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

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<tr>
<th>Instruction Type</th>
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<tr>
<td>Lecture</td>
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<td>Lab</td>
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Pre/Corequisites

MECA 1122  ELECTRICITY - DEVICES AND CIRCUITS I
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

   - 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](http://www.southcentral.edu/disability)

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