludes with an introduction to electronic filter circuits used in transmission and communication equipment. Approximately 50 percent of the course is spent in the laboratory, applying the principles and theory presented in the classroom.

Prerequisite: Electrical Circuits I 10605105; Corequisite: Trigonometry with Applications 1080419

English Composition 1 ☑

108011363 credits

Designed for learners to develop knowledge and skills in all aspects of the writing process. Planning, organizing, writing, editing, and revising are applied through a variety of activities. Students analyze audience and purpose, use elements of research, and format documents using standard guidelines. Individuals develop critical reading skills through analysis of various written documents.

Prerequisite: High School GPA of 3.0 or Accuplacer Writing of 262 or ACT of 20 or College Reading and Writing 1 10831104 with a "C" or better or equivalent. Students are encouraged to bring transcripts for further evaluation if they do not meet these requirements. Proficiency in word processing skills recommended.

Industrial Electric Power Applications

104621312 credits

Introduces concepts and applications of typical 3-phase power systems used in industry with focus on selection of overload devices, fuse sizing, wire selection, electrical motor theory and applications, and introduction to variable frequency drives through lecture and lab activities.

Industrial Safety ☑

104621072 credits

Provides an overview of safety, health, and environmental issues as they relate to industry. Various types of hazards and the controls and equipment used to reduce risks from hazards are discussed. Focuses on understanding the Occupational Safety and Health Administration (OSHA) and its function as well as other regulatory and enforcement agencies associated with industrial safety, health, and the environment.

COURSE DESCRIPTIONS

Instrumentation Principles ☒

106051693 credits

This course emphasizes a functional and mathematical approach to pneumatic and electric instrumentation used in industry. Includes survey of pressure, level, flow, and temperature instruments and their mechanisms, and an introduction to process control fundamentals. The course covers fundamental principles in math and science that applies to process instrumentation and process control. Topics covered include unit conversions, spreadsheets and graphing, linear equations, calibration principles, statistical process analysis, simple machines, basic thermodynamics, and electric motor theory.

Intermediate Algebra with Applications ☒

10804118 4 credits

This course offers algebra content with applications. Topics include properties of real numbers; order of operations; algebraic solution for linear equations and inequalities; operations with polynomial and rational expressions; operations with rational exponents and radicals; and algebra of inverse, logarithmic, and exponential functions.

Prerequisite: High School GPA of 3.0 or Accuplacer Arithmetic of 263 and QAS 234 or ACT of 19 or QAS of 245, or Pre-Algebra 10834109 with a grade of "C" or better or equivalent. Students are encouraged to bring transcripts for further evaluation if they do not meet these requirements.

Intro to American Government ☒

10809122.....3 credits

Introduces American political processes and institutions. Focuses on rights and responsibilities of citizens and the process of participatory democracy. Learners examine the complexity of the separation of powers and checks and balances. Explores the role of the media, interest groups, political parties, and public opinion in the political process. Also explores the role of state and national government in our federal system.

Prerequisite: High School GPA of 3.0 or Accuplacer Reading Skills of 236, Writing of 237 or ACT of 15 Reading/16 Writing. Students are encouraged to bring transcripts for further evaluation if they do not meet these requirements.

Intro to AutoCAD

10623106 1 credit

Learners will develop practical approaches to constructing basic 2D drawings in AutoCAD software by drawing, modifying, and assigning appropriate layer properties. Learners will also analyze length and area of shapes drawn in AutoCAD, summarize details through dimensions and annotations added to the drawings, and format the drawings for printing. Prior experience with computers is recommended.

Intro to Ethics: Theory & Application ☒

108091663 credits

Provides a basic understanding of the theoretical foundations of ethical thought. Diverse ethical perspectives are used to analyze and compare relevant issues. Students critically evaluate individual, social, and/or professional standards of behavior, and apply a systemic decision-making process to these situations.

Prerequisite: High School GPA of 3.0 or Accuplacer Reading Skills of 236, Writing of 237 or ACT of 15 Reading/16 Writing. Students are encouraged to bring transcripts for further evaluation if they do not meet these requirements.

Intro to Psychology ☒

108091983 credits

This science of psychology course is a survey of multiple aspects of behavior and mental processes. It provides an overview of topics such as research methods, theoretical perspectives, learning, cognition, memory, motivation, emotions, personality, abnormal psychology, physiological factors, social influences, and development.

Prerequisite: High School GPA of 3.0 or Accuplacer Reading Skills of 236, Writing of 237 or ACT of 15 Reading/16 Writing. Students are encouraged to bring transcripts for further evaluation if they do not meet these requirements.

Networking I ☒

10150110.....3 credits

Introduces the architecture, structure, functions, components, and models of the Internet and other computer networks. The principles and structure of IP addressing and the fundamentals of Ethernet concepts, media, and operations are introduced to provide a foundation for the curriculum. By the end of the course, participants will be able to build simple LANs, perform basic configurations for routers and switches, and implement IP addressing schemes. This course is the first of three courses that align with CCNA certification. Covers the objectives of the first CCNA exam.

Oral/Interpersonal Communication ☒

108011963 credits

Focuses on developing effective listening techniques and verbal and nonverbal communication skills through oral presentation, group activity, and other projects. The study of self, conflict, and cultural contexts will be explored, as well as their impact on communication.

Prerequisite: High School GPA of 3.0 or Accuplacer Reading Skills of 236, Writing of 237, or ACT of 15 Reading/16 Writing. Students are encouraged to bring transcripts for further evaluation if they do not meet these requirements.

Process Control Strategies

106051212 credits

This course examines various methods and techniques used in process control, including control loop analysis, control tuning (PID) process and tuning methods, system gain, statistical control processes, cascade and feed forward control, split control, and other advanced control techniques.

Prerequisite: Instrumentation Principles 10605169.

COURSE DESCRIPTIONS

Process Documentation

10605112 1 credit

This course will provide the student with the tools needed to read and understand process drawings and diagrams used in the process industries to maintain and troubleshoot industrial processes. Specific documentation includes piping and instrument diagrams (P&ID), process flow diagrams (PFD), block flow diagrams, control loop diagrams, functional diagrams, electrical diagrams, utility flow diagrams, wiring diagrams, schematics, isometric drawings.

Process Equipment

10605131 2 credits

This course will provide students with detailed analysis of standard process equipment. Equipment discussed includes pumps, valves, piping, equipment connections, motors, tanks and vessels, basic wiring practices, compressors, regulators, boilers, containment, heat exchangers.

Process Measurements Instrumentation

10605100 2 credits

Reviews basic principles and calibration standards and practices developed in instrument mechanics. Studies common sensing devices and components employed for the measurement of pressure, temperature, flow, level, and related phenomena.

Prerequisite: Instrumentation Principles 10605169.

Process Systems

10605172 2 credits

This course will provide students with detailed analysis of standard process systems and how they are monitored and controlled. Systems examined include water/steam services (boilers and cooling towers), thermal transfer systems and heat exchangers, compressors and vacuum systems, HVAC, turbines, distillation and strippers, refrigeration, separators.

Prerequisite: Process Equipment 10605131

Process Troubleshooting Strategies

10605133 1 credit

This course develops employee skills related to troubleshooting and employment strategies in area manufacturing industries by working directly with companies that have agreed to partner with Mid-State for this course. The course requires the student to work with a partnering company to assist in a problem solving or project work situation. Local companies are asked to submit a current problem or project with a narrow focus relating to industrial automation or instrumentation. The student meets with company personnel as needed, formulates the problem or project, and researches methods of solving or completing the project.

Prerequisite: Process Control Strategies 10605121

Speech

10801198 3 credits

Explores the fundamentals of effective oral presentation to small and large groups. Topic selection, audience analysis, methods of organization, research, structuring evidence and support, delivery techniques, and other essential elements of speaking successfully, including the listening process, form the basis of this course. Bring transcripts for further evaluation if they do not meet these requirements.

Prerequisite: High School GPA of 3.0 or Accuplacer Reading of 253, Writing of 262, or ACT of 21 Reading/19 Writing, or completion of College Reading and Writing 1 10831104 with a "C" or better or equivalent. Students are encouraged to bring transcripts for further evaluation if they do not meet these requirements.

Trigonometry with Applications

10804196 3 credits

Topics include circular functions, graphing of trigonometry functions, identities, equations, trigonometric functions of angles, inverse functions, solutions of triangles, complex numbers, DeMoivre's Theorem, polar coordinates, and vectors.

Prerequisite: Intermediate Algebra with Applications 10804118 with a grade of "C" or better. Students without Intermediate Algebra with Applications are encouraged to bring transcripts for individual course evaluation.