

SOUTHEAST COMMUNITY COLLEGE
CONSTRUCTION, MANUFACTURING AND TECHNOLOGY DIVISION
Energy Generation Operations Technology Program
Revision Date: August 26, 2019

I. CATALOG DESCRIPTION

Course Number: ENER2100
Course Title: Motor Controls and Switchgear
Prerequisite(s): ENER 1210
Catalog Description: This course is a study of various types of motors, motor controls, loads, drive systems and related electrical switchgear commonly used in power generating plants as well as any fuels processing systems. Variable frequency controllers, contactors, protective relaying, overload protection, current transformers and other critical components are covered. Lab must be taken concurrently.
Credit Hours: 3
Class Hours: 38
Lab Hours: 23
Total Contact Hours: 61

II. COURSE OBJECTIVES: *Course will:*

- A. Reinforce electrical safety.
- B. Introduce students to DC and AC motor design and operation principles.
- C. Introduce students to motor control systems.
- D. Introduce students to National Electric Code requirements applicable to motors and motor control systems.
- E. Introduce students to motor control and ladder logic diagrams.

III. STUDENT LEARNING OUTCOMES AND GENERAL EDUCATION LEARNING OUTCOMES:

- A. Student Learning Outcomes: *Student will be able to:*
 - 1. Review Electrical Safety.
 - 2. Review the different types of Electrical Drawings & Drawing Symbols.
 - 3. Describe the different types of Power Distribution Systems & Transformers.
 - 4. Classify the different types of Electrical Switchgear.
 - 5. Demonstrate knowledge of the types of Motor Controllers used in the Power Generation.
 - 6. Identify the types of Motors and their associated Motor Controllers.
 - 7. Explain the use and purpose of Relays in Motor Controllers.
 - 8. Discuss the optional features associated Motor Controllers.
 - 9. Understand the basic operation of a PLC (Primary Logic Controller) Circuit.
 - 10. Operate Motor Controllers Locally and Remotely.
 - 11. Operate Motor Controllers in Auto and Manually.
 - 12. Operate Motor Controllers in Emergency/Override Conditions.
- B. General Education Learning Outcomes (GELOs)
 - 1. GELO #3: Critical Thinking & Problem Solving
 - Outcome 5: Acquire and integrate knowledge and construct relationships across disciplines.

IV. CONTENT/TOPICAL OUTLINE

- A. Electrical Safety & Theory Review

1. Electrical Shock
2. PPE (Personal Protective Equipment)
3. Electrical Drawings & Symbols
- B. Distribution & Switchgear
 1. Transformer Theory
 2. Transmission & Distribution
 3. Switchgear & Panels
 4. Motor Control Centers
- C. Motors & Motor Controller Basics
 1. Motor Principles & Types
 2. Basic Types of Controllers & Switches
- D. Motor Contactors & Starter Functions
 1. Types & Operation
 2. Methods & Functions
 3. Safety Basis
- E. Relays & Their Functionality
 1. Types & Operation
 2. Methods & functions
 3. Safety Basis
- F. Complete Motor Control Circuits
 1. Complete Operational Process & Function
- G. Unique Applications – Speed Control & PLC's
 1. VFD's (Variable Freq. Drives)
 2. Challenges
 3. PLC's (Prog. Logic Controllers)

V. INSTRUCTIONAL MATERIALS

- A. Required Text(s):
 1. Petruzella, Frank D.; *Electric Motors & Control Systems*, McGraw Hill
 2. Petruzella, Frank D.; *Electric Motors & Control Systems (Activities Manual)*, McGraw Hill
 3. Herman, Stephan L., *Delmar's Standard Textbook of Electricity*, Cengage Learning
 4. Howlett II, H.C., *The Industrial Operators Handbook*
- B. Other Resources: Instructor provided.
- C. Outside Reading/Research Required: As assigned.
- D. Supplies: As assigned.

VI. METHODS OF PRESENTATION/INSTRUCTION

- A. Methods of presentation typically include a combination of the following:
 1. Traditional Class

VII. METHODS OF EVALUATION

- A. Methods of evaluation, although determined by the individual instructor, traditionally includes a combination of the following:
 1. Class participation
 2. Regular assignments
 3. Written exams and/or quizzes
 4. Performance and observational assessments

VIII. SPECIFIC COURSE REQUIREMENTS

- A. A minimum grade of 70% is required to receive credit for this course.
- B. **Cheating within the Manufacturing Division:** Any violation of academic integrity on assignments, quizzes, or tests will result in a grade of 0 on that assignment, quiz, or test. A second violation in any course after the initial infraction will result in a grade of F for that course. Any additional violations while in the program will result in a suspension from the program. For additional information, refer to the *Academic Integrity* pamphlet available from Student Services.
- C. **Credit by Examination:** Credit for the course CAN be earned through Credit by Examination.