

WESTERN IOWA TECH COMMUNITY COLLEGE

Course Syllabus

Electrical Technician – Level 4

Course Title: Electrical Technician – Level
Total Hours:76
Meeting time/ location :TBA
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COURSE DESCRIPTION AND PREREQUISITES/COREQUISITES:

The Electrical Maintenance Certificate combines the disciplines of Industrial Safety, Electrical Concepts, Blueprint Reading, Motor Controls, Industrial Wiring, and Programmable Logic Controllers. Each of the levels contains portions of each of these disciplines to present a holistic and competency driven approach to the mastering of the skills necessary for an Electrical Maintenance Technician. Each level is designed to be delivered in such a way that the student attends the levels in a sequential order to ensure a complete understanding of the material. This training can be transcribed into college credit. Test outs are available to ensure the students are prepared for each level prior to registering for the training.

COURSE OBJECTIVES

The course will provide information which should enable the student to:

1. Describe how to test an automatic input switch
2. Describe the operation of a float switch and give its schematic symbol
3. Describe the operation of a pump control circuit
4. Describe the operation of a pressure switch and give its schematic
5. Describe the functions of four types of automatic input devices and give an application of each
6. Describe the operation of a limit switch and give its schematic symbol
7. Describe the function of a sequence control circuit and give an application
8. Describe the operation of a sequence control
9. Describe the operation of a time-delay relay in time-driven sequencing
10. Describe the operation of an On-Delay timer relay and give its schematic
11. Describe the operation of a timer relay in an unloaded motor start circuit
12. Describe the operation of an Off-Delay timer relay and give its schematic symbol of each symbol
13. Describe the function of a time-delay relay and give an application
14. Describe the function of two types of timer relays and give an application
15. Describe how to test a timer relay
16. Describe how motor jogging is accomplished with a variable frequency AC drive
17. Describe the external control capabilities of a variable frequency AC drive
18. Describe the function and operation of two common types of variable speed AC drives
19. Describe the advantages and disadvantages of using an AC drive instead of a DC drive
20. Describe the advantages of starting a motor with an AC drive instead of line starting
21. Describe how frequency affects the speed on an AC induction motor
22. Describe the output of a variable frequency drive
23. Define reflected wave voltage and describe its effect on an AC induction motor
24. Describe three steps that can be taken to reduce the effects of reflected wave voltage
25. Describe how to program a variable speed AC drive for multiple speed selections
26. Explain how the Volts per Hertz ratio affects the torque capabilities of a motor
27. Describe how to program a variable frequency AC drive to drive a motor above its base
28. Define Volts per Hertz ratio
29. Describe how to program a variable speed AC drive to skip frequencies
30. Define ramping and explain its importance

31. Explain how ramping is accomplished using a variable frequency AC drive
32. Describe how a variable frequency AC drive can accelerate a motor past its rated speed
33. Describe S-curve acceleration and explain how it is used
34. Describe DC injection braking using a variable frequency AC drives and gives an
35. Describe how a variable frequency AC drive detects faults
36. Describe six common faults that can be detected by a variable frequency drive
37. Describe how to troubleshoot a circuit that includes a variable frequency AC drive
38. Describe how to program variable frequency AC drive to automatically clear a fault
39. Describe the operation of a countdown instruction
40. Describe the functions of two types of PLC counter instructions
41. Describe the operation of a count up instruction
42. Describe the function of the OTL and OTU instructions and give an application
43. Describe the operation of the OTL and OTU instructions
Describe the importance of housekeeping
44. Identify Floor Openings and Holes, and Wall Openings
45. Identify the hazards associated with stairways
46. Working from raised platforms and man lifts
47. Working from roofs
48. Working with ladders
49. Working with Personel Fall Arrest Systems
50. Recognize Fall Hazards
51. Planning for Emergencies
52. Preparing for Emergencies
53. Emergency Routes and Exits
54. Fire Protection
55. Fire Extinguishers
56. Local emergency planning committees
57. Machine guarding
58. Motorized equipment
59. Controlled access zones
60. Equipment positioning
61. Excavations

CONTENT OUTLINE:

1. LIMIT SWITCHES
2. PRESSURE SWITCHES
3. FLOAT SWITCHES
4. SEQUENCE CONTROL
5. ON-DELAY TIMERS
6. OFF-DELAY TIMERS
7. TROUBLESHOOTING
8. VARIABLE SPEED AC DRIVE BASICS
9. TWO AND THREE-WIRE MOTOR CONTROL
10. JOGGING CONTROL
11. BASIC SPEED CONTROL
12. ADVANCED SPEED CONTROL
13. TORQUE CONTROL
14. RAMPING
15. SPECIAL ACCELERATION METHODS
16. BRAKING
17. FAULT DESCRIPTIONS
18. TROUBLESHOOTING
19. CLEARING FAULTS
20. FAULT DETECTION
21. COUNT DOWN INSTRUCTION
22. COUNT UP INSTRUCTION
23. LATCH AND UNLATCH INSTRUCTIONS
24. INDUSTRIAL EQUIPMENT
25. FLUID POWER SYSTEMS

COMPETENCIES:

1. Connect and operate a limit switch
2. Design an overhead door motor control circuit
3. Connect and operate a float switch
4. Connect and operate a pump control circuit
5. Test an automatic input switch
6. Connect and operate a pressure switch
7. Design a pump control circuit that includes H-O-A operation
8. Connect and operate a sequence control circuit
9. Troubleshoot a sequence control circuit
10. Design a sequence control circuit
11. Design a motor control circuit to perform time-driven sequencing
12. Connect and operate an On-Delay timer circuit
13. Design a control circuit to perform an unloaded start of a motor
14. Connect and operate an Off-Delay timer circuit
15. Identify the basic components of a multi-function timer
16. Test a timer relay
17. Troubleshoot an On-Delay timer circuit
18. Troubleshoot an Off-Delay timer circuit
19. Determine faults based on the fault display of a variable frequency AC drive
20. Program a variable frequency AC drive to automatically reset a fault
21. Manually clear a fault on a variable frequency drive
22. Troubleshoot the parameter settings of a variable frequency AC drive
23. Troubleshoot a circuit that includes a variable frequency AC drive
24. Operate a motor using the program keypad of a variable frequency AC drive
25. Program, connect and operate a variable frequency AC drive for motor jogging
26. Program and connect a variable frequency AC drive for three-wire control
27. Operate a three-wire control circuit using a variable frequency AC drive
28. Program and operate a two-wire control circuit using a variable frequency drive
29. Output characteristics of a variable speed AC drive
30. Control motor speed using the keypad of a variable frequency AC drive
31. Connect and operate a circuit to control motor speed using a variable frequency AC drive
32. Program and operate a variable frequency AC drive using preset speeds
33. Program and operate a variable frequency AC drive to drive a motor above its base
34. Calculate Volts per Hertz ratio
35. Program and operate a variable frequency AC drive to provide low speed boost
36. Program and operate a variable frequency AC drive to provide DC injection braking to a motor
37. Program and operate a variable frequency AC drive to ramp an AC motor past its rated speed
38. Program and operate a variable frequency AC drive to provide S-curve acceleration
39. Program and operate a variable frequency AC drive to ramp a motor to its rated speed
40. Program and operate a variable frequency AC drive to ramp a motor to a stop
41. Enter and edit a PLC program that uses an up/down counter instruction
42. Design a PLC program that controls a conveyor queue station
43. Enter and edit a PLC program that uses a count up instruction
44. Design a PLC program to control the number of production cycles
45. Enter and edit a PLC program that uses the OTL and OTU instructions
46. Design a clamp and drill application which uses the latch/unlatch instructions

Course Grading Methods:

QUIZZES
 OBJECTIVE TESTS
 HANDS ON ASSESSMENTS
 FINAL TEST

REVIEWS OR QUIZZES NOT TURNED IN ON TIME WILL BE GIVEN "0" MISSED PRACTICAL TESTS AND FINAL EXAM CAN BE MADE UP ONLY BY THE APPROVAL OF THE INSTRUCTOR.

FINAL EXAM - TBA

ATTENDANCE:

Students are expected to attend all sessions of classes for which they are enrolled. Absences do not excuse the student from meeting the course requirements. The student must take the initiative in making up any missed work. Each instructor will provide policies concerning course attendance."

ACADEMIC HONESTY:

Students are responsible for their own learning and development. They have a responsibility to be an active learner by attending class, completing class and laboratory assignments, and preparing in advance of the scheduled class session. Students are expected to understand and maintain high standards of academic honesty. Examples of academic dishonesty include, but are not limited to, the following:

- Cheating
- Plagiarism
- Fabrication
- Dual Submission
- Facilitating Academic Dishonesty

COMPUTER CONDUCT:

College computer systems are provided by WITCC for use by students, faculty, and staff for the purpose of furthering the educational mission of the College. This includes course work, college-related educational endeavors, and business operations. Each user is expected to follow established computer conduct policies and not to interfere with or disrupt the orderly processes of WITCC resources. Users accept the responsibility for utilizing services in ways that are ethical, that demonstrate academic integrity and respect for others who share this resource. Users must follow all existing federal, state, and local laws as they relate to computer conduct.

AMERICANS WITH DISABILITIES ACT (A):

Persons with documented disabilities may request reasonable accommodations through Disability Services, located in the Admissions & Advising Center, A300, or at (712) 274-8733, Ext. 3216.

DISCRIMINATION:

Western Iowa Tech Community College does not discriminate on the basis of race, creed, color, gender, national origin, religion, age, disability, sexual orientation, gender identity, veteran status or any other protected basis as defined in Iowa or federal law as amended from time to time in its educational programs, activities, admission procedures or employment practices. Individuals who believe they have been discriminated against may file a complaint through the College's Grievance or Complaint Procedures. Complaint or Grievance Forms and Procedures may be obtained from the WITCC Human Resources Department, Dr. Robert H. Kiser Building, Room A242, (712) 274-6400, Ext. 1220.

SAFETY AND SECURITY:

WITCC has produced videos regarding safety features and procedures that can be taken by students, staff and faculty. These videos have been posted on the myWIT homepage under the "Safety" tab and may be viewed at any time. An Emergency Response Guide along with Tornado, Fire and Secure Your Area posters have been placed in each classroom and work space area which list specific precautions that should be taken. If you have any questions or concerns, please call the Safety/Security Supervisor at 712-274-8733, extension 3210. If you have an emergency situation at the Sioux City campus, call 1316 or 911 from any telephone on campus immediately. For the outlying campuses call 911 immediately.

As a comprehensive community college, our mission is to provide quality education and to economically enhance the communities we serve.
