Miami Dade College

Course Description

EET2547C | Transformers and Power Distribution | 3.00 credits

This course is designed for students specializing in industrial equipment maintenance. Students acquire an understanding of the components and devices used to distribute power, and how to protect major elements involved in power distribution. Students learn about the uses and maintenance of fuses, circuit breakers, enclosures, and relay coordination; how to protect against lightning and other abnormal conditions; and the protection of transformers, motors, and generators. Prerequisite: EET 2515C; Corequisite: EET 2527C.

Course Competencies

Competency 1: The student will demonstrate an understanding of electrical power distribution systems and operations by:

1. Identifying the components of electrical distribution systems
2. Discussing the role of generators and transformers in the electrical distribution process
3. Describing the factors and variables that affect power transmission

Competency 2: The student will demonstrate an understanding of components and systems used to protect the major elements of power distribution systems by:

1. Identifying protective devices used in power distribution systems and describing their respective functions
2. Describing the role of silicon control rectifiers (SCR) in protecting power distribution systems
3. Explaining how ground fault interrupters (GFI) function and protect power distribution systems
4. Discussing safety procedures for replacing protection devices

Competency 3: The student will demonstrate an understanding of transformers by:

1. Explaining the general theory, function, and operation of transformers
2. Identifying different types of transformers and discussing their similarities, differences, and respective applications
3. Explaining how single phase transformers work
4. Explaining how three-phase transformers work
5. Defining the following terms as they pertain to transformers: Mutual induction Turns ratio Impedance ratio Efficiency
6. Identifying and explaining the key specifications when selecting electrical transformers, including: maximum secondary voltage rating, maximum secondary current rating, maximum power rating, and output type
7. Describing the differences between a wye- connected and delta-connected transformer
8. Calculating voltage, current, and power of each of the following types of transformers when given the type of connection and turns ratios for the primary and secondary windings of a transformer: Delta – Delta Delta – Wye Wye – Delta Wye – Wye Open Delta
9. Describing how to de-energize and ground transformers
10. Explaining how and why combustible gases are sampled for in transformer operation
11. Explaining how winding resistance is tested

Competency 4: The student will demonstrate an understanding of Power Distribution by:

1. Explaining the following terms and concepts as they apply to Electrical Distribution Systems: Single-phase , two-phase, and three phase Diesel power Backup system/redundant power system Neutral grounding Protective relays Leading Power Factor Lagging Power Factor Overlapping protective zones
2. Describing the necessary components and wiring to provide a safe Electrical Distribution System when given the functional characteristics of an AC power source and the intended load
3. Discussing the reasons that three-phase power systems are used in industry
4. Defining the following terms relative to the power triangle (include symbols and units): Apparent power True power Reactive power Power factor
5. Calculating the following power components for an AC circuit when given the necessary values for voltage (E), resistance (R), reactance (X), impedance (Z), and/or current (I): True Power Apparent Power Reactive Power Power Factor

6. Explaining the differences between a wye- connected and delta-connected AC generator, including the advantages of each type
7. Stating the indications of an unbalanced load in a three-phase power system
8. Describing the application and use of inverters and battery chargers and how they operate

Competency 5: The student will demonstrate an understanding of protective devices by:

1. Listing the components within the electrical power distribution system that are used to protect power systems against lightning and other abnormal conditions
2. Describing the function and operation of various protective devices, including fuses, breaker circuits, reclosures, and relays
3. Troubleshooting component and system failures and identifying corrective measures
4. Selecting the correct type of relay based on voltage and current calculations
5. Selecting the correct type of fuse based on voltage and current calculations

Competency 6: The student will demonstrate how to troubleshoot and resolve equipment problems/failures using schematics by:

1. Interpreting circuit schematics to identify malfunctions
2. Calculating single phase and three phase voltages and currents
3. Connecting components using schematics

Competency 7: The student will demonstrate an understanding of the maintenance procedures for transformer protective devices by:

1. Discussing the causes of transformer failures
2. Explaining the function and operation of the transformer differential protection as a major protective element for transformer protective relays
3. Identifying transformer failures and describing corrective measures
4. Using schematics, computer simulations, and lab experiments to set, install, configure, and test transformer management relays
5. Identifying system problems caused by: Percent differential protection element Instantaneous differential protection Phase overcurrent Under/over frequency Over excitation

Learning Outcomes:

- Formulate strategies to locate, evaluate, and apply information
- Use computer and emerging technologies effectively