

Division: Technical

Subject Code: ELME

Course: 107

Course title: Electrical Systems I (w/Lab)

Thaddeus Stevens College of Technology

Master Course Form

Catalog description: : This course covers the principles and application of alternating (AC) and direct (DC) current electricity, industrial sequential control and electrical controls construction as found in a typical manufacturing environment. Topics include AC and DC circuit analysis and measurement in resistive, capacitive and inductive circuits; AC fixed speed motor control; control transformers, relays, timers, and counters; mechanical, pneumatic and hydraulic input and output devices; sequencing and logic functions; introduction to component and systems troubleshooting; electrical wiring practices; conduit and raceways; and requirements for conductors, disconnects and raceways as specified by the National Electric Code (NEC). All course material is supplemented with practical hands-on exposure to the items described.

Digital Description:

- Credit Hours: 4
- Lecture Hours: 3
- Lab Hours: 3

Prerequisites:

- None

Corequisites:

- MATH 131 – Intermediate Algebra
or
MATH 201 – Pre-Calculus

Course Objectives:

Upon successful completion of the course, the student will be able to:

1. Describe current, voltage, and power
2. Identify the three basic Ohm's law formulae.
3. Identify the three basic power law formulae.
4. Demonstrate an understanding of Series and Parallel circuits.
5. Calculate resistive, inductive and capacitive circuits.
6. Describe basic motor control circuits.
7. Define the characteristics of AC and DC motors.
8. Explain fundamental concepts of transformer theory.

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Learning Outcomes:

As a consequences of the classroom and lab experiences, the student should be able to:

1. Describe basic safety rules for working with electrical equipment under 600 volts
2. Apply basic safety rules for working with electrical equipment under 600 volts
3. State Ohm's and Kirchoff's laws
4. Apply Ohm's and Kirchoff's laws to calculate and measure voltage and current in series, parallel and combination resistive circuits and in basic capacitive and inductive circuits
5. Identify schematic symbols for power supplies, switches (NO and NC), resistors, capacitors, inductors, motors, transformers, buzzers, solenoids, lights, fuses, circuit breakers, and rheostats
6. Describe the operation and function for power supplies, switches (NO and NC), resistors, capacitors, inductors, motors, transformers, buzzers, solenoids, lights, fuses, circuit breakers, and rheostats
7. Connect and test circuits composed of power supplies, switches (NO and NC), resistors, capacitors, inductors, motors, transformers, buzzers, solenoids, lights, fuses, circuit breakers, and rheostats
8. Identify schematic symbols for 3 phase motors; manual, magnetic and reversing motor starters; overloads; fuses; and basic Hand-Off-Auto and Forward-Reverse-Jog motor control circuits
9. Describe the operation and function for 3 phase motors; manual, magnetic and reversing motor starters; overloads; fuses; and basic Hand-Off-Auto and Forward-Reverse-Jog motor control circuits
10. Interpret schematic symbols for typical input and output devices that would be used for motor, electro-pneumatic, and electro-hydraulic control operations
11. Describe the operation and function for typical input and output devices that would be used for motor, electro-pneumatic, and electro-hydraulic control operations
12. Combine motor, electro-pneumatic, and electro-hydraulic control components with relays, timers and counters to create logic and sequential control circuits and develop the elementary ladder diagram
13. Describe methods of troubleshooting and testing electrical components and systems.
14. Demonstrate methods of troubleshooting and testing electrical components and systems
15. Describe methods used for installing electrical outlets, switches and lighting appropriate to residential or light commercial construction
16. Describe methods used for sizing EMT and IMT conduit systems
17. Demonstrate methods used for sizing EMT and IMT conduit systems
18. Demonstrate methods used to design and install a wiring system in conduit in compliance with NEC requirements
19. Describe methods of bundling, labeling, and terminating wires to construct an electrical control panel; wire electric motors; interconnect panels and motors; and to wire a complete machine
20. Demonstrate methods of bundling, labeling, and terminating wires to construct an electrical control panel; wire electric motors; interconnect panels and motors; and to wire a complete machine

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Planned Sequence of Learning Activities:

- AC/DC Electrical Systems
- Electric Control Circuits
- Electric Motor Control
- Electronic Sensors
- Industrial Electrical Wiring
- Industrial Power Distribution

Required Text:

Industrial Maintenance ISBN-13 9781133131199

Ugly's Electrical references ISBN-13: 9781449690779

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