South Central College

# MECA 1250 Mechatronics Systems Operations I

## Course Outcome Summary

### Course Information

**Description** This course will provide the student with the principles of programmable logic controllers (PLC) hardware and fundamental sequence control systems. The student will gain essential knowledge necessary to create and edit basic PLC programs that will include timers, counters and special function blocks. As well as gaining an understanding of interfacing discrete input-output (I/O). The student will also perform fundamental PLC troubleshooting procedures. Technical writing skills and safety procedures will be implemented throughout the course. (Prerequisites MECA 1122 ELECTRICITY - DEVICES AND CIRCUITS I and MECA 1125 ELECTRICITY - DEVICES AND CIRCUITS II or MECA 1120 ELECTRICITY - DEVICES AND CIRCUITS)

**Total Credits** 3

**Total Hours** 64

**Types of Instruction**

| Instruction Type | Credits/Hours |
|---|---|
| Lecture | |
| Lab | |

**Pre/Corequisites**

MECA 1122 ELECTRICITY - DEVICES AND CIRCUITS I<br />

MECA 1125 ELECTRICITY - DEVICES AND CIRCUITS II

or MECA 1120 ELECTRICITY - DEVICES AND CIRCUITS

### Institutional Core Competencies

Communication - Students will be able to demonstrate appropriate and effective interactions with others to achieve their personal, academic, and professional objectives.

Critical and Creative Thinking - Students will be able to demonstrate purposeful thinking with the goal of using a creative process for developing and building upon ideas and/or the goal of using a critical process for the analyzing and evaluating of ideas.

### Course Competencies

## 1. Describe Programmable Logic Controllers

**Learning Objectives**
Discuss PLC Background
Recognize Principles of Operation
Analyze PLCs Versus Other Types of Controls
Identify Typical Areas of PLC Applications
Describe Benefits of Using PLCs

## 2. Define Number Systems and Codes

**Learning Objectives**
Explain Number System
Apply Number Conversions
Identify One's and Two's Complement
Interpret Binary Codes

## 3. Apply Logical Concepts

**Learning Objectives**
Explain the Binary Concept
Identify Logic Functions
Demonstrate the Principles of Boolean Algebra and Logic
Use PLC Circuits and Logic Contact Symbology

## 4. Explain Processors, The Power Supply System, and Programming Devices

**Learning Objectives**
Explain Processor Architecture
Characterize Processor Scan
Identify Error Checking and Diagnostics
Describe System Power Supply
Identify Programming Devices

## 5. Clarify Memory System and Input/Output Interaction

**Learning Objectives**
Identify Memory Types
Describe Memory Structure and Capacity
Identify Memory Organization and I/O Interaction
Translate Memory Mapping and I/O Addressing
Plan Memory Considerations

## 6. Identify Discrete Input/Output System

**Learning Objectives**
Complete I/O Table Mapping
Configure I/O Rack Enclosure
Evaluate Discrete Inputs
Evaluate Discrete Outputs
Interpret I/O Specifications

## 7. Explain Input and Output Voltage and Current Requirements

**Learning Objectives**
Identify Open Collector Circuit
Explain Current Sourcing
Explain Current Sinking
Read Schematic Circuits

## 8. Identify PLC System Selection Guidelines

**Learning Objectives**
Identify PLC size and Scope of Applications
Define Process Control System

Calculate Noise, Heat and Voltage Requirements
Document System Considerations
Communicate PLC Start-up and Checking Procedures

**9. Interpret Programming Languages**

**Learning Objectives**
Identify Types of PLC Instructions
Incorporate Ladder Diagram Format
Utilize Basic Relay Instructions
Utilize Timer and Counter Instructions
Review Non-Ladder Programming Languages
Apply Data Transfer Instructions

**10. Implement Programming Language to the PLC**

**Learning Objectives**
Identify Control Definition
Create Control Strategy
Implement Control Strategy Guidelines
Develop Short Programs

**11. Describe PLC System Documentation**

**Learning Objectives**
Identify Steps of Documentation
Apply Engineering-Level Record Keeping
Debug PLC Programs
Deliver Presentation

**SCC Accessibility Statement**

South Central College strives to make all learning experiences as accessible as possible. If you have a disability and need accommodations for access to this class, contact the Academic Support Center to request and discuss accommodations. North Mankato: Room B-132, (507) 389-7222; Faribault: Room A-116, (507) 332-7222.

Additional information and forms can be found at: www.southcentral.edu/disability

This material can be made available in alternative formats by contacting the Academic Support Center at 507-389-7222.