**BARTON COMMUNITY COLLEGE**

**COURSE SYLLABUS**

1. **GENERAL COURSE INFORMATION**

Course Number: NATG 1100

Course Title: DC Circuit Fundamentals

Credit Hours: 3

Prerequisites: MATH 1806 Technical Math

Division/Discipline: Workforce Training and Community Education/Natural Gas Transmission and Distribution Technician

Course Description: The course is designed to acquaint students with the fundamentals of direct current (DC); circuits, the relationship between voltage, current, resistance, and power, the application of Ohm’s and Kirchhoff’s laws.

# **INSTRUCTOR INFORMATION**

# **COLLEGE POLICIES**

Students and faculty of Barton Community College constitute a special community engaged in the process of education. The College assumes that its students and faculty will demonstrate a code of personal honor that is based upon courtesy, integrity, common sense, and respect for others both within and outside the classroom.

Plagiarism on any academic endeavors at Barton Community College will not be tolerated. The student is responsible for learning the rules of, and avoiding instances of, intentional or unintentional plagiarism. Information about academic integrity is located in the Student Handbook.

The College reserves the right to suspend a student for conduct that is determined to be detrimental to the College educational endeavors as outlined in the College Catalog, Student Handbook, and College Policy & Procedure Manual. (Most up-to-date documents are available on the College webpage.)

Any student seeking an accommodation under the provisions of the Americans with Disability Act (ADA) is to notify Student Support Services via email at disabilityservices@bartonccc.edu

# **COURSE AS VIEWED IN THE TOTAL CURRICULUM**

This course is designed to be the base for all future study in the Natural Gas Distribution and Transmission Technician Program discipline. The course will stand alone for those desiring a basic knowledge of electrical principles.

# **ASSESSMENT OF STUDENT LEARNING**

Barton Community College is committed to the assessment of student learning and to quality education. Assessment activities provide a means to develop an understanding of how students learn, what they know, and what they can do with their knowledge. Results from these various activities guide Barton, as a learning college, in finding ways to improve student learning.

1. Define the conductive and physical properties of common metal conductors.
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3. Describe the anatomy of an atom.
4. Define conductor versus insulator with respect to the number of electrons in the valence shell of and atom.
5. Calculate the charge produced by a certain number of electrons and define a coulomb.
6. List the hierarchy of metals with respect to conductivity and describe the advantages and disadvantages of each.
7. Define mils, in inches, and describe the relationship to cross-sectional area of a wire.
8. Define the various sizes of wire with respect to the American Wire Gage system.
9. Calculate the resistivity of a wire.
10. Explain the difference between voltage, current, resistance and power.
11. Identify electrical quantities and associated symbols.
12. Identify the differences between a positive and negative power supply.
13. Demonstrate the proper way to power up a circuit.
14. Calculate the efficiency and power loss in a power supply.
15. Define the industry standard for determining the amp-hour rating of gel-cell batteries.
16. Calculate the amp-hours of a gel-cell battery needed to supply various amounts of amperage for various time periods.
17. Define current and describe the similarity to flow in a fluid power system.
18. Describe the various sources of voltage.
19. Define voltage and describe the similarity to pressure components in a fluid power system.
20. Use the correct instruments and procedures to safely measure voltage, current, resistance, and power.
21. Define scientific, engineering, and exponential notation.
22. Demonstrate addition, subtraction, multiplication, and division of exponential numbers.
23. Define DVM, DMM, VOM, BVM, and VTVM.
24. Describe the safety considerations that should be considered when using a voltmeter, ammeter, and ohmmeter.
25. Define the impedance of a voltmeter and describe the importance of impedance when taking voltage and current measurements.
26. Demonstrate the correct way to measure voltage, current, and resistance using an analog volt ohmmeter and a digital voltmeter.
27. Demonstrate reading the voltage, current, and resistance scales of an analog volt ohmmeter.
28. Define taut band meter movement.
29. Describe the importance of ohmmeter lead polarity.
30. Calculate the value voltage, current, and resistance using Ohm’s law.
31. Demonstrate the proper method to validate Ohm’s law calculations using a digital voltmeter.
32. Demonstrate the relationship of voltage, current, and resistance in a simple circuit using a digital voltmeter.
33. Identify the symbols used for earth and chassis grounding systems and describe the function of each one.
34. Identify the value, tolerance, reliability, and wattage of resistors.
35. Calculate values of wattage using Watt’s Law.
36. Demonstrate the manipulation of Ohm’s Law and Watt’s Law to determine three ways to find voltage, current, resistance, and watts.
37. Calculate a monthly electrical bill associated with the usage of household items rated at specific wattages.
38. Define resistance and describe the similarity to valves in a fluid power system.
39. List the various types of resistors and describe the application of each.
40. Determine the value, tolerance, and reliability of a resistor indicated by the color code bands.
41. Measure the value of resistors using an analog or digital ohmmeter.
42. Determine the wattage of a carbon core resistor indicated by the physical size.
43. Describe the difference between linear and nonlinear potentiometers.
44. Describe the difference between a rheostat and a potentiometer.
45. Describe the operation of a thermistor and a photoconductive cell.
46. Apply rheostats or potentiometers according to circuit application.
47. Identify and wire a Wheatstone bridge.
48. Calculate the value of an unknown resistance in a Wheatstone bridge circuit.
49. Describe the applications of a Wheatstone bridge.
50. Identify and safely troubleshoot series, parallel, and complex resistive circuits on various electronic circuit boards.
51. Identify and wire a series circuit.
52. Describe Kirchhoff’s laws with respect to voltage, current, resistance, and wattage in a series circuit.
53. Calculate individual and total values of voltage, current, resistance, and wattage in a series circuit and validate the calculations using proper measurement techniques.
54. Describe the purpose of voltage divider circuits found in a series circuit
55. Demonstrate the effects of a shorted resistor and an open resistor in a series circuit.
56. Calculate the total voltage in a series circuit containing voltages of different polarities.
57. Demonstrate the effect of voltages having opposite polarities in a series circuit
58. Define a tungsten load switch.
59. Describe a pole, throw, and break in regards to switches.
60. Identify the symbols for voltage sources, current paths, resistances, fuses, circuit breakers, and switches.
61. Describe the difference between a schematic and wiring diagram.
62. Define the components of a basic circuit.
63. Develop basic electronic troubleshooting skills.
64. Demonstrate the proper method of measuring voltages in a series circuit with different references to ground.
65. Identify and wire a complex DC circuit.
66. Calculate the individual and total values of voltage, current, resistance, and wattage in a complex circuit and validate the calculations using proper measurement techniques.
67. Troubleshoot a complex circuit and identify open, shorted, and partially damaged resistors

1. **INSTRUCTOR'S EXPECTATIONS OF STUDENTS IN CLASS**

# **TEXTBOOKS AND OTHER REQUIRED MATERIALS**

# **REFERENCES**

# **METHODS OF INSTRUCTION AND EVALUATION**

# **ATTENDANCE REQUIREMENTS**

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# **COURSE OUTLINE**