MOTOR THEORY AND OPERATION IN CONSTRUCTION
Course Syllabus

Course Number: CNST-0776
OHLAP Credit: No
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 the theory of operation of AC and DC motors, their construction, selection of appropriate motors for specific applications, and feeder calculations.

Textbooks:
Amatrol Electrical Training Systems

Course Objectives:

A. Understand Motor Theory and Applications.
1. Define the following terms:2
2. Describe the various types of motor enclosures.2
3. Describe how the rated voltage of a motor differs from the system voltage.2
4. Describe the basic construction and components of a three-phase squirrel cage induction motor.2
5. Explain the relationships among speed, frequency, and the number of poles in a three-phase induction motor.2
6. Describe how torque is developed in an induction motor.2
7. Explain how and why torque varies with rotor reactance and slip.2
8. Define percent slip and speed regulation.2
9. Explain how the direction of a three-phase motor is reversed.2
10. Describe the component parts and operating characteristics of a three-phase wound-rotor induction motor.2
11. Describe the component parts and operating characteristics of a three-phase synchronous motor.2
12. Define torque, starting current, and armature reaction as they apply to DC motors.2
13. Explain how the direction of rotation of a DC motor is changed.2
14. Describe the design and characteristics of a DC shunt, series, and compound motor.2
15. Describe dual-voltage motors and their applications.2
16. Describe the methods for determining various motor connections.2
17. Describe general motor protection requirements as delineated in the NEC®.2

B. Install and Operate DC Series Motors.
1. Describe the function of an electric motor.1
2. List the three basic components of an electric motor and describe their functions.1
3. List advantages and disadvantages of driving a machine with an electric motor.1
4. List three categories of electric motors and give an advantage of each.  
5. List and describe five rules of safe dress around electric motors.  
6. List and describe nine basic rules of electric motor operation safety.  
7. List the five components of a DC motor and describe their function.  
8. Describe the operation of a DC motor.  
9. List three wiring configurations for a DC motor.  
10. Describe how a DC motor is wired for series operation.  
11. List an advantage and a disadvantage of a DC series motor.  
12. List three applications of a DC series motor.  
13. Connect and operate a DC series motor.  
14. Describe how to change the direction of rotation of a DC motor.  
15. Reverse the rotation of a DC series motor.  

C. Install and Operate Split-Phase Motors.  
1. Describe the waveform produced by alternating current.  
2. Define AC frequency and give its units of measurement.  
3. List and describe two methods of representing AC voltage.  
4. Convert between the effective value of AC voltage and the peak voltage.  
5. Describe the operation of multiphase AC electricity and explain how it is used.  
6. List the two categories of AC motors and give an advantage of each.  
7. List four types of single-phase AC motors.  
8. Describe the operation of a split-phase motor.  
9. List an advantage and a disadvantage of a split-phase motor.  
10. Connect and operate a split-phase motor.  
11. Describe how to calculate AC motor synchronous speed and explain its importance.  
12. Calculate AC motor synchronous speed given the frequency and the number of poles.  
13. Describe two methods used to determine the actual speed of an AC motor.  
14. List three applications of a split-phase AC motor.  
15. Measure and graph split-phase motor performance characteristics.  
16. Describe how to reverse the rotation direction on a single-phase AC motor.  
17. Reverse the rotation of a split-phase motor.  

D. Identify, Describe, Install, and Operate Three-Phase Induction Motors.  
1. List two categories of three-phase AC motors.  
2. List two types of induction motors.  
3. Describe the construction and operation of a squirrel-cage induction motor.  
4. List five advantages and a disadvantage of a three-phase induction motor.  
5. Connect and operate a three-phase induction motor.  
7. Measure and graph induction motor performance characteristics.  
8. List and describe the difference between the two three-phase configurations.  
9. Describe the wye configuration for a three-phase motor.  
10. Describe the delta configuration for a three-phase motor.  
11. Describe how to reverse the rotation direction of a three-phase induction motor.  
12. Reverse the rotation of a three-phase induction motor.  

1 Amatrol objective  
2 NCCER objective
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.