

**COURSE OUTLINE**  
**CET 111 AC/DC Circuits I**  
**4 Credit Hours**

**Course Description**

This course is an introduction to basic concepts of electricity: atomic structure, electrical safety, AC and DC current, Ohm's and Kirchoff's laws, power, conductivity, resistance, magnetism and electromagnetism. Students learn to interpret electrical circuit diagrams and properly and safely use electrical instruments and tools.

**Prerequisite(s)**

None

**Purpose of Course**

The purpose of this course is to prepare students to work with low-voltage electricity and electrical devices.

**Required Materials**

- Shultz, Paul (2016). *AC/DC Principles and Applications*. (2nd Ed). Homewood, IL: American Technical Publishers, INC. ISBN: 978-0-8269-1350-0

**Optional Resources**

- Shultz, P. T. (2007). *AC/DC Principles Workbook*. Homewood, IL: American Technical Publishers. ISBN #: 978-0-8269-1351-7
- Mazur, G. A., & Proctor, T. E. (2010). *Troubleshooting Electrical / Electronic Systems*. Orland Park, IL: American Technical Publishers. ISBN #: 978-0-8269-1791-1
- All About Circuits materials & videos: [http://www.allaboutcircuits.com/vol\\_1/index.html](http://www.allaboutcircuits.com/vol_1/index.html)
- DDC online (Digital control systems tutorials) [www.ddc-online.org](http://www.ddc-online.org)
- Video Physics lectures on electromagnetism by Walter Lewin, MIT: <http://video.mit.edu/channel/walter-lewin/>
- Online Kele catalog

**Learning Outcomes and Competencies**

The intention is for the student to be able to:

1. Discuss how the basic properties of matter relate to electricity and electrical properties.
  - a. Differentiate between materials that are better conductors versus those that are better insulators.
  - b. Explain the differences between AC and DC current.
  - c. Differentiate between Conventional Current Flow and Electron Current Flow.
  - d. Draw parallels between electrical properties (current, voltage, resistance) to fluid flow properties in a pipe (flow rate, pressure difference, friction).
  - e. Demonstrate proficiency in converting units for electrical properties from metric to English and vice versa.
  - f. Calculate values for work, potential and kinetic energy, true power and apparent power.
2. Work safely with electrical circuits.
  - a. Give examples of unsafe electrical practices
  - b. Demonstrate proper electrical safety procedures when taking voltage and current measurements.
  - c. Discuss how the human body might act as a conductor of an electrical circuit to ground, and the resulting dangers.

- d. Explain why using “lockout/ tagout” procedures is important when doing electrical work.
3. Explain the concept of resistance.
  - a. Use Ohm’s law to calculate values for amperage, voltage and current.
  - b. Use a color code chart to determine the resistance and tolerance of a resistor.
  - c. Discuss uses for resistors with either positive temperature coefficients or negative temperature coefficients.
  - d. Use a multimeter to determine the resistance across a resistor.
  - e. Calculate the total resistance of resistors in series and in parallel.
  - f. Describe the difference between a potentiometer and a rheostat.
  - g. Select a wire size for a given application.
4. List and explain the different types of voltage sources.
  - a. Describe how to prevent electrostatic discharge from damaging electronic components.
  - b. Discuss applications for piezoelectric crystals as transducers to convert pressure into an electric signal.
  - c. Explain the principles behind a photovoltaic cell.
  - d. Explain how thermocouples are used to measure the temperature of a substance.
  - e. Explain the chemical action of batteries in creating a voltage force.
  - f. Discuss magnetism and how an electric current is used to create an electromagnetic field.
5. Interpret circuit diagrams and symbols and build a simple circuit.
  - a. Discuss the functions of conductors, resistors, voltage sources, and loads in a simple circuit.
  - b. Describe different types of switches that are commonly used in circuits.
  - c. Discuss the types of overcurrent devices and their application in circuits.
  - d. Discuss the importance of knowing maximum voltage and current values for equipment before building circuits.
  - e. Discuss the importance of grounding devices in circuits.
  - f. Build a simple circuit and a corresponding circuit diagram.
  - g. Use a multimeter to test electrical properties of a circuit.
  - h. Use Ohm’s Law to predict electrical properties of a circuit.
  - i. Use the Power Formula to calculate electrical properties in a circuit.
  - j. Explain the terms short circuit, open circuit, closed circuit, and continuity.
6. Interpret single-phase series circuit diagrams and calculate unknown values for electrical properties in a circuit.
  - a. Draw and construct a series circuit with labels of all components.
  - b. Add resistances in series circuits.
  - c. Calculate unknown values for current, voltage, and resistance in a series circuit with specified values.
  - d. Describe why a voltage divider would be used in a circuit.
7. Interpret single-phase parallel circuit diagrams and calculate unknown values for electrical properties in a circuit.
  - a. Draw and construct a parallel circuit with labels of all components.
  - b. Add resistances in parallel circuits.
  - c. Calculate unknown values for current, voltage, and resistance in a parallel circuit with specified values.
  - d. Design a series circuit and a parallel circuit that achieve the same total resistance and desired voltage drop.
8. Interpret information in circuits that contain both series and parallel components.
  - a. Calculate unknown values for current, voltage, and resistance in a circuit with both series and parallel components.
9. Define functions of common electrical circuit components.
  - a. Describe the function of relays, inductors, capacitors, contactors, magnetic motor starters, diodes, transformers, inductor, rectifier, thermistor, diac, triac, heat sink and power supplies in electrical circuits.
  - b. Define capacitance, inductance, and impedance.

## **Learning Units**

- I. Basic Concept of Electricity and Magnetism
- II. Electrical Safety
- III. Resistance

- IV. Voltage Sources
- V. Simple Circuits and Ohm's Law
- VI. DC Series Circuits
- VII. DC Parallel Circuits
- VIII. DC Series/Parallel Circuits
- IX. Electrical circuit components

**Method of Delivery/Instruction**

☒ Face-to-face      ☒ Blended      ☐ Online

Learning activities will be assigned within and outside the classroom to assist the student to achieve the intended learning outcomes through lecture, Instructor-led class discussion, guest speakers, group activities, lab, drills/skill practice, and others at the discretion of the instructor.

**Method of Grading and Evaluation**

The student will be graded on learning activities and assessment tasks. Grade determinants may include the following: daily work, quizzes, chapter or unit tests, comprehensive examinations, student projects, student presentations, class participation, and other methods of evaluation employed at the discretion of the instructor.