Miami Dade College

Course Description

EET1015C | Direct Current Circuits | 4.00 credits

This course is intended for students majoring in electronics engineering technology and related disciplines. Students will learn basic electrical safety, the various basic electrical components and resistive circuit network analysis. Students will learn to verify and apply basic theories and principles through hands-on, laboratory experiments utilizing modern testing equipment. Prerequisite: MAC 1105.

Course Competencies

Competency 1: The student will demonstrate the ability to avoid potentially dangerous situations and to avoid electrical shock by:

1. Demonstrating that a circuit must be closed before current can flow
2. Describing the procedures necessary to prevent (a) the human body (b) metallic objects (rings, jewelry etc.) from completing an electrical circuit
3. Identifying the dangers of high-voltage electrical shock
4. Identifying electrical equipment that generates high voltages (usually internally)
5. Describing the danger of heat damage from low voltage systems
6. Describing the effects of heat on the human body and on a circuit board

Competency 2: The student will demonstrate the ability to perform basic computations and provide functional definitions for the Bohr model atom, current flow, voltage, resistance, energy, and power by:

1. Using engineering notation and metric prefixes to express electrical quantities
2. Describing the structure of atoms and relating that structure to conductors and insulators
3. Defining voltage, current, and resistance
4. Identifying the differences between DC and AC voltages
5. Identifying various real and ideal voltage and current sources
6. Identifying independent and dependent sources
7. Distinguishing between work, energy, and power
8. Solving problems involving electrical power and efficiency

Competency 3: The student will demonstrate an understanding of the properties of resistors by:

1. Solving for conductance when given a resistance
2. Solving for resistance when conductance is specified
3. Choosing a correct wire size when given current in a load
4. Distinguishing between types of resistors, based on construction and physical size
5. Determining the nominal resistance and tolerance when given a color code
6. Specifying the color code for a given resistance
7. Distinguishing between the nominal value and actual value of resistors

Competency 4: The student will demonstrate an understanding of circuit concepts, current, voltage measurement, and Ohm's Law by:

1. Listing the requirements of a closed circuit
2. Applying Ohm's Law to an entire circuit or to part of a circuit containing resistors, and both independent and dependent sources
3. Solving for and verifying by measurement current, voltage, or resistance when given the remaining quantities

Competency 5: The student will demonstrate the ability to analyze and troubleshoot series circuits by:

1. Identifying a series resistive circuit
2. Determining the current through a series circuit

3. Calculating the total resistance of a series circuit
4. Applying Ohm's Law to the solution of series circuits
5. Applying Kirchhoff's Voltage Law (KVL)
6. Using a series circuit as a voltage divider
7. Identifying possible circuit faults when given a set of measurements

Competency 6: The student will demonstrate the ability to analyze and troubleshoot parallel circuits by:

1. Identifying a parallel resistive circuit
2. Determining the voltage across each parallel branch
3. Solving for equivalent resistance of two- branch and multi-branch circuits
4. Applying Ohm's Law to the solution of parallel circuits
5. Applying Kirchhoff's Current Law (KCL)
6. Using parallel circuits as a current divider
7. Making current and voltage measurements, and identifying possible causes of a malfunction when given a set of measurements

Competency 7: The student will demonstrate the ability to analyze and troubleshoot series-parallel circuits by:

1. Identifying series-parallel relationships
2. Calculating voltages and currents in a single source series-parallel circuit
3. Analyzing loaded voltage dividers
4. Describing the balanced and unbalanced Wheatstone bridge circuits
5. Identifying possible circuit faults in a series-parallel circuit when given a set of measurements

Competency 8: The student will demonstrate the ability to apply circuit theorems by:

1. Solving circuits with more than one voltage/current source using the superposition theorem
2. Simplifying circuits using Thevenin's theorem or Norton's theorem
3. Performing source conversions
4. Specifying the condition for maximum power transfers (MPT)

Competency 9: The student will demonstrate the ability to apply nodal analysis to DC circuits by:

1. Describing a circuit in terms of nodes, paths, branches, loops, and meshes
2. Applying the Node-Voltage method to both the planar and non-planar circuits
3. Understanding the special cases when applying the Node-Voltage method
4. Defining and using the concept of a super node in Nodal's analysis circuit problem
5. Applying the Node-Voltage's technique to an Amplifier Circuit

Competency 10: The student will demonstrate an understanding of the practical considerations for Electrostatic Discharge (ESD) by:

1. Explaining how static electric charge occurs
2. Identifying the damaging voltage levels within ESD
3. Detecting ESD in sensitive equipment and components
4. Reviewing ESD standards set forth by the Electrostatic Association
5. Discussing and implementing industry standard ESD procedures and equipment
6. Identifying and interpreting industry standard symbols for ESD
7. Applying ESD procedures in a classroom environment
8. Using ESD methods to prevent damage to lab components and laboratory equipment
9. Observing ESD prevention practices when handling CMOS integrated circuits

Competency 11: The student will demonstrate an understanding of safety procedures in an electronics laboratory by:

1. Showing how to operate the main room power disconnect
2. Identifying the location of the fire extinguishers
3. Handling equipment in accordance with stated manufacturers' instructions

4. Describing safe work practices around potential electric circuit hazards
5. Describing electrical shock symptoms and the proper response to an electrical shock victim
6. Explaining the inspection requirements for commonly used electrical components
7. Explaining the importance of removing power from the circuit or equipment prior to working on it and verifying that the power is off
8. Setting and making connections to the direct current power supplies, and function generator
9. Reading the over current indicator and interpreting the significance of the measurements
10. Using the voltmeter to check for the presence of voltages
11. Verifying that capacitors are discharged in electrical circuits
12. Soldering and desoldering electrical sub- assemblies to a circuit board following industry standards

Learning Outcomes:

- Use quantitative analytical skills to evaluate and process numerical data
- Solve problems using critical and creative thinking and scientific reasoning
- Use computer and emerging technologies effectively