

BI 0801 - BASIC ELECTRICITY AND WIRING FUNDAMENTALS

Catalog Description

Formerly known as CET 801

Prerequisite: Completion of BI 800 with grade of "Pass"

Hours: 40 (20 lecture, 20 laboratory)

Description: This comprehensive introduction to electrical wiring provides a well-rounded understanding of the fundamentals of basic electricity, electrical safety, electrical circuitry, and the processes and procedures of the electrical wiring trades. Includes relevant electrical codes. Students required to secure personal protective equipment as of first class session. (pass/no pass grading) (noncredit)

Course Student Learning Outcomes

- CSLO #1: Demonstrate proper/safe use of typical wiring tools and materials during specified wiring activities to industry standard.
- CSLO #2: Demonstrate how to correctly install the assigned outlet, components and lighting circuits, with the materials provided, to comply with code, to industry standard.
- CSLO #3: Apply the electrical code by correctly specifying wiring type, gauge, and color code for the assigned wiring activity.

Effective Term

Fall 2020

Course Type

Noncredit

Contact Hours

40

Outside of Class Hours

14

Total Student Learning Hours

54

Course Objectives

Lecture Objectives:

1. List five sources of electricity.
2. Describe the fundamentals of electric theory.
3. Describe the fundamentals of direct current (DC) theory.
4. Describe the flow of power in DC circuits.
5. Describe the operation of a simple battery or cell.
6. Describe polarity as it applies to batteries.
7. Explain the fundamentals of alternating current (AC) theory.
8. Define electrical terms and concepts to include: electricity; static electricity; direct current (DC); alternating current (AC); electrons; magnetism; polarity; conductors; insulators; semiconductors; Volts; amps; watts; ohms, etc.
9. List the four factors of electrical resistance.
10. Demonstrate knowledge of electricity and wiring fundamentals.

11. Identify gauge, type and color code or typical interior outlet circuit.
12. Understand the fundamentals of overcurrent protection and breaker sizing.
13. Correctly size circuit breakers for a variety of typical 120v circuits.
14. Explain the purpose and basic function of GFCI and AFCI protection devices.
15. Correctly identify elements of a simple circuit.
16. Draw both a series circuit and a parallel circuit and note the differences of each.
17. List the rules governing voltage and amperage in a parallel circuit.
18. Explain the importance of transformers in the electrical distribution systems.
19. Identify both step-up and step-down transformers.
20. Describe single split phase and three-phase power systems and their generation.
21. Display knowledge of typical lighting circuits.
22. Demonstrate how to correctly diagram single pole, three-way, and four-way switch circuits.
23. Demonstrate how to make accurate calculations using Ohms Law and the Power Formula.
24. Demonstrate safe use of meters and diagnostic gear required during wiring activities.
25. Explain how being shocked by less than half an amp of current can be fatal.

Laboratory Objectives:

1. Demonstrate safety rules and protocols during all electrical lab activities.
2. Demonstrate a firm understanding of electrical safety to include using Lock-out / Tag-out procedures on any circuit that could become energized "live" during electrical work.
3. Calculate safe wire size & type for a variety of electrical circuits & applications.
4. Correctly strip various gauges of wire and make accurate splice connections.
5. Demonstrate how to work safely with the tools of the wiring and lighting retrofit trades.
6. Apply code requirements during electrical wiring installations.
7. Demonstrate how to correctly wire typical electrical circuits found in residential wiring situations to include: outlet circuits; lighting circuits; small appliance circuits; GFCI & AFCI circuits, 240v dedicated circuits, etc.
8. Demonstrate how to wire a variety of lighting circuits for both interior and exterior applications.
9. Demonstrate how to wire single pole, three way, and Four way light switch circuits.
10. Identify the correct conduit for specific wiring applications.
11. Install EMT conduit for and interior light circuit.
12. Demonstrate how to measure, cut, & pull wire in conduit from the switch box to light box.
13. Safely use ladders when accessing ceiling and wall mounted fixtures.
14. Demonstrate how to wire a variety of electrical devices: outlets, switches, & lights.
15. Understand the on-the-job terminology and vocabulary of the wiring trade.
16. Calculate total loads for a structure to determine minimum electrical service size.
17. Prepare proper grounding for service load for UFER and ground rod applications.
18. Classify the correct circuit breaker for a variety of typical circuits.
19. Differentiate between 120v and 240v circuit breakers in a residential service.

20. Demonstrate how to wire neutral and ground wires to the service panel.

21. Install a variety of circuit breakers – from 15 to 50 amps in the service panel.

General Education Information

- Approved College Associate Degree GE Applicability
- CSU GE Applicability (Recommended-requires CSU approval)
- Cal-GETC Applicability (Recommended - Requires External Approval)
- IGETC Applicability (Recommended-requires CSU/UC approval)

Articulation Information

- Not Transferable

Methods of Evaluation

- Objective Examinations
 - Example: Students will answer questions on basic electrical theory, electrical practices, and codes. Example: Describe the difference between AC and DC. Points will be assigned to each question and converted to a letter grade.
- Skill Demonstrations
 - Example: Students will demonstrate correct wiring and installation techniques, safe use of various meters, diagnostic tools and equipment, follow proper installation procedures, and observe OSHA safety protocols. The grading is determined by a grading rubric.

Repeatable

Yes

Methods of Instruction

- Laboratory
- Lecture/Discussion

Lab:

1. Instructor will lecture on typical methods of electrical circuit sizing and installation. The student will be given an opportunity to clarify any questions in an instructor-guided discussion. (Lecture Objective 12)

Lecture:

1. Lab techniques will be presented in a "describe / show / review" methodology. Students will complete a safety test before using equipment. Instructor will work with students until they can successfully complete the test with 100% success rate. (Lab Objective 1)

Typical Out of Class Assignments

Reading Assignments

1. Read the assignment on electrical blueprint symbols and be prepared to review the symbols in class, followed by a quiz. 2. Read the wiring color code handout and be prepared to discuss in class.

Writing, Problem Solving or Performance

1. Work the Watts Law and Ohms law math problems from the assigned worksheets. 2. Layout assigned circuits following NEC guidelines and

proper electrical plan symbols on the graph paper provided and be prepared to discuss in class.

Other (Term projects, research papers, portfolios, etc.)

1. From the assignment guide and the NEC handout, complete the wire color code sheets – complying with current code. 2. Maintain a class notebook organized by topic that includes lecture notes, lab notes, class handouts, and supplementary materials.

Required Materials

- Electrical Wiring Residential
 - Author: Ray C. Mullin
 - Publisher: Cengage Learning
 - Publication Date:
 - Text Edition: 19th
 - Classic Textbook?: No
 - OER Link:
 - OER:
- The Ultimate Guide to Wiring
 - Author: John Calloggen and Rex Cauldwell
 - Publisher: Federation Marketing Corp, Mahwah, NJ
 - Publication Date: 2017
 - Text Edition: 5th
 - Classic Textbook?: No
 - OER Link:
 - OER:
- National Electrical Code (NEC)
 - Author: National Fire Protection Association
 - Publisher: Nat. Fire Protection Association (NFPA), Quincy, Mass
 - Publication Date: 2017
 - Text Edition:
 - Classic Textbook?: No
 - OER Link:
 - OER:

Other materials and-or supplies required of students that contribute to the cost of the course.

Student manuals provided by the instructor.