Miami Dade College

Course Description

EET2515C | Motors and Generators | 3.00 credits

This course is designed for students specializing in industrial equipment maintenance. Students learn how to analyze, troubleshoot, and repair rotating electric machinery with emphasis on industrial applications. Students learn terminology specific to motors, generators, and transformers; electromechanical device theory; circuits connecting electromechanical devices to voltage sources and loads; and how to apply mathematical analysis to determine quantitative circuit functioning in terms of voltage, current, and power. Prerequisite: EET 1025C. Corequisite: EET 1141C. A.S. degree credit only. Special fee. (2 hr. lecture; 2 hr. lab)

Course Competencies

Competency 1: The student will demonstrate an understanding of basic motor theory by:

1. Explaining the basic principles of motor operation.
2. Distinguishing between different types of motors, identifying their characteristics, and explaining their uses.
3. Defining basic terminology specific to motors and their operation.
4. Explaining the differences between AC and DC motors, their characteristics, and how they operate.
5. Listing types of AC and DC motors respectively.
6. Identifying the types of single phase motors and their operating characteristics.
7. Identifying the types of three phase motors and their operating characteristics.
8. Explaining the principles of single-phase and three-phase motors.
9. Solving problems using formulas specific to electromechanical device theory.
10. Identifying what factors to consider and explaining how to select the correct motor type for a given application according to their operating characteristics, and selecting the proper connections for the application involved.
11. Applying mathematical analysis to determine quantitative circuit functioning in terms of voltage, current, and power.
12. Calculating the synchronous speed of a motor.
13. Connecting motors for different voltages.
14. Reversing single-phase motor rotation.

Competency 2: The student will demonstrate an understanding of the circuits connecting electro-mechanical devices to voltage sources and loads by:

1. Identifying and describing the voltage and current sources and their interactions in electro-mechanical devices.
2. Explaining various practical ways to connect motors, generators, and transformers to voltage sources and loads.
3. Describing how to select electro- mechanical device circuits based on an identified application, and how to connect them to voltage sources and loads.

Competency 3: The student will demonstrate an understanding of the application of direct current (DC) motors and their components by:

1. Identifying the basic components of a DC motor, including a reverse contactor, tapped resistor, field rheostat, and a drive control system, and explaining their functions in motor operation.
2. Explaining specific concepts of motor operation and how each of these factors affects motor operation: flux interaction commutation the effect of multiple windings armature reaction, compensation and CEMF (counter electro-motive force) armature current on the main flux field and how this results in motor action how armature reaction shifts the neutral plane, how it affects motor operation, and what measures will correct the reaction induced voltage.
3. Identifying the components of the brush assembly and explaining their functions.
4. Explaining the designs of a series wound, shunt wound, compound wound, and permanent magnet wound motors and how each of them works.
5. Explaining the function of reduced voltage starters and what determines the direction of the rotation of a motor.
6. Selecting motors according to their operating characteristics and application.

Competency 4: The student will demonstrate an understanding of alternating current (AC) motors and their Components by:

1. Identifying the components of AC motors.

2. Explaining the operation of AC motors, to include: Slip Induction motors Synchronous motors
3. Explaining the theory behind permanent magnet motors, three-phase motors, and induction motors.
4. Measuring winding insulation resistance.
5. Measuring winding resistance in AC motors.
6. Explaining why AC and DC motors draw large starting currents and how starting currents are limited.
7. Identifying the reason for limiting the number of motor starts in a given period.
8. Describing the differences between single- phase and three-phase motors and the applications of each type of motor.

Competency 5: The student will demonstrate an understanding of generator theory by:

1. Describing the general operating principles of generators.
2. Identifying the major components of AC generators.
3. Explaining the theory behind operation and key parameters.
4. Stating the requirements for generator action.
5. Describing how alternating current flow is generated.
6. Calculating the frequency output of an AC generator, given the speed of rotation and number of poles.
7. Listing the four losses found in an AC generator.
8. Identifying the effects of overheating insulation and bearings in motors and generators.
9. Listing the causes of excessive generator currents.
10. Listing the three conditions required for paralleling AC sources.
11. Explaining how to adjust generators connected in parallel for variations in shared load.
12. Describing the effect of changing the excitation of a generator connected to the grid.
13. Explaining the construction and operation of voltage regulators associated with generators.

Competency 6: The student will demonstrate the ability to troubleshoot and repair motors, generators, and component parts by:

1. Discussing common failure mechanisms and operating principles of motors and generators.
2. Identifying scheduled maintenance activities for motors and generators.
3. Identifying the preventive maintenance procedures and schedule for motors and generators.
4. Assembling and disassembling motors.
5. Connecting, testing and operating series, shunt, and compound generators.

Learning Outcomes:

- Use quantitative analytical skills to evaluate and process numerical data
- Formulate strategies to locate, evaluate, and apply information
- Use computer and emerging technologies effectively