MOTOR CONTROL WIRING IN CONSTRUCTION
Course Syllabus

Course Number: CNST-0207
OCAS Code: None
Course Length: 30 Hours
Career Cluster: Architecture and Construction
Career Pathway: Construction
Career Major(s): Commercial Electrician’s Assistant

Pre-requisite(s):
This course covers relays, motor starters, overload sizing, ladder diagrams, and design of complex systems used to control motors in various commercial and industrial applications.

Textbooks:
Amatrol Electrical Training Systems

Course Objectives:

A. Work with Contactors and Relays.
1. Describe the operating principles of contactors and relays.
2. Select contactors and relays for use in specific electrical systems.
3. Explain how mechanical contactors operate.
4. Explain how solid-state contactors operate.
5. Install contactors and relays according to the NEC® requirements.
6. Select and install contactors and relays for lighting control.
7. Read wiring diagrams involving contactors and relays.
8. Describe how overload relays operate.
9. Connect a simple control circuit.
10. Test control circuits.

B. Install and Operate Circuits Using Control Logic.
1. Describe the function of relay control logic circuits.
2. List the six elements of control logic.
3. Describe the function of AND logic and give an application.
4. Connect and operate an AND control logic circuit.
5. Describe the function of OR logic and give an application.
6. Connect and operate an OR control logic circuit.
7. Describe the function of NOT logic and give an application.
8. Connect and operate a NOT control logic circuit.
9. Describe the function of NOR logic and give an application.
10. Connect and operate a NOR logic control circuit.
11. Describe the function of NAND logic and give an application.
12. Connect and operate a NAND logic control circuit.
13. Describe the function of a MEMORY logic and give an application.
14. Describe the function of a ladder diagram.
15. Identify the four basic components of a ladder diagram.
16. Describe the function of the four components of a ladder diagram.
17. Explain five rules of drawing a ladder diagram.¹
18. Read and interpret the operation of a circuit given a ladder diagram.¹
19. Connect and operate a logic circuit given a ladder diagram.¹
20. Design and ladder diagram using one or more logic elements.¹
21. Describe the function of a solenoid operated fluid power valve.¹
22. Describe the function of a power diagram.¹
23. Connect and operate a circuit using a solenoid valve given a ladder diagram.¹
24. Design a control circuit in a ladder diagram format to operate a solenoid valve.¹

C. Install and Operate Circuits Using Sequencing Control.
1. Describe the function of an electromechanical relay and give an application.
2. Describe the operation of an electromechanical relay and give its ladder diagram symbol.
3. Read and interpret a basic ladder diagram with detached symbology.
4. Describe the operation of a relay used to energize a fluid power valve solenoid.
5. Connect and operate a relay to energize a fluid power solenoid.
6. Describe the operation of a relay performing control logic.
7. Design a logic circuit that uses a relay.
8. Describe the function and operation of a seal-in circuit.
9. Connect and operate a relay to perform a seal-in function.
10. Describe the function of a limit switch and give an application.
11. Describe the operation of a limit switch and give its schematic symbol.
12. Describe the operation of a limit switch in an event sequencing circuit.
13. Connect and operate an event sequencing circuit given a ladder diagram.
14. Design a logic circuit that uses a limit switch to sequence an event.
15. Describe the operation of a limit switch in a single-cycle cylinder reciprocation.
17. Describe the operation of a limit switch in an event de-energizing circuit.
18. Describe the operation of a limit switch in a continuous-cycle reciprocation circuit.
19. Connect and operate continuous-cycle cylinder reciprocation circuit.
20. Describe the operation of a safety interlock circuit.
21. Design a continuous-cycle cylinder reciprocation circuit with a safety interlock.

D. Install, Connect and Operate Timers and Relay Systems
1. Connect and operate a control circuit with a timer relay.
2. Design a time-driven traffic light circuit.
3. Connect and operate a control circuit to perform an unloaded start of a motor.
4. Design a control circuit to perform a cylinder dwell.
5. Design a control circuit to perform time-driven sequencing.
6. Design a dual cylinder sequence circuit using one limit switch.
7. Connect and operate a dual-cylinder control circuit using two limit switches.
8. Design a continuous-cycle multiple-cylinder circuit.
9. Connect and operate a circuit having both automatic and manual modes of operation.
10. Connect and operate a control circuit to simulate a two-pushbutton jog circuit.
11. Connect and operate a two-pushbutton jog circuit that will jog two cylinders independently.
12. Design a continuous cycle, synchronized cylinder circuit with a manual mode.

E. Install Various Motor Control Circuits Using Industrial Equipment and Materials to Perform Motor Operations.
1. Draw various motor control circuits to perform motor operations.
2. Connect and operate the following motor control circuits.
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a. One Start Stop
b. Two Start Stop
c. Three Start Stop
d. Jog Control
e. Forward and Reversing Motor Controller

3. Install motors to operate from motor controllers.
4. Test and troubleshoot various motor control circuits.

1 Amatrol objective
2 NCCER objective
All unmarked objectives are TTC instructor developed.

Teaching Methods: The class will primarily be taught by the lecture and demonstration method and supported by various media materials to address various learning styles. There will be question and answer sessions over material covered in lecture and media presentations. Supervised lab time is provided for students to complete required projects.

Grading Procedures: 1. Students are graded on theory and shop practice and performance.
2. Each course must be passed with seventy (70%) percent or better.
3. Grading scale: A=90-100%, B=80-89%, C=70-79%, D=60-69%, F=50-59%.

Description of Classroom, Laboratories, and Equipment: Tulsa Technology Center campuses are owned and operated by Tulsa Technology Center School District No. 18. All programs provide students the opportunity to work with professionally certified instructors in modern, well-equipped facilities.

Available Certifications/College Credit: The student may be eligible to take state, national or industry exam after completion of the program. College credit may be issued from Oklahoma State University-Okmulgee or Tulsa Community College. See program counselor for additional information.

College Credit Eligibility: The student must maintain a grade point average of 2.0 or better.