

## COURSE SYLLABUS

<b>LAST REVIEW</b>	Fall 2022
<b>COURSE TITLE</b>	National Electric Code I
<b>COURSE NUMBER</b>	ELET 0110
<b>DIVISION</b>	Career and Technical Education
<b>DEPARTMENT</b>	ELET
<b>CIP CODE</b>	46.0302
<b>CREDIT HOURS</b>	4
<b>CONTACT HOURS/WEEK</b>	Class: 2.5      Lab: 3
<b>PREREQUISITES</b>	None

### COURSE DESCRIPTION

This is an introductory course on the use and interpretation of the current National Electrical Code. Students should develop a working knowledge of the code that will permit them to apply it to everyday applications. Upon successful completion of this course, the student should be able to use the code to design service entrances, feeders and branch circuits and discern between wiring methods used in different occupancies. 4 hrs lecture /wk

### PROGRAM ALIGNMENT

This course is part of a program aligned through the Kansas Board of Regents and Technical Education Authority. For more information, please visit:

[https://kansasregents.org/workforce\\_development/program-alignment](https://kansasregents.org/workforce_development/program-alignment)

### PROGRAM LEARNING OUTCOMES

1. The Student will be able to identify workplace safety issues in accordance with OSHA standards.
2. Upon successful completion of this course, the student should be able to identify the job skills necessary to have a successful career in the Electrical Profession.
3. Inspect electrical circuit connections in accordance with the N.E.C. standards of compliance.

### TEXTBOOKS

<http://kckccbookstore.com/>

### METHOD OF INSTRUCTION

A variety of instructional methods may be used depending on content area. These include but are not limited to lecture, multimedia, cooperative/collaborative learning, labs and demonstrations, projects and presentations, speeches, debates, panels, conferencing, performances, and learning experiences outside the classroom. Methodology will be selected to best meet student needs.

## **COURSE OUTLINE**

- I. General terms of the National Electrical Code
  - A. Explain the history of NEC.
  - B. Differentiate code changes from previous codes.
  - C. Explain terms and layout of NEC.
  - D. Use the NEC to find information.
  - E. Explain what professionals use the NEC.
  - F. Define the purpose of the NEC.
  - G. Distinguish different interpretations of the NEC.
  - H. Explain code arrangement and enforcement.
  - I. Distinguish between mandatory and explanatory material.
  - J. Describe safety and wiring planning.
- II. Chapter 1 General
  - A. Interpret definitions of the NEC using Article 100.
  - B. Summarize the NEC requirements for electrical installations.
  - C. Explain the approval of equipment by the authority having jurisdiction
    - 1. Describe the identification, installation and use of equipment.
    - 2. Explain nominal voltages and conductor methods.
    - 3. Distinguish different conductor insulation and wiring methods.
    - 4. Explain interrupting rating.
    - 5. Explain deteriorating agents and mechanical execution of work.
    - 6. Describe the mounting of cooling equipment.
    - 7. Explain electrical conductor termination.
    - 8. Define access and working space.
    - 9. Define guarding and manufacturer's markings.
- III. Chapter 2 Wiring and Protection
  - A. Generalize the use of Article 200 for identification of grounded conductors.
    - 1. Explain the connection to grounded system.
    - 2. Describe the use of the grounded conductor.
    - 3. Explain the use of white or gray conductors.
    - 4. Describe terminal identification and polarity.
  - B. Article 210, Branch Circuits
    - 1. Explain scope and definitions.
    - 2. Describe branch circuit classification.
    - 3. Explain multi-wire branch circuits.
    - 4. Explain color code for branch circuits.

5. Explain voltage limitations and use of receptacles.
  6. Describe GFCI receptacle protection.
  7. Explain conductor ampacity and overcurrent protection.
  8. Calculate outlet device rating and maximum branch circuit Loads.
  9. Calculate permissible loads and multi-outlet branch circuit
  10. Calculate lighting outlet requirements.
- C. Article 215, Feeder Conductors
1. Describe the scope and minimum rating and size of feeders.
  2. Calculate overcurrent protection.
  3. Describe feeder conductor grounding means.
  4. Identify feeder high leg.
  5. Explain ground-fault protection of equipment.
- D. Article 220, Branch Circuit, Feeder and Service Demands
1. Explain the scope and definitions of section 220.
  2. Explain voltages and computations of loads.
  3. Calculate branch circuit requirements.
  4. Calculate general lighting demands.
  5. Describe commercial receptacle demand factors.
  6. Describe motors and fixed electric space heating requirements.
  7. Complete a dwelling unit small appliance and laundry load.
  8. Calculate a dwelling unit appliance demand.
  9. Calculate a dwelling unit electric clothes dryer demand.
  10. Calculate a dwelling unit electric range demand.
  11. Explain a commercial unit electric range demand.
  12. Explain a non-coincident load.
  13. Size a feeder neutral load.
  14. Verify an optional calculation for a dwelling unit.
- E. Article 225, Outside Branch Circuits and Feeders
1. Explain the scope and definitions of section 225.
  2. Calculate the loads of an outside branch circuit.
  3. Describe conductor covering and minimum size conductors.
  4. Explain the use of lighting equipment installed outdoors.
  5. Interpret the requirements for more than one building or other structure.
  6. Explain the wiring requirements on buildings.
  7. Identify the point of attachment and clearances from a building.
  8. Describe mechanical protection.
  9. Explain rain tight raceways and arranged to drain.
  10. Describe underground circuits and use of trees for support.
- F. Article 230, Service Installations
1. Explain the scope and definitions of section 230.
  2. Explain the rules for sizing a service.
  3. Explain the number of services allowed on a building.

4. Identify the rules for single building or structure not to be supplied through another building.
  5. Identify conductors considered outside a building.
  6. Explain service conductors separate from other conductors.
  7. Describe raceway seals and clearance from building openings.
  8. Calculate overhead conductors' size and rating.
  9. Identify clearance requirements and points of attachment.
  10. Identify the use of service masts as supports for the point of attachment.
  11. Describe underground service size and rating.
- G. Overcurrent Protection
1. Explain the scope of Article 240
  2. Locate the section on standard ampere ratings.
  3. Describe supplementary overcurrent protection.
  4. Explain ground fault protection of equipment.
  5. Describe the rules for underground conductors.
  6. Differentiate between damp and wet location.
  7. List the rules for Edison base fuses.
  8. List the rules for type S fuses.
  9. Describe the use of a circuit breaker.
  10. Define series rated equipment.
- IV. Grounding and Bonding
1. Explain the purpose of grounding.
  2. Differentiate between grounding and bonding.
  3. Define the term objectionable currents.
  4. Explain the rules for service system grounding.
  5. Define separately derived system.
  6. Explain the term made and other electrodes.
  7. List the rules for supplemental grounding electrodes.
  8. Define maximum resistance to ground.
  9. List the requirements for grounding and bonding on the line side of the service.
  10. List the requirements for grounding and bonding on the load side of the service.
  11. Define hazardous locations.
  12. Describe equipment bonding jumpers.
  13. List the rules for bonding of piping and building steel.
  14. Define a lightning protection system.
  15. Describe grounding of ranges and clothes dryers.
  16. Explain the rules for bonding receptacles and boxes
- V. Chapter 3 Wiring Methods and Materials
- A. Article 300, Wiring Methods
1. Define voltage and temperature limitations.
  2. Describe the rules for underground installations.

3. List the rules for securing and supporting.
  4. Describe the danger of multi-wire branch circuits.
  5. Explain length of free conductors.
  6. Calculate the number and size of conductors allowed in a raceway.
  7. Explain Induced currents in metal parts.
- B. Article 527, Temporary Wiring
1. Explain time constraints.
  2. List the rules for ground-fault protection of personnel.
- C. Article 310, Conductors for General Wiring
1. Differentiate between stranded and solid conductors.
  2. Define the rules for conductors in parallel.
  3. Explain insulation temperature limitation.
  4. Calculate conductor ampacity using temperature and bundling adjustment factors.
- D. Surface Raceways
1. Define flat conductor cable (FCC).
  2. List the uses and limitations of FCC.
  3. Describe the branch circuit ratings of FCC.
  4. Define electrical nonmetallic tubing (ENT).
  5. Describe the uses and limitations of type AC cable, MC cable, NM cable, SE, and USE cable, UF cable.
  6. List the installation requirements for intermediate metal conduit and rigid metal conduit, rigid nonmetallic conduit.
  7. Describe the use of flexible metal conduit, liquid-tight flexible metal conduit and liquid-tight nonmetallic flexible conduit.
  8. Describe the use of a multi-outlet assembly.
  9. Define wire-way.
- E. Outlet, Device, Pull and Junction Boxes.
1. Differentiate between nonmetallic and metal boxes.
  2. Define classified location for box installation.
  3. Calculate the number of conductors allowed in a box.
  4. Size a junction box.
  5. Calculate the size of a pull box when making an angle pull and a straight pull.
  6. Explain auxiliary gutters.
- F. Switchboards and Panelboards
1. Define working clearance.
  2. Distinguish between a lighting panelboard and appliance branch circuit panelboard.
  3. Describe overcurrent protection of a panelboard.
  4. Explain grounding of panelboards.
- VI. Chapter 4 Equipment for General Use
- A. Flexible cords and Fixture wire
1. Describe types of flexible cords.

2. Define fixture wire.
3. Identify allowable ampacities of fixture wire.
4. List the rules for overcurrent protection.
- B. Light Fixtures, Lamps and Receptacles
  1. Describe specified fixture locations.
  2. Explain fixture supports.
  3. Describe a receptacle installation.
  4. Explain the protection of recessed fixtures.
  5. Describe electric discharge lighting.
- C. Appliances
  1. Identify the branch circuit requirements for an appliance.
  2. Describe over current protection.
  3. Explain disconnecting means.
  4. Describe the rules for baseboard heaters.
- D. Article 450, Transformers
  1. List the rules for over current protection on a transformer.
  2. Explain ventilation requirements.
  3. Size the conductors for the primary side of a transformer.
  4. Size the conductors for the secondary side of a transformer.

## **COURSE LEARNING OUTCOMES AND COMPETENCIES**

Upon successful completion of this course, the student will:

- A. Explain the purpose and history of NEC and layout.
  1. Explain why and when the NEC was developed.
  2. Explain how the NEC has a distinct layout format.
  3. Explain the purpose of the NFPA.
  4. Explain the protection of people and property.
  5. Explain mandatory and informational in the NEC.
  6. Explain code arrangement and enforcement of the NEC.
  7. Explain safety and wiring planning of the NEC.
- B. Interpret and apply general requirements of the NEC.
  8. Explain nominal voltages and conductor methods.
  9. Explain approval of equipment by authority having jurisdiction.
  10. Describe identification, installation and use of equipment.
  11. Explain what professionals use NEC.
  12. Explain code arrangement and enforcement.
- C. Interpret and apply wiring and protection requirements.
  13. Explain the connection to grounded system.
  14. Explain and describe branch circuits wiring.
  15. Explain color code for branch circuit wiring.

16. Calculate branch circuit requirements.
  17. Interpret and calculate lighting outlet requirements.
  18. Interpret and calculate voltages for various loads.
  19. Interpret and explain the sizes for underground service.
  20. Explain the rules for system grounding.
  21. Interpret and apply wiring for grounding and bonding.
- D. Interpret and apply wiring and protection requirements.
22. Explain voltage and temperature limitations.
  23. Interpret and apply wiring methods to secure and support.
  24. Describe the rules for underground installations.
  25. Calculate the number and size of conductors in a raceway.
  26. Explain the rules for ground fault protection wiring.
  27. Describe the use of flexible metal conduit for wiring.
  28. Interpret and apply wiring rules for parallel circuits.
  29. Explain the over current protection on panel boards.
- E. Interpret and apply wiring methods and materials.
30. Describe the minimum number of circuits are allowed in various locations in a home or business.
  31. List the number of branch circuits for the average home.
  32. Explain voltage limitations and use for receptacles.
  33. Interpret and apply the use of flat conductor cable.
  34. Interpret and apply the use of electrical metallic tubing.
  35. Interpret and apply the calculation for conductors in a raceway.
  36. Interpret and apply over current and grounding of a panelboard.
- F. Install equipment for general use.
37. Install flexible cords and fixture wires.
  38. Install light fixtures lamps and receptacles.
  39. Install branch circuits for appliances.
  40. Install transformers and over current protection.

## **ASSESSMENT OF COURSE LEARNING OUTCOMES AND COMPETENCIES**

Student progress is evaluated through both formative and summative assessment methods. Specific details may be found in the instructor's course information document.

## **COLLEGE POLICIES AND PROCEDURES**

*Student Handbook*

<https://www.kckcc.edu/files/docs/student-resources/student-handbook-and-code-of-conduct.pdf>

*College Catalog*

<https://www.kckcc.edu/academics/catalog/index.html>

*College Policies and Statements*

<https://www.kckcc.edu/about/policies-statements/index.html>

*Accessibility and Accommodations*

<https://www.kckcc.edu/academics/resources/student-accessibility-support-services/index.html>.