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Iowa Lakes Community College is committed to ensuring that all programs and services, including electronic and our website (www.iowalakes.edu), are accessible to people with disabilities. In accordance with the provisions of Sections 504 and 508 of the Rehabilitation Act and the Americans with Disabilities Act (ADA), Iowa Lakes provides students, faculty, staff, and visitors with reasonable accommodations to ensure equal access to the programs and activities of the college. For more information visit: <https://www.iowalakes.edu/educational-counseling-services/accommodations-disability-resources>.

Doug Zemler is Electrical Technology Program Coordinator at Iowa Lakes Community College.

Updated in 2017, this course covers an introduction to residential electrical wiring and is offered in credit programs in a face-to-face format.

Course Syllabus

ELE-181

Electrical Wiring Residential

Wednesday Lecture, 8 am/ Monday Lab, 8 am and Friday Lab 8 am
Fall Semester/ 2017

Iowa Lakes Community College
300 South 18th St.
Estherville, IA 51334

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Office Hours: As posted on office door

Catalog Description: This course is designed to introduce students to residential wiring. Discussion topics will include safety, planning, using residential building plans, calculating loads, and wiring methods. Lab settings will require the student to use hand tools and wire circuits. The National Electrical

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Code will be used in depth to determine the requirements used for residential wiring. We will be using hand and power tools in the labs for wiring practices and installations.

Prerequisites:

Credits: 4

Text & Additional Materials: Electrical Wiring Residential, Delmar Thompson Learning

Course Objectives/Competencies:

Determine, establish and examine safety in the workplace

Describe license and permitting

Develop electrical plans

Interpret the National Electrical Code

Utilize electrical symbols

Establish a residential electrical plan layout

Discuss outlet, device and junction boxes

Install and discuss nonmetallic outlet boxes

Install and discuss ganged device boxes

Install and discuss box mounting

Discuss boxes for conduit wiring

Explain what a yoke is

Define number of conductors in a box

Selecting the correct box size

Decide the positioning of receptacles

Describe the basics of wiring sizing and loading

Make sense of computing loads

Calculating floor area

Determining minimum number of lighting branch circuits

Determine track lighting loads

Determining minimum number of small appliance branch circuits

Explain receptacle outlet branch circuits

Install and discuss conductors

Discuss permissible loads on branch circuits

Discuss voltage drop

Discuss conductor size

Install and discuss NM wiring

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Install and discuss AC and MC wiring
Install and discuss RNC conduit
Install and discuss EMT conduit
Install and discuss IMC conduit
Install and discuss RMC conduit
Install and discuss flexible metal conduit
Install and discuss SE cable
Discuss and install cables through wood and metal framing members
Installation through ducts
Select connectors for NM and AC cable
Describe conductor identification
Demonstrate connecting wiring devices
Demonstrate wiring a 3-way switch
Demonstrate wiring a 4-way switch
Describe push-in terminations
Install and discuss toggle switches
Discuss and wire combination and interchanging wiring devices
Install and discuss timers
Discuss code requirements for GFCI
Install and discuss GFCI in residential circuits
Describe a feed through GFCI
Discuss testing and recording of test data for GFCI receptacles
Discuss GFCI protection for temporary wiring
Install and discuss AFCI
Describe a TVSS system
Install and discuss types of luminaires
Install and discuss fluorescent ballast and lamps
Install and discuss incandescent lamps
Install and discuss LED lamps
Discuss residential lighting
Discuss estimating loads for outlets
Determining size of outlet boxes, device boxes, junction boxes and conduit bodies
Describe grounding of wall boxes
Install and discuss split-circuit receptacles
Discuss placing receptacles near baseboard heaters
Discuss luminaries in clothes closets
Discuss selection of boxes for ceiling suspended paddle fans
Discuss hallway lighting

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Discuss receptacles in hallway
Describe equipment grounding
Discuss clock outlets
Discuss small appliance branch circuits for kitchen
Discuss multi-wire circuits
Discuss track lighting
Install and discuss dimmer controls
Discuss valance lighting
Discuss surge suppressors
Install and discuss clothes dryer circuits
Install and discuss laundry receptacles
Discuss combination washer/dryer
Discuss attic lighting and pilot light switches
Discuss lighting in garage
Discuss receptacles in garage
Discuss landscape lighting
Discuss outdoor wiring
Discuss underground wiring
Discuss overhead garage door receptacles
Discuss cable installation on basements
Discuss conduit installation in basements
Explain de-rating factors
Explain correction factors
Explain overcurrent protection for conductors
Explain conductor sizing
Discuss water pump circuit
Discuss jet pump circuit
Discuss submersible pump circuit
Discuss water heater circuit
Discuss heat pump
Discuss code requirements for electric ranges, counter-mounted cooking units, wall mounted ovens
Discuss wall mounted oven circuits
Discuss and counter mounted oven circuit
Calculations for electric ranges, ovens and counter mounted cooking unit
Discuss heating elements
Discuss food waste disposal
Discuss a Dishwasher
Discuss Portable dishwasher

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Discuss cord connections of fixed appliances
Discuss bathroom ceiling heating circuits
Discuss and install exhaust fan
Discuss attic exhaust fan
Discuss humidity control
Discuss hydro-massage tub circuit
Discuss circuit requirements for electric furnaces
Discuss control of electric baseboard heating units
Discuss circuit requirements for electric baseboard heating
Discuss location of electric baseboard heaters
Discuss room air conditioners
Discuss central heating and air conditioning
Discuss and install wiring for home television
Discuss and install for satellite antennas
Install and discuss telephone wiring
Install and discuss signal systems (door chime)
Install and discuss heat, smoke, carbon monoxide detectors
Install and discuss fire alarm circuits
Explain the types of smoke detectors
Explain the types of heat detectors
Discuss installation requirements
Explain carbon monoxide detectors
Explain security systems
Install and discuss an overhead service
Discuss a mast type service
Discuss an underground service
Discuss and explain the main service disconnect location
Discuss and explain service entrance conductor sizing
Discuss and explain service entrance overcurrent protection
Discuss and explain service entrance raceway sizing
Discuss what a meter/meter base is
Explain grounding
Explain bonding
Install and discuss fuses
Install and discuss circuit breakers
Discuss and explain interrupt ratings for fuses and circuit breakers
Describe and explain how to calculate short circuit current
Install and discuss panel boards and load centers

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Discuss and explain size service entrance conductors and service disconnect means
Discuss types of watt-hour meters
Discuss reading watt-hour meters
Discuss swimming pool wiring
Discuss spas
Discuss hot tubs
Explain stand by power systems
Discuss transfer switches
Discuss disconnecting means
Discuss and explain conductor size from standby generator
Discuss and explain generator size recommendations

Course Schedule/Outline (Units of Instruction):

Electrical Symbols
Lighting and small appliance branch circuits
Wiring methods
Switching
GFCI
AFCI
Luminaries
Branch circuits
Special purpose outlets
Heating systems
TV, telephone, low voltage signal systems
Heat, smoke, carbon monoxide, fire alarms, security systems
Service entrance equipment
Overcurrent protection
Service entrance calculations
Swimming pools, spas, hot tubs, hydro massage baths
Home automation
Standby power systems

Methods of Instruction: Course will consist of two hours of lecture period, once each week, which may include covering text book assignments, discussion, demonstrations and other methods to be determined by the instructor.

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Grading Policies:

Scale: A = 90% to 100%
B = 80% to 89%
C = 70% to 79%
D = 60% to 69%
F = Less than 60%

Grading Policy: The instructor will determine the weight of each assessment towards overall points. Graded components are as follows:

Attendance
Assignments
Labs
Tests & Quizzes
Final Exam
Final Lab
Participation

Other Expectations: I believe that for learning to take place students must be actively involved. For this reason, I place emphasis on class attendance. Students are expected to attend all classes and labs. Attendance will be taken at the beginning of class. If you are late, you will not be given attendance credit for that day (remember, 10 percent of your grade is attendance). If you are late, enter the classroom quietly and do not disturb your fellow students. I give a ten-minute break during lectures. Use the restrooms at that time or get your drink. If you leave the classroom during lecture, you will be docked 10 points (other than emergency situations). If students are unable to attend classes, labs, or tests, the instructor is to be notified, by email or voice mail, before absence occurs. Three consecutive class absences require me to notify the main campus and they will get in touch with you. Habitual absences of three or more will go against your participation grade for the class (20 percent of your grade).

Students who are excused by the instructor will be allowed to make up work and tests. If you miss a class, it is your responsibility to get copies of notes or assignments from a fellow student. If you miss an assignment, you have one week to complete assignment. After that one week, if the work has not been turned in, you will receive zero points for the assignment. Students who are absent and have not notified the instructor will receive a 20 percent deduction on tests and assignments. Extra credit will not be given in this class. Incompletes are only issued when a student can establish a completion date. If you

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need to leave class early, let the instructor know ahead of time and leave quietly. Students who wish to leave the room while the test is in progress must submit their exam as completed. Deadlines for turning in labs, lab books, assignments and tests is strictly enforced (no exceptions). You need to listen to your instructor when that deadline is and write it down (no excuses).

Cell phone use (including texting) is prohibited in lecture and labs. If you are caught using your phone (except for an emergency situation) you will be docked 10 points for the day. If you are expecting an emergency call, please let me know prior to class (birth, family illness, etc.).

Students may use a laptop computer to take notes during lecture, provided it does not cause a distraction. The instructor will not notify students individually if assignments or deadlines are missed.

Students should utilize instructor office hours to determine missed assignments and grades.

Students are responsible for learning the course material covered during their absence.

Students are expected to conduct themselves in a professional manner.

Any behavior which is disruptive or unsafe may be grounds for removal from class.

Foul, profane, or vulgar language will not be tolerated in the classroom or in the field and a student or students will be told to leave the class. No smoking or chewing tobacco is allowed on campus grounds.

Students must abide by all policies as stated in the Iowa Lakes Community College Student Handbook.

Students should be aware that classes might be audio or video recorded by one or more students. The college's policies governing the audio or video recording of class are included in the Student Handbook. Students who have any questions or concerns about class recordings should address their questions or concerns with the instructor at the *beginning of the semester*.

STUDENT ACADEMIC HONESTY POLICY

Iowa Lakes Community College believes that personal integrity and academic honesty are fundamental to scholarship. Iowa Lakes strives to create an environment where the dignity of each person is recognized and an atmosphere of mutual trust exists between instructors and students. The faculty has confidence in the integrity of the students and encourages students to exercise good judgment in fulfilling this responsibility.

Actions contrary to academic integrity will not be tolerated. Activities that have the effect or intention of interfering with learning or fair evaluation of a student's work or performance are considered a breach of academic integrity. Examples of such unacceptable activities include, but are not limited to:

- **Cheating** (intentionally using or attempting to use unauthorized material, assistance or study aids in my academic work). For example, using a cheat sheet for a test, looking at another student's paper during an exam, stealing or buying all or parts of an exam or paper, altering and resubmitting work for a better grade without prior approval to do so, etc.
- **Plagiarism** (representing another's ideas, words, expressions or data in writing or presentation without giving proper credit, failing to cite a reference or failing to use proper documentation, using works of another gained over the Internet and submitted as one's own work).

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- **Falsification and/or misrepresentation of data** (submitting contrived or made-up information in any academic exercise). For example, making up data, citing non-existent sources, etc.
- **Facilitating Academic Dishonesty** (knowingly helping or attempting to help another violate any provision of the academic honesty policy). For example, working together on a take-home exam or other assignment when the option has not been made available, giving a paper/assignment to another student for his/her use, etc.
- **Multiple Submissions** (submitting, without prior approval from the instructor involved, any work submitted to fulfill academic requirements in another class). For example, submitting the same paper for two different classes, etc.
- **Unfair Advantage** (trying to gain unauthorized advantage over fellow students). For example, gaining or facilitating unauthorized access to exam materials (past or present); interfering with another student's efforts in an academic exercise; lying about the need for an extension on a paper or assignment; destroying, hiding, removing or keeping library materials, etc.

Disciplinary Action

Any violation of this policy will be treated as a serious matter. The instructor has primary responsibility over classroom behavior and maintaining academic integrity. Students who earn an "F" based on any violation of the Student Academic Honesty Policy may not withdraw from the class (and receive a grade of W). Depending on the nature and severity of the offense, Iowa Lakes Community College reserves the right to exercise disciplinary action as outlined in the Disciplinary Action Section of the Student Handbook.

Americans with Disabilities Act – Policy of Nondiscrimination

It is Iowa Lakes Community College policy to not discriminate against qualified individuals with disabilities and to provide reasonable accommodation(s), as required by law, to otherwise qualified applicants for admission or to students with disabilities in all education programs, activities, services and practices, including application procedures, admissions, course selection, the awarding of degrees, discipline and dismissal. Educational opportunities will not be denied to an otherwise qualified application or student because of the need to make reasonable accommodation(s) or modification(s) for the physical and mental impairment(s) of any such individual.

Iowa Lakes Community College students needing reasonable accommodation(s) and/or modification(s) should contact Jody Condon by phone at (712) 852-5219 or via email at jcondon@iowalakes.edu. To assure that accommodation(s) and/or modification(s) will be ready when classes start, students must make the request as soon as possible, before a semester begins.

It is the policy of Iowa Lakes Community College not to discriminate on the basis of sex, race, national origin, creed, age, marital status or disability in its education programs, activities, or employment policies, as required by Titles VI and VII of the 1964 Civil Rights Act, Title IX of the 1972 Educational Amendments, Section 504 of the Federal Rehabilitation Act of 1973 and Title II of the Americans with Disabilities Act (ADA) of 1990.

Inquiries regarding compliance with Title IX, Title VI, Title VII, or Section 504 may be directed to Kathy Muller, Human Resources, Iowa Lakes Community College, 19 S. Seventh Street, Estherville, IA 51334, telephone (712) 362-0433; to the Director of the Iowa Civil Rights Commission, Des Moines; or to the Director of the Region VII Office of Civil Rights, Department of Education, Kansas City, Missouri.

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