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ETEC 191.50: NCC ER Electrical and Core

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APPLIED COMPUTING AND ENGINEERING TECHNOLOGY DEPARTMENT
ENERGY TECHNOLOGY PROGRAM

**NCCER Electrical and Core
Syllabus**

Course number:	ETEC 191
Credits:	3
Instructor:	Bradley Layton
Course Format:	Online with Face-to-face recording sessions
Office hours:	TR 9:00 – 10:30a
Contact:	(406) 243-7865, bradley.layton@umontana.edu
Final:	Online during Finals Week or F2F by appointment

Corequisites:

Familiarity with computers and the Internet. Students must possess basic word processing skills, be able to download and open files, and perform functions such as loading software and navigating between folders and files. Familiarity with basic computing skills is a must for online courses and will significantly influence your course experience.

Description:

Students will learn the fundamentals of installing electrical systems in structures. These systems will include wiring, circuit breaker panels, switches, and light fixtures. Students will also learn to read and follow blueprints in accordance with the National Electrical Code® as well as state and local codes. The course largely follows the first level of NCCER's 4-level Electrical curriculum that complies with DOL time-based standards for apprenticeship.

Course Objectives/Outcomes:

At the completion of this course students should be able to:

- 1.1. Describe the apprenticeship/training process for electricians.
- 1.2. Describe various career paths/opportunities one might follow in the electrical trade.
- 1.3. Define the various sectors of the electrical industry.
- 1.4. State the tasks typically performed by an electrician.
- 1.5. Explain the responsibilities and aptitudes of an electrician.
- 2.1. Recognize safe working practices in the construction environment.
- 2.2. Explain the purpose of OSHA and how it promotes safety on the job.
- 2.3. Identify electrical hazards and how to avoid or minimize them in the workplace.
- 2.4. Explain electrical safety issues concerning lockout/tagout procedures, confined space entry, respiratory protection, and fall protection systems.
- 2.5. Develop a task plan and a hazard assessment for a given task and select the appropriate PPE (personal protective equipment) and work methods to safely perform the task.
- 3.1. Define voltage and identify the ways in which it can be produced.
- 3.2. Explain the difference between conductors and insulators.
- 3.3. Define the units of measurement that are used to measure the properties of electricity.
- 3.4. Identify the meters used to measure voltage, current, and resistance.

- 3.5. Explain the basic characteristics of series and parallel circuits.
- 4.1. Explain the basic characteristics of combination circuits.
- 4.2. Calculate, using Kirchhoff's voltage law, the voltage drop in series, parallel, and series-parallel circuits.
- 4.3. Calculate, using Kirchhoff's current law, the total current in parallel and series-parallel circuits.
- 4.4. Using Ohm's law, find the unknown parameters in series, parallel, and series-parallel circuits.
- 5.1. Explain the purpose and history of the *NEC*®.
- 5.2. Describe the layout of the *NEC*®.
- 5.3. Demonstrate how to navigate the *NEC*®.
- 5.4. Describe the purpose of the National Electrical Manufacturers Association and the NFPA.
- 5.5. Explain the role of nationally recognized testing laboratories.
- 6.1. Describe the different types of nonmetallic and metallic boxes.
- 6.2. Calculate the *NEC*® fill requirements for boxes under 100 cubic inches.
- 6.3. Identify the appropriate box type and size for a given application.
- 6.4. Select and demonstrate the appropriate method for mounting a given box.
- 7.1. Identify the methods for hand bending and installing conduit.
- 7.2. Determine conduit bends.
- 7.3. Make 90° bends, back-to-back bends, offsets, kicks, and saddle bends using a hand bender.
- 7.4. Cut, ream, and thread conduit.
- 8.1. Identify and select various types and sizes of raceways and fittings for a given application.
- 8.2. Identify various methods used to fabricate (join) and install raceway systems.
- 8.3. Identify uses permitted for selected raceways.
- 8.4. Demonstrate how to install a flexible raceway system.
- 8.5. Terminate a selected raceway system.
- 8.6. Identify the appropriate conduit body for a given application.
- 9.1. From the cable markings, describe the insulation and jacket material, conductor size and type, number of conductors, temperature rating, voltage rating, and permitted uses.
- 9.2. Determine the allowable ampacity of a conductor for a given application.
- 9.3. Identify the *NEC*® requirements for color coding of conductors.
- 9.4. Install conductors in a raceway system.
- 11.1. Explain the role of the *National Electrical Code*® in residential wiring and describe how to determine electric service requirements for dwellings.
- 11.2. Explain the grounding requirements of a residential electric service.
- 11.3. Calculate and select service-entrance equipment.
- 11.4. Select the proper wiring methods for various types of residences.
- 11.5. Compute branch circuit loads and explain their installation requirements.
- 11.6. Explain the types and purposes of equipment grounding conductors.
- 11.7. Explain the purpose of ground fault circuit interrupters and tell where they must be installed.
- 11.8. Size outlet boxes and select the proper type for different wiring methods.
- 11.9. Describe rules for installing electric space heating and HVAC equipment.
- 11.10. Describe the installation rules for electrical systems around swimming pools, spas, and hot tubs.

- 11.11. Explain how wiring devices are selected and installed.
- 11.12. Describe the installation and control of lighting fixtures.
- 12.1. Explain the operations of and describe the following pieces of test equipment:
 - Voltmeter
 - Ohmmeter
 - Clamp-on ammeter
 - Multimeter
 - Megohmmeter
 - Motor and phase rotation testers
- 12.2. Select the appropriate meter for a given work environment based on category ratings.
- 12.3. Identify the safety hazards associated with the various types of test equipment.

For additional objectives, please see [LP CEP 2](#)

Required Texts/Materials:

- *Electrical Level One* PowerPoint®
- Computer
- Appropriate personal protective equipment
- *Careers in Construction*,
- © 2006, NCCER/Pearson Education
- Copies of the latest editions of the *NEC*® and *NFPA 70E*® standards
- Help-wanted section from an electrical trade publication
- Samples of NCCER Training Credentials Employee manual
- *OSHA Safety and Health Standards for the Construction Industry (29 CFR, Part 1926)*
- TV/VCR/DVD player (*optional*)
- Module Examination*

Required laboratory supplies:

Supplies will be provided.

Computer Hardware and Software:

The information for this course is presented in several formats. The student must be able to open and read Microsoft Word as well as PDF files. Numerous web site references will be used. Since several of the documents that will be used in this course are relatively large PDF files, ***the speed of your computer and of your Internet access will impact your online experience.***

If you have problems accessing course material, your browser may very well be the culprit. Because I will need to reset Test and Quiz access, please contact me directly if you have a technical problem while taking a Quiz or Test (See the Technical Glitches section under the Assessment/Grading Policies heading below for details). UM online Tech Support can be reached from the "Tech Support" tab in the Main Menu on Blackboard, or by calling 243-HELP (4357).

Assessment/Grading Policies:

The course will be evaluated according to the policies set forth on the [NCCER Electrical Level 1 website](#). A score of 70% or greater is required to pass.

Grading Summary:

25%- Learning Unit Quizzes
12.5%- Special Assignment
12.5%- Experimental write-up
25%- Mid-Term Exam
25%- Final Exam

Late Work: Late assignments and missed Quizzes or Exams will receive a score of zero. If you have an extenuating circumstance that will prohibit you from meeting a deadline, please contact me well in advance of the deadline and I will make reasonable accommodations.

Technical Glitches: If you encounter a technical problem that prohibits you from completing a Quiz or Test, please e-mail me immediately with details of the problem. We will work with Technical Support to resolve the problem as expeditiously as possible. You will not be penalized in any way for technical problems with Moodle, or technical failings that the fault of the instructor.

Homework: The weekly Learning Unit contents will be made available at 8 AM (Mountain Time) on the Monday of that week's Learning Unit. Quizzes will be available from within each Learning Unit. You are to complete the Quiz and click on the "Submit" button by 11:55 PM (Mountain Time) on the Sunday of the week in which that Learning Unit is scheduled. Correct Quiz answers will be posted within that Learning Unit on the following Monday.

P/NP option: A student must earn the equivalent of a letter grade of A, B, or C for a P.

Online support may be obtained via courseware-support@umontana.edu or x4999

Topical Outline:

Each Learning Unit will include a summary of the week's assignments and a PowerPoint "lecture" that has been converted to a PDF (for compatibility reasons). Assigned readings will be in the text book, PDF files imbedded in the learning unit, and in documents available on the Internet. The length of the PDF lecture will vary depending on how well that topic is covered by the textbook and supplemental reading sources. There are thirteen Learning Units. There will be no Learning Unit the week of the Mid-term Exam.

Week 1: The Electrical Trade; Review and Testing
Week 2: Electrical Shock & Protective Equipment
Week 3: OSHA
Week 4: NFPA 70E
Week 5: Basic Tool Safety, Confined Space Entry & First Aid
Week 6: Solvents, Lead Safety, Toxic Vapors, Asbestos, Batteries, PCBs and Vapor Lamps
Week 7: Voltage and meters including motor testing
Week 8: Boxes and Connections
Week 9: Joining, Cutting and Reaming
Week 10: Conduit, Conduit Bending and Raceways
Week 11: Ampacity, temperature, color coding
Week 12: Pulling, terminating
Week 13: Drawings, schematics, floor plans
Week 14: Load calculations, lighting installation, GFCI

Calendar:

For a list of specific dates for this semester, see the [Provost's calendar](#).

Drop/Add Policy:

Refer to: http://www.umt.edu/catalog/policy_procedure.htm

Academic Honesty Policy:

All students must practice academic honesty. Academic misconduct is subject to an academic penalty by the course instructor and/or a disciplinary sanction by the University. All students need to be familiar with the Student Conduct Code. The Code is available for review online at <http://www.umt.edu/SA/VP/SA/index.cfm?page?1321>.

Students with Disabilities:

Students with disabilities will receive reasonable accommodations in this online course. To request course modifications, please contact me as soon as possible. I will work with you and Disability Services in the accommodation process. For more information, visit the Disability Services website at <http://www.umt.edu/dss/> or call 406.243.2243 (Voice/Text).

E-mail Policy at UMontana:

According to the University e-mail policy, an "employee must use *only* UM assigned student e-mail accounts for all e-mail exchanges with students, since such communication typically involves private student information." This means that **you must send any correspondence through your UMConnect account**. For more information on setting up and using your UMConnect account, please go to <http://www.umt.edu/it/email/studentemail.htm>.