

WESTERN IOWA TECH COMMUNITY COLLEGE

Course Syllabus

Electrical Technician Level 1

Course Title: Electrical Technician – Level 1
Total Hours: 48
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. Define electricity and give an application
2. Describe the two types of electrical current and give an application of each
3. Describe the function and operation of a circuit tester
4. Describe the function of the four basic components of an electrical circuit
5. Describe the operation of two types of power supplies and give their schematic symbols
6. Describe the function of an electrical schematic
7. Describe the operation of a manual switch
8. Describe the operation of N.O. and N.C. contacts and give their schematic symbols
9. Describe the function of three types of manual switch operators and give an application of each
10. Describe the operation of three types of manual switch operators and give their schematic symbols
11. Describe the function of two multimeters analog and digital
12. Define voltage and give its units of measurement
13. Describe the function of two types of voltmeters and give their schematic symbol
14. Describe how to use a voltmeter to measure voltage
15. Describe the function of five types of electrical output devices and give an application of each
16. Describe the operation of five types of electrical output devices and give their schematic symbols
17. Explain why time-delay fuses are used with motor starting circuits
18. Describe three important factors to consider with overcurrent protection devices
19. Describe the operation of three-phase power
20. Describe the two most common three-phase voltage systems
21. Explain the function of neutral
22. Describe the operation of grounded and ungrounded systems
23. Describe two devices used to disconnect power to a circuit
24. Explain the importance of the equipment ground connection
25. Describe the function of five common standards associated with electrical control
26. Describe ten basic rules of electrical safety
27. Describe the purpose of the lockout/tagout system used in industry
28. Describe five functions of motor control
29. Describe the four basic requirements of a typical motor installation
30. Define motor controller and motor starter
31. Describe the function of three types of overloads and give an application of each

32. Describe the operation of two types of thermal overloads
33. Define low-voltage protection and describe its importance
34. Describe how low-voltage protection is accomplished in a manual starter
35. Describe the functions of two categories of motor starters
36. Describe the functions of two types of manual starters
37. Describe the operation of a manual motor starter
38. Describe the operation of a magnetic overload
39. Describe how the turn's ratio determines the secondary voltage of a transformer
40. Describe the function of the four basic components of an electrical control circuit
41. Describe the function of an electrical schematic diagram
42. Describe the function of a control transformer
43. Describe the operation of a control transformer and give its schematic symbol
44. Describe how to test a transformer
45. Describe how to size a transformer
46. Describe the operation of a separate control circuit
47. Describe the operation of a transformer and give its schematic symbol
48. Define turns ratio and describe how it is calculated
49. Describe the function of a programmable logic controller and give an application
50. Describe the basic operation of a PLC
51. Describe the functions of the six basic components of PLC Activity 1 PLC component and trainer identification
52. Name three methods of entering a PLC program and give an advantage of each
53. List six advantages of a PLC
54. Explain why PLCs use ladder diagrams
55. Identify and describe the function of the parts of a SLC 500 discrete address
56. Describe the function and operation of input/output diagrams
57. Describe the operation of XIC and XIO input instructions
58. Describe the basic operation of PLC ladder logic
59. Describe the operation of an OTE instruction
60. Blueprint Lines, Abbreviations, Schedules, Divisions, Title Blocks, Revision Information, Conventions, Notes, Section View, and Detail Drawing
61. Blueprint Symbols, Building Column Numbers, Letters, Scales, Architect's Scale, Specifications, and CST Master Format
62. Blueprint Component Identification Industrial Equipment, Power Sources, Direct Current and Alternating Current, Disconnects and Overcurrent Protection Devices, Contacts, Control Switches, Relays und Timers, Contactors and Motor Starters, Resistors, Capacitors, Diodes, Thyristors, Transistors, Digital Logic Gates, Coils, Solenoids, Transformers, Motors, Lights, Alarms, und Meters, General Wiring
63. The OSHA act, Regulations, Worker Rights, General Duty Clause, Inspections, Consultation, Contact information, Complaint process
64. Know when personal protective devices are needed
65. Hierarchy of controls including engineering and work administrative controls
66. Recognize the different personal protective devices that are available
67. Wear and Maintain protective equipment
68. Determine the limitations of protective equipment
69. List how personal protective equipment protects you from on the job hazards

CONTENT OUTLINE:

1. MANUAL INPUT DEVICES
2. ELECTRICAL CIRCUIT COMPONENTS
3. FUNDAMENTALS OF ELECTRICITY
4. VOLTAGE MEASUREMENT
5. OUTPUT DEVICES
6. ELECTRICAL SAFETY
7. DISCONNECTS AND PROTECTIVE DEVICES
8. THREE-PHASE POWER
9. THREE-PHASE MOTORS
10. MANUAL MOTOR CONTROL
11. OVERLOAD PROTECTION

12. MANUAL MOTOR STARTER OPERATION
13. INTRODUCTION TO TRANSFORMERS
14. CONTROL TRANSFORMER APPLICATIONS IN MACHINE CONTROL
15. CONTROL TRANSFORMER OPERATION
16. PLC OPERATIONS
17. PLC ORIENTATION
18. PLC PROGRAMMING LANGUAGES
19. NUMBERING SYSTEMS
20. PRINTREADING FUNDAMENTALS
21. INDUSTRIAL ELECTRICAL AND ELECTRONIC SYMBOLS

COMPETENCIES:

At the conclusion of the course the student will be able to:

1. Use an AC tester to check a wall outlet for electricity
2. Connect and operate a power supply
3. Switch operation guide
4. Use a DMM to measure the voltage of a point referenced to ground
5. Use an analog voltmeter to measure the voltage at a point referenced to ground
6. Connect and operate a circuit using three types of manual switches
7. Use a digital multimeter to check the condition of a fuse
8. Use a voltmeter to verify supply voltage
9. Perform a lockout/tagout
10. System familiarization
11. Start and stop a motor using a manual starter
12. Connect and operate a simple motor control circuit
13. Set the trip level of a bimetallic overload
14. Select the correct heaters for a NEMA overload
15. Calculate the turns ratio of a transformer
16. Calculate the secondary voltage of a transformer
17. Size a control transformer
18. Test a control transformer
19. Connect and operate a control transformer
20. Stop a PLC processor file using PLC programming software
21. Run a PLC processor file using PLC programming software
22. Monitor a PLC processor file using PLC programming software
23. Download a PLC processor file using PLC programming software
24. Open a processor file using PLC software
25. Operation of Basic PLC Logic Elements
26. Operation of Input and Output instructions
27. Operation of PLC Inputs and Outputs
28. Blueprint - Selecting Electrical Hardware
29. Installing an Automatic Lubricator

EVALUATION/GRADING CRITERIA:

QUIZZES

OBJECTIVE TESTS

HANDS ON ASSESMENTS

FINAL TEST

NOTE: REVIEWS AND QUIZZES WILL NOT BE ACCEPTED LATE AFTER THE INDIVIDUALLY ASSIGNED DATE !!!! 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.

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.