



Program Code 10-605-4
Expected Program Costs: \$10,700
Median Annual Salary: \$40,000

OVERVIEW

An indispensable asset in today's high tech manufacturing environments is a person that can measure and control industrial processes. This program trains you to understand and operate instrumentation that monitors and directs these processes, including pressure, flow, temperature, level and material composition. You will learn to use a variety of different forms of instrumentation such as electrical, electronic, pneumatic, hydraulic, mechanical and computerized control devices. This program teaches you to design, install, calibrate, maintain, troubleshoot and repair these control systems. You must learn to understand the basic laws of physical sciences and have the mathematical expertise to apply those laws to practical situations.

The Instrumentation & Controls Engineering Technology program is offered at the Wisconsin Rapids campus.

PROGRAM OUTCOMES

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

- Troubleshoot, repair and calibrate pneumatic/electronic and analog/digital instruments used to measure and control pressure, level, flow, temperature and pH
- Effectively interpret technical manuals, P + ID's, loopsheets and cross reference data books to analyze, troubleshoot and tune automatic process control loops
- Configure digital communication devices
- Solve problems using verbal and written communication skills as an individual or part of a team in supervised and unsupervised conditions
- Operate oscilloscopes, multimeters, manometers and other related measuring devices
- Calculate values of inputs, setpoints and outputs of open and closed loops with various values and combinations of proportional, integral and derivative
- Create two dimensional drawings using AutoCAD
- Design, program and troubleshoot programmable logic control (PLC) programs

CAREER OPTIONS

Apprenticeship Programs: Instrumentation, Electrician, Pipefitter
Instrument Technician
Plant Maintenance Technician
Quality Control/Assurance Inspector

POTENTIAL FOR ADVANCEMENT

Control Systems Technician
Instrumentation Design Engineer
Instrumentation Sales and Management
Instrumentation Start-Up Engineer
Instrumentation Supervisor
Journeyman: Instrument Technician, Electrician, Pipefitter

Potential advancement generally requires further education.

ADMISSIONS PROCEDURES

To apply to the Instrumentation & Controls Engineering Technology program, please submit the following documents to the MSTC Admissions Office:

1. Complete an MSTC application form and return it with the \$30 non-refundable application fee.
2. Complete the Accuplacer or ACT test. Minimum scores required:
 - Reading–Accuplacer score of 55
 - Sentence Skills–Accuplacer score of 60
 - Math–Accuplacer score of 65
 - Act equivalents for above scores are acceptable.

If a student does not meet the required test scores, they may retest or complete an identified structured course(s) in the Academic Support Center.

- Written Communication, courses in mathematics and some science courses have placement requirements. Please refer to the course description section in the back of the catalog, listed under General Education, for course specific information.
3. Submit an official copy of all academic transcripts, including high school, college or university and HSED/GED.

Mid-State Technical College
Admissions
500 32nd Street North
Wisconsin Rapids, WI 54494

PROGRAM COURSE DESCRIPTION

10462114 // 3 credits Metals & Machining

A two-part class which introduces the basics of metal science and machine shop practice. Metallurgical concepts of steel and iron production, properties of metals, testing of metals, carbon and its role, heat-treating, steel designations, and cast iron and non-ferrous metals are introduced. Students will participate in lab exercises examining the properties of metal, an introduction to machine shop practices of safety, measurement, and machining through the use of hand tools, drilling machines, saws and engine lathes. Students will be introduced to those concepts by both classroom presentation and hands-on shop experiences.

10462116 // 3 credits Metal Fabrication

An introduction to structural steel and plate fabrication, sheet metal fabrication and basic electric arc and oxyacetylene welding. Fabrication techniques, metal selection, layout, cutting, bending, drilling, threading, and joining will be presented. Information will be presented to the student followed by lab activities to provide a hands-on experience. The emphasis will be placed on developing an understanding of the tools, techniques, safe work habits, and the application of metal fabrication skills.

10605100 // 4 credits Process Measurements I

Reviews basic principles and calibration standards and practices developed in Instrument Mechanics. Common sensing devices and components employed for the measurement of pressure, temperature, flow, level and their related phenomena are studied.
Prerequisite: Instrument Mechanics 10605102 Grade "C" or better

10605102 // 3 credits Instrument Mechanics

An introductory course into instrumentation emphasizing a functional and mathematical approach to the use and study of various pneumatic instruments and principles. Identifies the duties and functions of instruments and their components. Calculations of springs, force balance, moment balance, and an introduction to pressure measurement and controllers.
Corequisite: Intermediate Algebra w/ Apps 10804118

10605104 // 3 credits Process Measurements II

This course covers analog and digital electronic transmitters and controllers, pulp and papermaking, pH, conductivity, ORP and concludes with a study of basic nuclear theory.
Prerequisites: Process Measurements I 10605100; Instrument Mechanics 10605102

10605105 // 3 credits Electrical Circuits I

An introduction to AC/DC electricity and the physical laws that apply to electronic circuits. Direct Current (DC) covers basic definitions of voltage, current, and resistance and analysis of series and parallel resistive circuits. Alternating Current (AC) includes an introduction to AC generation, capacitors, inductors, and transformers and their applications in electronic circuits. Approximately 50% of the course is spent in the laboratory applying the principles and theory presented in the classroom.
Corequisite: Intermediate Algebra w/ Apps 10804118

CURRICULUM

Term		(18 credits)
10605102	Instrument Mechanics	3
10605105	Electrical Circuits I	3
10623106	Intro to AutoCAD	2
10801195	Written Communication	3
10804118	Intermediate Algebra with Applications	4
10809198	Intro to Psychology	3

Term		(17 credits)
10462114	Metals & Machining -or-	
10462116	Metal Fabrication	3
10605110	Electrical Circuits II	3
10605117	Programmable Logic Controllers-Beginning	3
10623100	Problem Solving & Critical Thinking	1
10804196	Trigonometry with Applications	3
10806154	General Physics 1	4

Term		(16 credits)
10605100	Process Measurements I	4
10605115	Basic Electronics	3
10605118	Programmable Logic Controllers-Advanced	3
10801199	Employment Strategies	3
10804195	College Algebra with Applications	3

Term		(17 credits)
10605104	Process Measurements II	3
10605116	Instrumentation Electronics	4
10605171	Process Control	4
10801196	Oral/Interpersonal Communication -or-	
10801198	Speech	3
10809143	Microeconomics -or-	
10809144	Macroeconomics	3

Total Credits 68

Please Note:

- The Instrumentation & Controls Engineering Technology program has an August start date. We advise you to meet with an academic advisor or counselor to successfully plan your academic schedule.
- This curriculum sequence is only for student planning. Actual student schedules will vary depending on course availability.
- Degree completion time may vary based on student scheduling and course availability.
- For General Education course descriptions (800 level), see section marked under Course Descriptions.

10605110 // 3 credits

Electrical Circuits II

This course continues the study of AC/DC circuits started in Electrical Circuits I. Advanced DC circuit analysis techniques such as Thevenin's Theorem and Node analysis are introduced. AC circuit analysis includes discussion on voltage and power theorems used in the analysis of circuits consisting of both resistance and reactance. The complex plane and construction of phase diagrams are also discussed. The course concludes with an introduction to electronic filter circuits used in transmission and communication equipment. Approximately 50% of the course is spent in the laboratory, applying the principles and theory presented in the classroom.

Prerequisite: Electrical Circuits I 10605105 grade "C" or better; Corequisite: Trigonometry w/Apps 10804196

10605115 // 3 credits

Basic Electronics

Presents semi-conductor principles with emphasis on practical applications. After reviewing diode and transistor characteristics, bias stabilizing techniques are studied followed by an introduction to transistor amplifiers.

Corequisite: Electrical Circuits II 10605110

10605116 // 4 credits

Instrumentation Electronics

A basic course in industrial electronics involving devices and circuits that relate to the field of instrumentation. Includes a basic review of electronic and electrical fundamentals. Additional topics include power supplies, operational amplifiers, servo mechanisms, relay ladder logic, PLC's, motor control devices, variable frequency drive, single and 3 phase, 110 volt, 220 volt and 480 volt generation and usage.

Prerequisite: Basic Electronics 10605115 Grade "C" or better

10605117 // 3 credits

Programmable Logic Controllers-Beginning

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

10605118 // 3 credits

Programmable Logic Controllers-Advanced

This lab-intensive course is a continuation of the beginning PLC course designed to build advanced PLC skills. Activities in advanced programming techniques, motor control and operator interfaces may be included. This course may be offered for 1-3 credits. Check with the course instructor for specific competencies to be covered each semester.

Prerequisite: Programmable Logic Controllers-Beginning 10605117 or approval of course instructor

10605171 // 4 credits

Process Control

Introduces the concept of automatic process control on the instrument technician level. Reviews principles of force/moment balance and feedback concepts. Studies two position control, feedback/feedforward control, and process characteristics related to process gain, dead time, time constants, and process capacity. Studies controller functions and effects such as proportional, integral and derivative and how different combinations of each cause controller outputs and inputs to respond in open and closed loops. Practices digital controller configuration and loop tuning for level, pressure, flow, and temperature.

Prerequisites: Instrument Mechanics 10605102; Process Measurements I 10605100

10623100 // 1 credit

Problem Solving & Critical Thinking

Introductory course in problem setup, organization, and solution. Identification of given and unknown values, equation setup, unit conversions and use of significant figures. Introduction to physical science; working with units of force, area, volume, time, and distance in metric and imperial systems. This course is designed to help you be successful in technical and engineering classes and should be taken during your first semester of enrollment.

10623106 // 2 credits

Intro to AutoCAD

This is an introductory course in computer aided drafting (CAD) using AutoCAD software. It will provide foundation skills in using CAD software to create and print two dimensional technical drawings. This course is available to students in any program. Computer skills and prior knowledge of drawing/drafting techniques is recommended.