

Instrumentation

Associate in Applied Science Degree (AAS)

Overview

An indispensable part of technology is the measurement and control of 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 will teach 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 program is offered at the Wisconsin Rapids campus.



Career Options

Apprenticeship Programs: Instrumentation, Electrician, Pipefitter
Field Service Representative
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
Planning and Scheduling Coordinator
Plant Maintenance Supervisor
Potential advancement generally requires further education.

Admissions Procedures

To apply to the Instrumentation program, please submit the following to MSTC Student Affairs Admissions Office:

1. WTCS application form and \$30 non-refundable application fee
2. Completed Accuplacer test. (Other test scores may be acceptable alternatives.) Entrance exam requirements for the Instrumentation program are:
 - Reading–Accuplacer score of 55 or equivalent
 - Language–Accuplacer score of 60 or equivalent
 - Math–Accuplacer score of 34 or equivalent

If a student does not meet the required scores in these academic areas, they may remediate and retest or complete an identified structured remediation course(s) in the Academic Support Center. Please see course descriptions for specific math requirements.

3. High school transcript or GED/HSED scores

Mid-State Technical College
Admissions
500 32nd Street North
Wisconsin Rapids, WI 54494
mstc.edu
888.575.MSTC

Program Course Descriptions

10462114 Metals & Machining 3 credits

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 and 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 Metal Fabrication 3 credits

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 Process Measurements I 4 credits

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

Program Outcomes

Employers will expect you, as an Instrumentation 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

10605102
Instrument Mechanics 3 credits

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: Technical Math 1A 10804113

10605104
Process Measurements II 3 credits

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
Electrical Circuits I 3 credits

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: College Tech Math 1A 10804113

10605110
Electrical Circuits II 3 credits

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: College Tech Math 1B 10804114

10605115
Basic Electronics 3 credits

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
Instrumentation Electronics 4 credits

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
Programmable Logic Controllers-Beginning 3 credits

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
Programmable Logic Controllers-Advanced 3 credits

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
Process Control 4 credits

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

10606105
Intro to AutoCAD 2 credits

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. Prior knowledge of drafting techniques is recommended.

Curriculum

First Semester (17 Credits)

10605102	Instrument Mechanics	3
10605105	Electrical Circuits I	3
10606105	Intro to AutoCAD	2
10801195	Written Communication	3
10804113	College Technical Mathematics 1A	3
10809198	Intro to Psychology	3

Second Semester (17 Credits)

10462114	Metals & Machining	3
	or	
10462116	Metal Fabrication	3
10605110	Electrical Circuits II	3
10605117	Programmable Logic Controllers-Beginning	3
10801196	Oral/Interpersonal Communication	3
	or	
10801198	Speech	3
10804114	College Technical Mathematics 1B	2
10806143	College Physics 1	3

Third Semester (17 Credits)

10605100	Process Measurements I	4
10605115	Basic Electronics	3
10605118	Programmable Logic Controllers-Advanced	3
10801199	Employment Strategies	3
10804116	College Technical Mathematics 2	4

Fourth Semester (17 Credits)

10605104	Process Measurements II	3
10605116	Instrumentation Electronics	4
10605171	Process Control	4
10806144	College Physics 2	3
10809143	Microeconomics	3
	or	
10809144	Macroeconomics	3

Total Credits 68

Please Note:

- The Instrumentation program has an August preferred starting date. However, we advise you to meet with a counselor to successfully plan your academic schedule.
- For General Education course descriptions (800 level courses), see section marked under Course Descriptions.