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### COURSE INFORMATION

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Alternate Title: DC 1: Introduction

Description:

10-660-104 DC 1: INTRODUCTION ...introduction to the concepts of DC electricity and simple series circuits. Voltage, current, resistance, Ohm's Law, power and Kirchoff's Voltage Law are defined. (This class can only be taken at the high school level.)

Instructional Level: 10

Total Credits: 1

Total Hours: 36

### COURSE HISTORY

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Status: Active

Active Date: 4/23/2012

Last Revision Date: 10/19/2022

Revised By: SYSTEM IMPORT

### EMPLOYABILITY SKILLS

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**1. Communicate Effectively**

Type: NWTC      Status: Active

**2. Demonstrate Personal Accountability**

Type: NWTC      Status: Active

**3. Solve Problems Effectively**

Type: NWTC      Status: Active

**4. Think Critically and Creatively**

Type: NWTC      Status: Active

**5. Value Individual Differences and Abilities**

Type: NWTC      Status: Active

**6. Work Cooperatively and Professionally**

Type: NWTC      Status: Active

### PROGRAM OUTCOMES

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**1. TSA1 - Perform work safely**

Type: TSA      Status: Active

Criteria

- 1.1. Follow Lock-out Tag-out safety procedures and practices to ensure proper start-up and shutdown of equipment
- 1.2. Follow Personal Protective Equipment requirement
- 1.3. Follow established safety policies and practices (e.g. OSHA, site specific)

**2. TSA2 - Troubleshoot electrical and mechanical systems and devices**

Type: TSA      Status: Active

Criteria

- 2.1. Verify proper operation or problem
- 2.2. Identify the cause of the problem: mechanical, electrical
- 2.3. Determine corrective action
- 2.4. Utilize appropriate test equipment

**3. TSA4 - Communicate Technical Information**

Type: TSA      Status: Active

Criteria

- 3.1. Interpret documentation of electro-mechanical devices and systems
- 3.2. Use field specific technical terminology in speaking and writing
- 3.3. Create electro-mechanical diagrams
- 3.4. Document problems and solutions
- 3.5. Interpret electro-mechanical diagrams

**4. Understand and apply knowledge of electricity, electronics, hydraulics, and electric motors and mechanics.**

Status: Active

**5. Read technical drawings, schematics, and diagrams.**

Status: Active

**6. Document technical information through descriptive writing, sketches/diagrams, mathematical expression, computation, and graphs.**

Status: Active

**7. Perform electrical, mechanical, and fluid measurements by properly selecting tools and test equipment.**

Status: Active

**8. Perform electrical/mechanical assembly/disassembly, repair, or calibrate components by properly selecting tools and equipment and following procedures.**

Status: Active

**9. Understand the overall operation and control of machines.**

Status: Active

**10. Apply critical thinking skills to solving problems.**

Status: Active

**11. Perform safe work practices.**

Status: Active

## COURSE COMPETENCIES

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### 1. Employ Scientific and Engineering notation in the description of electrical quantities

Status: Active

Assessment Strategies

- 1.1. By employing Scientific and Engineering notation in the description of electrical quantities under the instructor's observation, given appropriate worksheets and a calculator

Criteria

Your performance will be successful when:

- 1.1. convert decimal numbers in Scientific and Engineering notation
- 1.2. Define the SI system of dimensional units
- 1.3. Use SI suffix notation in conjunction with Engineering notation
- 1.4. Compute results for numeric problems using Scientific and Engineering notation
- 1.5. Assign Engineering suffix notation to representative electrical values

Learning Objectives

- 1.a. Express electrical decimal values into Scientific and Engineering notation
- 1.b. Classify representative electrical values with proper engineering suffix notation

### 2. Follow learning facility rules and procedures

Status: Active

Assessment Strategies

- 2.1. By following learning facility rules and procedures under the instructor's observation, given handout materials and lecture information

Criteria

Your performance will be successful when:

- 2.1. you list general safety rules for electricity and electronics.
- 2.2. you locate first-aid supplies and 911 phone.
- 2.3. you perform proper login/logout procedure
- 2.4. you complete the mandatory eye protection agreement.
- 2.5. you read and sign the "Electronics Open Lab Contract for Education".

Learning Objectives

- 2.a. Identify safety procedures in lab
- 2.b. Review stated lab management procedures

### 3. Analyze the theory and properties of an electric circuit.

Status: Active

Assessment Strategies

- 3.1. By analyzing the theory and properties of an electric circuit under the instructor's observation, given basic components and test equipment.

Criteria

Your performance will be successful when:

- 3.1. Use SI units, metric prefixes, electrical symbols and abbreviations.
- 3.2. Identify the names and schematic symbols of the most common electronic components and describe their main function.
- 3.3. List examples of common electronic test equipment and identify each unit's main functions.
- 3.4. Describe the model of an atom, naming the characteristics of its structure and associative connection to electronics.
- 3.5. Discuss the theory of electrical charges.
- 3.6. Explain the differences between conductors, insulators, and semi-conductors as they apply to the atomic model and the periodic table of elements.
- 3.7. Describe electrical charge in terms of dimensional units, physical particles and the relationship between the two.
- 3.8. Describe Coulombs Law of force between charged bodies.
- 3.9. Define current as the flow of charged particles in a conductor.
- 3.10. Define voltage as the energy source in an electrical circuit.
- 3.11. Describe the electrical components that make-up an electrical circuit.
- 3.12. Describe voltage, current, and resistance as they apply to an electrical circuit.
- 3.13. Cite the conceptual differences between electron flow and conventional current flow.
- 3.14. Use a Digital multimeter (DMM) to measure voltage and current.

#### Learning Objectives

- 3.a. Review established symbols, standards, conventions and terminology.
- 3.b. Associate basic atomic theory to electronics.
- 3.c. Recognize the elements and properties of a basic electrical circuit.

#### 4. Analyze the physical basis for the electrical quantity of resistance

Status: Active

#### Assessment Strategies

- 4.1. By analyzing the physical basis for the electrical quantity of resistance under the instructor's observation, given basic components and test equipment

#### Criteria

Your performance will be successful when:

- 4.1. Describe electrical resistance, resistor types, and resistor characteristics.
- 4.2. Determine the resistance and tolerance of a resistor using the resistor color code.
- 4.3. Identify fixed resistor component values and tolerances using the EIA color code.
- 4.4. Describe variable resistors according to available types.
- 4.5. Classify resistors by their composition.
- 4.6. List typical failures that occur with all types of resistors.
- 4.7. Measure resistor values with a digital multimeter.

#### Learning Objectives

- 4.a. Study resistor types and composition
- 4.b. Detail various resistive component characteristics
- 4.c. Record various resistor values

## 5. Evaluate simple electrical components in various circuit configurations.

Status: Active

### Assessment Strategies

- 5.1. By evaluating simple electrical components in various configurations under the instructor's observation, given your lab observations and appropriate information resources

### Criteria

Your performance will be successful when:

- 5.1. Explain the difference between primary and secondary cells.
- 5.2. Explain how cells can be connected to increase either current capacity or voltage output of a battery.
- 5.3. Use wire tables and circular mil area to determine resistance of wires.
- 5.4. List common types of conductors and connectors.
- 5.5. Apply simple switching devices to open and close electrical circuits.
- 5.6. Define the terms pole and throw as they relate to mechanical switches.
- 5.7. Determine an open circuit condition from a closed circuit condition.
- 5.8. Measure voltage in a simple DC circuit.
- 5.9. Measure current in a simple DC circuit.

### Learning Objectives

- 5.a. Describe features of a battery.
- 5.b. Explain the function and characteristics of conductors in a circuit.
- 5.c. Observe DC electrical quantities.
- 5.d. Identify various switch circuits conditions.

## 6. Analyze circuit parameters such as voltage, current, resistance and power.

Status: Active

### Assessment Strategies

- 6.1. By analyzing circuit parameters such as voltage, current, resistance and power under the instructor's observation, given basic circuits and test equipment

### Criteria

Your performance will be successful when:

- 6.1. Derive the six Ohm's Law relationships between voltage, current, resistance and power.
- 6.2. Express the basic Ohm's Law relationship between voltage, current and resistance.
- 6.3. Derive the other two forms of Ohm's Law.
- 6.4. Express the basic relationship between voltage, current and power.
- 6.5. Derive the two other forms of power relationship using voltage, current and resistance.
- 6.6. Contrast the concept of electrical power with that of electrical energy
- 6.7. Describe the power direction convention as it relates to an electrical device being a load or a source
- 6.8. Define electrical energy.
- 6.9. Relate energy /power usage of a system to efficiency
- 6.10. Calculate energy usage and cost for various load devices
- 6.11. Relate loss in an electrical system to efficiency
- 6.12. Define non-linear devices and piecewise determination of their characteristics

6.13. Measure resistive loads in an electrical circuit to prove Ohm's law

6.14. Simulate simple circuits to prove Ohm's Law

6.15. Complete lab activities demonstrated and evaluated by instructor

6.16. Complete DC1: Introduction written examination

Learning Objectives

6.a. Describe circuit parameters using Ohm's law.

6.b. Compute power and efficiency in a circuit using Watt's law.

## **COURSE LEARNING PLANS AND PERFORMANCE ASSESSMENT TASKS**

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- PAT: Lab Report 1-Introduction to the Electronics Lab
- LP: Employ Scientific and Engineering notation in the description of electrical quantities
- PAT: Lab Report 2- Introduction to Lab Equipment
- LP: Follow learning facility rules and procedures
- PAT: Lab Report 3-Resistance Measurements
- LP: Analyze the theory and properties of an electric circuit
- PAT: Lab Report 4-Circuit Basics
- LP: Analyze the physical basis for the electrical quantity of resistance
- PAT: Lab Report 5 - Ohm's Law
- LP: Evaluate simple electrical components in various circuit configurations
- LP: Analyze circuit parameters such as voltage, current, resistance and power