

# AUTOMATION & INSTRUMENTATION TECHNOLOGY

## Associate in Applied Science (AAS)

**Program Code: 10-605-4**

**Total Credits: 62**

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.

To learn more about this program, visit [mstc.edu/programs](https://mstc.edu/programs).

### 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](https://mstc.edu/advising).

### NEW STUDENT CHECKLIST

Complete the following steps to prepare for your New Student Advising appointment with your academic advisor:

- Submit a Mid-State application at [mstc.edu/apply](https://mstc.edu/apply).
- Send official transcripts to:  
Mid-State Technical College  
Student Services  
500 32nd Street North  
Wisconsin Rapids, WI 54494
- Complete the Free Application for Federal Student Aid (FAFSA) at [fafsa.gov](https://fafsa.gov). Mid-State's Financial Aid team is available to assist with your FAFSA application and to answer your financial aid questions. Contact Financial Aid or schedule an appointment at [mstc.edu/financial-aid](https://mstc.edu/financial-aid).
- Set up student MyCampus account at [mstc.edu/mycampus-assistance](https://mstc.edu/mycampus-assistance).
- Schedule a New Student Advising appointment at [mstc.edu/advising](https://mstc.edu/advising).

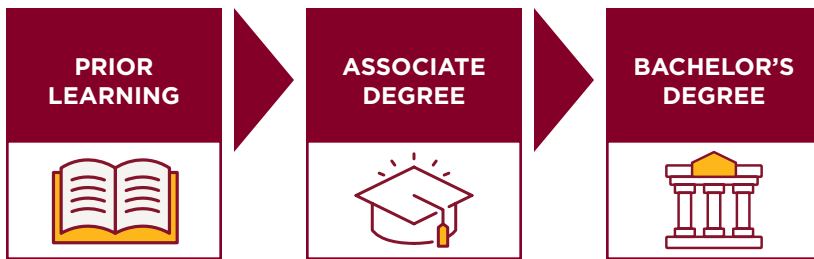
[mstc.edu](https://mstc.edu) • 888-575-6782 • TTY: 711



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Mid-State does not discriminate on the basis of race, color, national origin, sex, disability, or age in its program, activity, or employment. The following person has been designated to handle inquiries regarding the nondiscrimination policies: Vice President – Human Resources; 500 32nd Street North, Wisconsin Rapids, WI 54494; 715-422-5325 • AAEO@mstc.edu. 3/2026-AC

## CAREER PATHWAY



Career pathways help you build your education step by step. Each stage offers one or more credentials that are recognized by employers and lead to real jobs—and you can keep building toward your career goals as you go.

**Begin at any point.**

### **Prior Learning**

#### **Credit for Prior Learning**

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

Learn about Credit for Prior Learning at [mstc.edu/cpl](https://mstc.edu/cpl).

### **High School Credit**

- High School Dual Credit
- Mid-State Fast Track

Learn about High School Credit at [mstc.edu/dc](https://mstc.edu/dc).

### **Associate Degree**

- Automation & Instrumentation Technology (62 Credits)  
Start Your Career: Automation/Controls Technician, Electrical and Instrumentation Technician, Industrial Electrician, Instrument Technician, Process Control Technician

### **Bachelor's Degree**

For those interested in continuing their education, Mid-State offers transfer guides with various four-year colleges and universities. For more information, visit [mstc.edu/transfer](https://mstc.edu/transfer).

### **Other Options**

Related Programs: Advanced Manufacturing, Industrial Mechanical Technician

Apprenticeship Opportunity: Electrical & Instrumentation Technician

## 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 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. Faculty will let students know when and how the TSA is being assessed in the program.

## STUDENT HANDBOOK

Visit [mstc.edu/studenthandbook](http://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.

## 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. Some students are exempt from this requirement. Please see your academic advisor for more information.

## ADDITIONAL COURSES AS NEEDED

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

## MULTIPLE MEASURES

Students can place into courses using high school GPA and completed classes. Placement can be determined in the following ways:

- **Multiple Measures Writing (MMW)**  
High school GPA of 2.6 & successful completion of 2.0 credits of high school writing courses with a "C" or better
- **Multiple Measures Reading (MMR)**  
High school GPA of 2.6 & successful completion of 2.0 credits of high school literature courses with a "C" or better
- **Multiple Measures Math 1 (MMM\_1)**  
High school GPA of 2.6 & successful completion of 1.0 credit of high school math (Algebra 1 or equivalent) with a "C" or better
- **Multiple Measures Math 2 (MMM\_2)**  
High school GPA of 2.6 & successful completion of 2.0 credits of high school math including Algebra 1 and Algebra 2 with a "C" or better
- **Multiple Measures Science 1 (MMS\_1)**  
High school GPA of 2.6 & successful completion of 1.0 credit of high school lab science course with a "C" or better
- **Multiple Measures Science 2 (MMS\_2)**  
High school GPA of 2.6 & successful completion of 1.0 credit of high school chemistry with a "C" or better

*Past high school and college transcripts are used in making course placement decisions.*

## SAMPLE FULL-TIME CURRICULUM OPTION

### Automation & Instrumentation Technology • 62 Total Credits

Term 17 Credits	Course Number	Course Name	CPL	Credits
	10605105	Electrical Circuits I	Yes	3
	10605112	Process Documentation	Yes	1
	10605131	Process Equipment	No	2
	10605169	Instrumentation Principles	Yes	3
	10801136	English Composition 1	Yes	3
	10804118	Intermediate Algebra with Applications	Yes	4
	10890102	GPS for Student Success	Yes	1

Term 16 Credits	Course Number	Course Name	CPL	Credits
	10462107	Industrial Safety	Yes	2
	10605110	Electrical Circuits II	No	3
	10605117	Automation 1 - Beginning PLC	Yes	3
	10605145	Industrial Networking	No	2
	10607106	Excel for Engineering	No	1
	10664128	AutoCAD Electrical	No	2
	10804196	Trigonometry with Applications	No	3

Term 16 Credits	Course Number	Course Name	CPL	Credits
	10462133	Electric Controls for Industrial Automation	No	3
	10605109	Process Measurements Instrumentation	No	2
	10605118	Automation 2 - Advanced PLC	No	3
	10605121	Process Control Strategies	No	2
	10804195	College Algebra with Applications	Yes	3
	10809198 or 10809188	Introduction to Psychology or Developmental Psychology	Yes	3

Term 13 Credits	Course Number	Course Name	CPL	Credits
	10462131	Industrial Electric Power Applications	No	2
	10605119	Automation 3 - HMI's & Robotics	No	2
	10605133	Process Troubleshooting Strategies	No	1
	10605172	Process Systems	No	2
	10801198 or 10801196	Speech or Oral/Interpersonal Communication	Yes	3
	10809166 or 10809122	Introduction to Ethics: Theory & Application or Introduction to American Government	Yes	3

#### Please Note

- Credit for Prior Learning (CPL) options are available for some courses. You can visit [mstc.edu/cpl](http://mstc.edu/cpl) or contact your academic advisor for details.
- 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](http://mstc.edu/schedule).
- Get the latest updates online at [mstc.edu](http://mstc.edu).

## SAMPLE PART-TIME CURRICULUM OPTION

### Automation & Instrumentation Technology • 62 Total Credits

<b>Term</b>	<b>Course Number</b>	<b>Course Name</b>	<b>CPL</b>	<b>Credits</b>
<b>11 Credits</b>	10605105	Electrical Circuits I	Yes	3
	10605169	Instrumentation Principles	Yes	3
	10804118	Intermediate Algebra with Applications	Yes	4
	10890102	GPS for Student Success	Yes	1
<b>8 Credits</b>	10462107	Industrial Safety	Yes	2
	10605110	Electrical Circuits II	No	3
	10804196	Trigonometry with Applications	No	3
<b>6 Credits</b>	10605112	Process Documentation	Yes	1
	10605131	Process Equipment	No	2
	10801136	English Composition 1	Yes	3
<b>8 Credits</b>	10605117	Automation 1 - Beginning PLC	Yes	3
	10605145	Industrial Networking	No	2
	10607106	Excel for Engineering	No	1
	10664128	AutoCAD Electrical	No	2
<b>8 Credits</b>	10605118	Automation 2 - Advanced PLC	No	3
	10605121	Process Control Strategies	No	2
	10804195	College Algebra with Applications	Yes	3
<b>7 Credits</b>	10462131	Industrial Electric Power Applications	No	2
	10605119	Automation 3 - HMI's & Robotics	No	2
	10801198 or 10801196	Speech or Oral/Interpersonal Communication	Yes	3
<b>8 Credits</b>	10462133	Electric Controls for Industrial Automation	No	3
	10605109	Process Measurements Instrumentation	No	2
	10809198 or 10809188	Introduction to Psychology or Developmental Psychology	Yes	3
<b>6 Credits</b>	10605133	Process Troubleshooting Strategies	No	1
	10605172	Process Systems	No	2
	10809166 or 10809122	Introduction to Ethics: Theory & Application or Introduction to American Government	Yes	3

## COURSE DESCRIPTIONS

### **AutoCAD Electrical**

**10664128**

**2 credits**

In this course, students will learn to navigate and apply AutoCAD Electrical software to design and document electrical control systems. Emphasis is placed on creating accurate schematics, panel layouts, and project files using industry-standard tools and workflows. Students will gain hands-on experience developing electrical plans that meet professional standards and support real-world applications in electrical and industrial design.

*Prerequisite: Electrical Circuits 1 10605105*

### **Automation 1 - Beginning PLC**

**10605117**

**3 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**

**10605118**

**3 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**

**10605119**

**3 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 2 - Advanced PLC 10605118*

### **College Algebra with Applications**

**10804195**

**3 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: ACT Math score of 22 or Trigonometry with Applications 10804196 or Intermediate Algebra with Applications 10804118 with a "C" or better*

### **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 2.6 and MMR and MMW or Accuplacer Reading Skills of 236 and Writing of 237 or ACT of 15 Reading/16 English*

### **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**

**10605105**

**3 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 or College Mathematics 10804107*

### **Electrical Circuits II**

**10605110**

**3 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 10804196*

### **English Composition 1**

**10801136**

**3 credits**

Learners develop and apply skills in all aspects of the writing process. Through a variety of learning activities and written documents, learners employ rhetorical strategies, plan, organize and revise content, apply critical reading strategies, locate and evaluate information, integrate and document sources, and apply standardized English language conventions.

*Prerequisite: High School GPA of 2.6 and MMW or Accuplacer Writing of 262 or Accuplacer Reading 253 or ACT English score of 20 or ACT Reading 21 or completion of College Reading and Writing 1 10831104 with a "C" or better*

## **Excel for Engineering**

**10607106**

**1 credit**

Students learn to create, modify, and format spreadsheets and workbooks for readability and functionality in the engineering industry. Students will practice constructing workbooks to perform calculations and generate results in tabular and graphic form.

## **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.

## **Industrial Electric Power Applications**

**10462131**

**2 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.

*Prerequisite: Electric Controls for Industrial Automation 10462133*

## **Industrial Networking**

**10605145**

**2 credits**

Students will study network infrastructure and communication languages commonly found in the industrial setting.

*Corequisite: Automation 1 - Beginning PLC 10605117*

## **Industrial Safety**

**10462107**

**2 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.

## **Instrumentation Principles**

**10605169**

**3 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 2.6 and MMM\_1 or Accuplacer Arithmetic of 263 and QAS 234 or ACT Math score of 19 or QAS of 245 or Pre-Algebra 10834109 with a "C" or better.*

## **Introduction 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 2.6 and MMR and MMW or Accuplacer Reading Skills of 236 and Writing of 237 or ACT of 15 Reading/16 English*

## **Introduction to Ethics: Theory & Application**

**10809166**

**3 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 2.6 and MMR and MMW or Accuplacer Reading Skills of 236 and Writing of 237 or ACT of 15 Reading/16 English*

## **Introduction to Psychology**

**10809198**

**3 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 2.6 and MMR and MMW or Accuplacer Reading Skills of 236 and Writing of 237 or ACT of 15 Reading/16 English*

## **Oral/Interpersonal Communication**

**10801196**

**3 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 2.6 and MMR and MMW or Accuplacer Reading Skills of 236 and Writing of 237 or ACT of 15 Reading/16 English or College Reading and Writing with a C or better*

## **Process Control Strategies**

**10605121**

**2 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.*

## **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**

**10605109**

**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. Includes informative, persuasive, and occasion speech presentations.

*Prerequisite: High School GPA of 2.6 and MMR and MMW or Accuplacer Reading Skills of 253 and Writing of 262 or ACT of 21 Reading/19 English or completion of College Reading and Writing 1 10831104 with a "C" or better*

## **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: ACT Math score of 22 or Intermediate Algebra with Applications 10804118 with a "C" or better*