

COURSE OUTLINE
CET 211 AC/DC Circuits II
3 Credit Hours

Course Description This course builds upon the introduction to basic concepts of electricity presented in CET 111. Topics covered include power supplies, reactive electrical components, power distribution, circuit protection, electric motor theory, electric generator theory, types of electric motors, motor starters, switching devices, electrical symbols, pictorial diagrams, schematics, sequences of operation, and basic electrical troubleshooting.

Prerequisite(s)

CET 101 OSHA 30 – Safety Orientation OSHA 30

CET 111 AC/DC Circuits I or HVA 1104 Electrical Fundamentals

Purpose of Course

The purpose of this course is to prepare students to work safely with low-voltage electrical systems.

Required Materials

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

Optional Resources

- 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
- DDC online (Digital control systems tutorials) 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. Work safely with electrical circuits.
 - a. State procedures and safety gear needed when taking high voltage measurements.
 - b. Give examples of unsafe electrical practices.
2. Describe power supplies regarding industrial and high performance building controls.
 - a. Calculate the size of power supply needed for a given set of devices.
 - b. Demonstrate the ability to replace an existing power supply in a circuit.
3. Demonstrate an understanding of reactive electrical components
 - a. Define and give examples of reactive components.
 - b. Explain how capacitive and inductive components shift waveforms.
 - c. Describe the operation of capacitors, inductors, motors and transformers
 - d. Calculate inductive reactance and capacitive reactance given circuit information about inductors and capacitors.
4. Describe how power is supplied to and distributed within a building.
 - a. Calculate power efficiency.
 - b. Perform a safe voltage test of building voltages.
5. Demonstrate an understanding of the importance and purpose of circuit protection.
 - a. List different types of circuit protection.

- b. Explain how circuit breakers function.
 - c. Diagram a circuit showing the placement of a fuse and circuit breaker, using common electrical symbols.
 - d. Define GFCI and explain its function.
6. Discuss the theory of electric motors.
 - a. Identify the major parts of an electric motor.
 - b. List the basic types of motors found in commercial/industrial buildings.
 - c. Describe the basic principles necessary to turn a motor shaft.
7. Explain the theory of generator operation.
 - a. State how electrical current can be induced in a conductor which is cutting lines of magnetic force.
 - b. Compare and contrast the function of AC generators with DC generators.
8. Identify the following common motor types: synchronous, repulsion, AC Series.
 - a. Based on construction, configuration and component knowledge, identify unknown motor types.
 - b. Explain the applications for basic motor types.
 - c. Based on starting and running torque information, classify motor types.
9. Explain the function and protective purpose of motor starters.
 - a. Describe the function of various motor starters.
 - b. Discuss how motor starters are sized.
 - c. Outline the difference between mechanically and electrically held starters.
10. Explain how switching devices are used.
 - a. Identify various types of switching devices.
 - b. Draw the symbols for the following switches: toggle, rocker, push-button, rotary, SPST, SPDT, DPST, DPDT, limit, current, pressure, whisker.
 - c. Demonstrate the ability to properly wire switching devices into a circuit.
11. Identify electrical symbols and their use in pictorial diagrams.
 - a. Explain the purpose of a pictorial diagram.
 - b. Draw a basic circuit, using the appropriate symbols, including various types of electrical devices.
 - c. Given a set of components, draw a pictorial diagram depicting relative position to control panel and associated wire connections.
 - d. Construct a circuit given a pictorial diagram.
12. Explain the purpose of schematics and what information they provide.
 - a. Compare and contrast a pictorial diagram with its equivalent schematic diagram.
 - b. Convert a pictorial diagram into its equivalent schematic diagram.
 - c. Construct and safely apply power to a circuit using a schematic diagram.
13. Explain the importance of sequence of operation and the importance within a system operation.
 - a. Distinguish between a pictorial diagram, schematic diagram and a sequence of operation.
 - b. Compare and contrast a pictorial diagram, schematic diagram and a sequence of operation.
 - c. Construct a unique, operable circuit from a sequence of operation using components which satisfy the sequence.

Learning Units

- I. Electrical Safety
- II. Power Supplies
- III. Reactive Electrical Components
- IV. Power Distribution
- V. Circuit Protection
- VI. Electric Motor Theory
- VII. Electric Generator Theory
- VIII. Electric Motor Types
- IX. Motor Starters
- X. Switching Devices
- XI. Electrical Symbols & Pictorial Diagrams

- XII. Schematics
- XIII. Sequences of Operation

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.