Dakota County Technical College

ELEC 2110: Electrical Apparatus Theory

A. COURSE DESCRIPTION

Credits: 3

Lecture Hours/Week: 3

Lab Hours/Week: *.*

OJT Hours/Week: *.*

Prerequisites: None

Corequisites: None

MnTC Goals: None

This course will consist of technical instruction and assessment of knowledge related to the installation and operation of electrical apparatus. Students will receive instruction on basic and complex control circuits, single-phase and three-phase motors and transformers, across-the-line motor controllers, reduced voltage starters, variable frequency drives, and power distribution and transfer apparatus.
In addition, students will study the National Electrical Code requirements governing the installation of electrical equipment and apparatus. The majority of the technical information will be used to support a parallel lab course.

B. COURSE EFFECTIVE DATES: 01/13/2003 - Present

C. OUTLINE OF MAJOR CONTENT AREAS

D. LEARNING OUTCOMES (General)

1. Explain the symptoms and effects of electrical shock.
2. Identify situations where accidents are most likely to occur.
3. Explain the recommended safe work practices for preventing accidental contact with energized equipment.
4. Identify commonly used electrical personal protective equipment (PPE).
5. Define lockout/tagout.
6. Interpret the information found on a Material Safety Data Sheet (MSDS).
7. Demonstrate how to isolate energy sources.
8. Describe the mission of OSHA related to construction sites.
9. Describe the application, and the rules for using step ladders, straight ladders, scaffolding, and common hand and power tools.
10. Detail the NEC requirements for ground-fault circuit interrupter (GFCI) relating to the use of temporary power.
11. Explain the operation of push button and selector switches.
12. Describe the information provided in a typical schematic diagram.
13. Draw schematic diagrams of simple control circuits.
14. List the principle uses of control relays and describe their operation.
15. Explain the difference between a relay, contractor and a motor starter.
16. Describe the operation of a single-phase motor and identify the parts of a single-phase, capacitor-start motor.
17. Draw schematic diagrams using relays to control pilot lights based on a narrative description.r
18. Identify the principles of overcurrent protection.
19. Describe the construction and operating of various types of fuses and inverse-time circuit breakers.
20. Diagram the connections for wye-connected and delta-connected motor windings for both the high and low voltage connections.
21. Calculate the minimum ampacity of motor branch-circuit conductors.
22. Describe the use of a voltmeter, ammeter, ohmmeter, and insulation tester to troubleshoot electric motors.
23. Describe typical causes of motor failures and preventative measures.
24. Describe troubleshooting procedures for various types of motors.
25. Calculate primary and secondary overcurrent protection.
26. Calculate the overcurrent protection for transformers
27. Calculate the values of voltage and current in a single-phase transformer.
28. Calculate voltage, current, and kVA ratings of transformers.
29. Define terminology associated with VFDs.
30. Define the basic terminology and abbreviations associated with blueprints and print reading.
31. Demonstrate organized and effective troubleshooting procedures while determining actual problems with power and control circuits and electrical apparatus.
32. Demonstrate organized and effective troubleshooting procedures while determining actual problems with single-phase and three-phase electric motors.
33. Describe control applications where proximity sensors and photoswitches are used rather than mechanically operated switches.
34. Describe the construction of switchboards and panelboards.
35. Describe the operation of a transformer.
36. Describe the operation of various types of reduced voltage controllers.
37. Describe the use of a voltmeter, ammeter, and ohmmeter to troubleshoot electrical systems.
38. Determine buck-boost transformers ratings based on specific applications.

38. Determine buck-boost transformers ratings based on specific applications.
39. Determine the expected and measured voltages at varying points on a control circuit.
40. Diagram the power and control circuits of a part winding starter.
41. Diagram the power circuit of a wye-delta starter.
42. Discuss the different types of transformers.
43. Discuss the power and control circuits of an autotransformer starter.
44. Draw a schematic diagram of a 3-wire motor control circuit with multiple start and stop buttons.
45. Draw control circuit schematic diagrams using various interlocking techniques.
46. Draw the high- and low-voltage connections of a transformer.
47. Draw the schematic diagram, connect and operate a jogging control circuit.
48. Explain different methods of controlling the output frequency of a VFD.
49. Explain grounding requirements of transformer secondaries.
50. Explain the NEC requirements of a qualified person and arc flash protection.
51. Explain the basic operation of a VFD.
52. Explain the basic operation of the common timing relays and describe the operation of timed contacts.
53. Explain the characteristics of wye- and delta-connected three-phase systems.
54. Explain the operation of a transformer, including voltage, current and turns ratios.
55. Explain the requirements for tightening terminations to a specific torque.
56. Identify the basic personal safety requirements associated with troubleshooting electrical equipment.
57. Interpret a schematic diagram of a control circuit of a motor control center unit.
58. Navigate a construction print to obtain specific information regarding the types and placement of apparatus and equipment.
59. Use manufacture¿s shop drawings to layout service entrance and feeder conduits for a switchboard installation.

E. Minnesota Transfer Curriculum Goal Area(s) and Competencies

None

F. LEARNER OUTCOMES ASSESSMENT

As noted on course syllabus

G. SPECIAL INFORMATION

None noted