Fox Valley Technical College

10660110 DC Circuits 1

Course Outcome Summary

Course Information

Description	Introduces electrical safety and program procedures. The course covers Ohm's Law, power law, series circuits, and voltmeter, ammeter and ohmmeter applications. Number powers, electronic notations, circuit component recognition and diagrams, resistor power ratings, color code, Kirchhoff's voltage law and atomic structure are also included.
Career Cluster	Science, Technology, Engineering and Mathematics
Instructional Level	Associate Degree
Total Credits	1.00
Total Hours	27.00

Types of Instruction

Instruction Type	Credits/Hours
Lab and Lecture/Flexible	1 Credit/27 Hours

Course History

Revised By	Kaye Krueger (kruegek)
Last Approval Date	9/9/2014

Pre/Corequisites

Corequisite College Technical Math 1 (10-804-115) or College Technical Math 1A (10-804-113) or Industrial Maintenance Math (31-804-308)

Textbooks

Electronics Fundamentals: Circuits, Devices, and Applications
Floyd, Thomas L.; Buchla, David
Prentice-Hall
ISBN: 9780135072950
8th Edition

DC Circuits 1, 2, 3; AC Circuits 1, 2 - Curriculum Manual
Ken Holmes & Ben Gardner
Fox Valley Technical College

ISBN: 660110R070714

Employability Essentials

1. **Act Responsibly - Apply ethical standards in both personal and professional behavior.**
   Status *Active*

2. **Adapt to Change - Anticipate changes and positively respond to them.**
   Status *Active*

3. **Communicate Effectively and Respectfully - Apply appropriate writing, speaking, and listening skills across various settings to engage diverse audiences.**
   Status *Active*

4. **Think Critically and Creatively - Apply independent and rigorous reasoning that leads to informed decisions, innovation and personal empowerment.**
   Status *Active*

5. **Work Collaboratively - Work collaboratively with others to complete tasks, solve problems, resolve conflicts, provide information, and offer support.**
   Status *Active*

Program Outcomes

1. **Apply electronic theory to practice.**
   Type *TSA* ***Status*** *Active*

   Criteria
   1.1. You mathematically analyze a circuit or system.
   1.2. You simulate a circuit or system.
   1.3. You construct a circuit or system according to schematics or other documentation.
   1.4. You perform circuit or system measurements to collect data.
   1.5. You analyze data to validate predicted outcome.

2. **Operate test equipment.**
   Type *TSA* ***Status*** *Active*

   Criteria
   2.1. You demonstrate measurement of electrical and/or electronic signals.
   2.2. You demonstrate measurement of electrical and/or electronic quantities.
   2.3. You demonstrate measurement of electrical and/or electronic components.
   2.4. You use test equipment to generate electrical and/or electronic signals.
   2.5. You apply appropriate safety precautions.

3. **Build electronic circuits and systems.**
   Type *TSA* ***Status*** *Active*

   Criteria
   3.1. You assemble a prototype for operation.
   3.2. You demonstrate soldering and de-soldering techniques.
   3.3. You apply appropriate antistatic precautions.
   3.4. You identify appropriate interfaces.
   3.5. You set up programmable devices and/or systems.
   3.6. You apply appropriate safety precautions.

4. **Evaluate the operation of electronic circuits or systems.**
   Type *TSA* ***Status*** *Active*

Criteria

4.1. You determine the correct operation of circuits or systems.

4.2. You identify incorrect operation of circuits or systems.
4.3. You isolate causes of failures in circuits or systems.
4.4. You correct failures in circuits or systems.

5. Communicate technical information.

Type *TSA* ***Status*** *Active*

Criteria

5.1. You interpret electrical and/or electronic diagrams.
5.2. You create electrical and/or electronic diagrams.
5.3. You interpret technical reports and documents.
5.4. You use appropriate terminology in speaking and writing.
5.5. You interpret documentation of electronic devices and systems.
5.6. You locate necessary resources and pertinent information to perform work functions.

Course Competencies

1. Apply basic concepts to electronic theory.

Status *Active*

Assessment Strategies

1.1. Exam

Criteria

Performance will meet expectations when:

1.1. you achieve a 70% or better.

Learning Objectives

1.a. Convert numbers between decimal form, scientific notation and engineering notation.
1.b. List the most common metric prefixes, their symbols, and what power of ten is represented by each (Giga, Mega, kilo, base units, milli, micro, nano, pico).
1.c. Convert a quantity expressed with a metric prefix to an equivalent quantity expressed with a different metric prefix (Megohms to kilohms, millivolts to volts, milliamps to microamps, etc.).
1.d. Use the power of ten (EE) key on a calculator to enter quantities expressed with metric prefixes.
1.e. Express the result of a calculation either in engineering notation or as a quantity with a metric prefix. Round to a reasonable number of significant digits (typically 3).
1.f. Describe how protons, neutrons and electrons are arranged to form the basic structure of an atom.
1.g. Explain the concept of electron shells, and define valence electrons.
1.h. Define the terms conductor, semiconductor and insulator, and give two examples of each type of material.
1.i. Indicate the numbers of valence electrons in atoms of conductor, semiconductor and insulator materials.
1.j. Name the type of charge on protons, neutrons and electrons, and explain how an atom becomes a positive ion or a negative ion.
1.k. Describe the force that acts between like charges or between opposite charges.
1.l. Define electrical charge and name its basic unit.
1.m. Define voltage (electromotive force, potential difference) and name its basic unit.
1.n. List six types of energy that can be converted to electrical energy, and give an example of a device that produces voltage from each type of energy.
1.o. Define current and name its basic unit.
1.p. Explain the difference between electron current flow and conventional current flow.
1.q. Explain the difference between voltage and current, and explain how they are related to each other.
1.r. Define resistance and name its basic unit.
1.s. Define conductance and name its basic unit.
1.t. Convert a resistance value to conductance. Convert a conductance value to resistance.
1.u. Identify which electrical quantity or basic unit is represented by the following symbols:
Q, C, E, V, I, A, R, Ω, G, S

1.v. Identify the resistance value and tolerance of a four-band resistor, and calculate the upper and lower limits of the tolerance range.

2. Measure electrical properties using a multimeter.

Status *Active*

Assessment Strategies

2.1. Exam

Criteria

Performance will meet expectations when:

2.1. you achieve a 70% or better.

Learning Objectives

2.a. Identify the function settings on a digital multimeter (DMM).
2.b. Set up and connect a meter to properly measure DC voltage.
2.c. Set up and connect a meter to properly measure DC current.
2.d. Set up and connect a meter to properly measure resistance.
2.e. Connect and operate a variable DC power supply properly.
2.f. Select the function range, and identify and read the corresponding scale on an analog volt-ohm-milliammeter (VOM) to properly measure electrical properties.
2.g. Explain the difference between linear and nonlinear analog meter scales.
2.h. Define the term continuity.

3. Apply Ohm's Law and Watt's Law to electronic circuits.

Status *Active*

Assessment Strategies

3.1. Exam

Criteria

Performance will meet expectations when:

3.1. you achieve a 70% or better.

Learning Objectives

3.a. Identify schematic symbols for the following components:
A. DC voltage source (battery)
B. voltmeter
C. ammeter
D. ohmmeter
E. fixed resistor
F. potentiometer
G. rheostat
H. potentiometer connected as a rheostat
I. lamp
J. ground
K. conducting wires crossing with no connection
L. conducting wires connected
M. fuse
N. circuit breaker
O. SPST switch
P. SPDT switch
Q. DPST switch
R. DPDT switch
S. NOPB push-button switch
T. NCPB push-button switch
U. rotary switch

3.b. Properly connect a circuit according to a schematic diagram which includes any of the components identified above.
3.c. Identify the three basic parts of an electric circuit, and draw a schematic diagram of a simple electric circuit.

3.d. Define open circuit and closed circuit.
3.e. Describe, for an open switch in a series circuit, the resistance of the switch, whether or not current is flowing in the circuit, and the voltage that would be measured across the switch.
3.f. Describe, for a closed switch in a series circuit, the resistance of the switch, whether or not current is flowing in the circuit, and the voltage that would be measured across the switch.
3.g. Describe the operation of the following types of switches:
SPST, SPDT, DPST, DPDT, NOPB, NCPB
3.h. Describe potentiometers and rheostats in terms of what is controlled by each and how many terminals are used by each.
3.i. Explain what causes a fuse to “blow” or a circuit breaker to “trip,” and how these operate to protect a circuit.
3.j. Compare the cross-sectional areas for two wires having different American Wire Gauge (AWG) numbers.
3.k. List the four factors that determine the resistance of a wire.
3.l. Describe the possible functions of the ground point in a circuit.
3.m. Use Ohm’s law to explain the relationships between voltage, current and resistance.
3.n. Use Ohm’s law to calculate voltage, current or resistance when any two of the three values are given.
3.o. Define power and name its basic unit.
3.p. Calculate the amount of energy an appliance consumed, in kilowatt-hours, when given the power requirement of the appliance and the length of time it operated.
3.q. Calculate power dissipation using one of the three forms of Watt’s Law when given any two of voltage, current, and resistance
3.r. Use Watt’s Law to explain how power dissipation is affected by a changed value of voltage, current, or resistance.
3.s. Define the power rating of a resistor, and list three factors that determine the power rating.
3.t. Calculate the efficiency of a power supply when given its input power and output power.
3.u. Calculate the expected lifetime of a battery when given its amp-hour rating and the current requirement of a load.

4. Analyze resistive series circuits.

Status *Active*

Assessment Strategies

4.1. Exam

Criteria

Performance will meet expectations when:

4.1. you achieve a 70% or better.

Learning Objectives

4.a. Define the term series circuit with regard to physical and electrical description.
4.b. Solve series circuit problems by calculating the following parameters:
A. Total Resistance
B. Total Current
C. Total Voltage
D. Total Power
E. Total Conductance
F. Voltage drops, currents, and power dissipated at individual resistors
4.c. Explain the effects on the circuit parameters listed in step 2 when an open develops.
4.d. Explain the effects on the circuit parameters listed in step 2 when a shorted component develops.
4.e. Describe how voltage and resistance values at individual resistors compare to the total voltage and total resistance values in a series circuit, based on ratios (or percentages).
4.f. Predict the net voltage values applied to the load when series aiding and series opposing power supplies are used.
4.g. Indicate the voltage polarity across individual components in a series circuit.
4.h. Use Kirchhoff’s Voltage Law to determine an unknown voltage drop across a resistor in a series circuit.
4.i. Explain the term reference point ground, and determine voltage potentials with respect to ground.
4.j. Predict the resistor voltages in a series circuit when a specific resistor is known to be open or shorted and the power supply voltage is given.

Grant Award

This workforce product was funded by a grant awarded by the U.S. Department of Labor's Employment and Training Administration. The product was created by the grantee and does not necessarily reflect the official position of the U.S. Department of Labor. The U.S. Department of Labor makes no guarantees, warranties, or assurances of any kind, express or implied, with respect to such information, including, but not limited to, accuracy of information or its completeness, timeliness, usefulness, adequacy, continued availability, or ownership.

Auxiliary aids and services are available upon request to individuals with disabilities.

This equal opportunity program is part of a grant from the U.S. Department of Labor equaling $2,999,750.00.

Creative Commons

Creative Commons

Course Learning Plans and Performance Assessment Tasks

Type	Title	Source	Status
PAT	Basic Concepts and Measurements Exam	Course	Active
PAT	Electric Circuits, Ohm's Law and Power Exam	Course	Active
PAT	Series Circuits Exam	Course	Active
LP	Basic Concepts and Measurements	Course	Active
LP	Electric Circuits, Ohm's Law and Power	Course	Active
LP	Series Circuits	Course	Active