

7900001

ELECTRICAL SYSTEMS

COURSE INFORMATION

Credits: 3

PREREQUISITES AND/OR COREQUISITES

1700023 APPLIED MATH

COURSE DESCRIPTION

Students will gain knowledge and hands-on experience in DC and AC circuits and principles, electrical measurement instruments, electrical safety, conductor sizes and types, wiring applications, wiring techniques, and troubleshooting.

COURSE GOALS

- I. Demonstrate safety and safe work habits for an industrial shop.
- II. Identify the major parts of both DC series and parallel circuits.
- III. Explain the terms 'voltage', 'current', and 'resistance'.
- IV. Explain how to perform any mathematical computations necessary to solve electrical circuits.
- V. Explain the types of wire splicing devices/methods available to the electrician.
- VI. Explain magnetic principles appropriate to the study of electronic circuits.

STUDENT LEARNING OUTCOMES

- I. Safety
 - A. Describe the effect of electrical shock on a human being.
 - B. Demonstrate, at all times, the appropriate behavior when working with electrical systems and devices.
 - C. Identify various lockout/tagout devices specific to the electrical trade, and demonstrate their use in a laboratory environment
 - D. Wear appropriate safety and personal protective equipment in all laboratory exercises.
- II. Tool Identification and Use
 - A. Identify the applications and proper uses for digital and analog meters.
 - B. Demonstrate the proper applications of voltage testers.
 - C. Demonstrate the appropriate use of wire strippers and electrical tools
- III. DC Theory
 - A. Identify the major parts of both DC series and parallel circuits, define the terms 'voltage', 'current', and 'resistance' with respect to basic circuit analysis and operation, and perform appropriate calculations.
 - B. Differentiate between voltage rise sources and voltage drop sources, and state the points in a given circuit where each would be located.

- C. Perform resistance measurements, voltage rise and drop measurements, and current measurements using a DMM in a safe and approved manner with a minimum accuracy of 90%.
 - D. Perform any mathematical computations necessary to solve electrical circuits and problems.
- IV. AC Theory
- A. Identify the major parts of both AC series and parallel circuits, define the terms 'voltage', 'current', and 'resistance' with respect to basic circuit analysis and operation, and perform appropriate calculations.
 - B. Differentiate between peak, peak-to-peak, average and RMS voltages, and perform conversion calculations as required.
 - C. Perform resistance measurements, voltage rise and drop measurements, and current measurements using a DMM in a safe and approved manner.
 - D. Perform any mathematical computations necessary to solve electrical circuits and problems.
- V. Conductor Sizes and Types
- A. Describe the 'mil' unit and perform calculations necessary to determine circular mil area, square mil area, and conversions between the measures.
 - B. State the factors affecting the resistivity of a material, and perform calculations to determine the resistance of a given conductor.
 - C. Specify the effects that temperature will have on a given conductor, perform temperature conversions, and calculate the resistance of a particular material when given the temperature conditions.
 - D. List several types of common insulation materials used for electrical conductors, utilize the NEC charts to determine ampacity, and specify the most appropriate insulation for various applications.
- VI. Wiring Methods
- A. Calculate line loss and line drop for a given conductor.
 - B. Describe the types of wire splicing devices/methods available to the electrician, and state the applications and advantages/disadvantages for each.
 - C. Design, wire, and troubleshoot two-way, three-way, four-way, split outlet, and various other electrical circuits in a timely fashion and according to NEC and company specifications.
- VII. Magnetic Theory and Applications
- A. Describe the three major classes of magnets, the laws describing their actions, and state the major magnetic materials and their properties with a minimum acceptable score of 77.5%
 - B. Demonstrate the left-hand rules for conductors and coils, and state what each part of the hand indicates.
 - C. List the rules for magnetic lines of force, and their application to the operation of electromagnets.
 - D. Define the terms used to describe magnetic characteristics.
 - E. List magnetic principles appropriate to the study of electronic circuits, determine applications of magnetism in these circuits, and calculate various appropriate magnetic values.
- VIII. Electrical troubleshooting
- A. Demonstrate the use of voltmeters, ammeters, ohmmeters, and megohmmeters in troubleshooting.
 - B. Demonstrate knowledge of individual component operation to be able to troubleshoot component.

- C. Use meters to troubleshoot a non-functioning circuit.
- D. Describe safety procedures for conducting live-circuit troubleshooting.

COURSE MATERIALS

Industrial Electricity 9th edition, Michael E. Brumbach, Cengage Learning ISBN#978-1-285-86398-6

GRADING CRITERIA

Students can expect to be graded on Written Assignments, Quizzes, Tests, Lab Activities, and Attendance. There is currently no scheduled time available to makeup classes or labs that are missed.

PARTICIPATION/ATTENDANCE POLICY

Students can expect that attendance/participation will be a part of their final grade, and determined by the instructor at his/her discretion. Students are encouraged to attend every class as regular attendance as it contributes to successful course completion and will impact the final grade.

COURSE EXPECTATIONS

For successful completion of this course, students are expected to Read Course Material, Complete all Assignments, Take Notes, Study and Participate in classroom discussions.

ACADEMIC INTEGRITY AND CONDUCT POLICY

The integrity of a class and program rests on the principle that the grades awarded to students must reflect only their own individual efforts and achievement. Students are required to perform the work specified by the instructor and are responsible for the content of work submitted, such as papers, reports, examinations, and other work. Violations of academic integrity include various types of plagiarism and cheating.

Plagiarism

Plagiarism includes, but is not limited to:

- Using exact words from a source without appropriate crediting
- Cutting and pasting electronically from any source without appropriate crediting
- Using wording and/or sentence structure too close to the original in paraphrasing
- Using visual images in whole or in part created by someone else without appropriate crediting
- Buying a paper and presenting any part of it as your own
- Borrowing any part of a paper and presenting it as your own without appropriate crediting
- Falsifying or inventing any information or citation in an academic exercise

Cheating

Cheating includes, but is not limited to:

- Obtaining or giving assistance in any academic work such as on quizzes, tests, homework, etc., without instructor's consent
- Taking a test or course or turning in work for someone else
- Allowing someone to take a test or course or turn in work in your name
- Using crib notes or electronic devices to get unauthorized assistance on tests or other in-class work
- Using work from another class or previous semester without instructor consent

CLASS CANCELLATION POLICY

Class meetings can occasionally be called off due to bad weather, check the local news and radio for information or call 319-296-4444 for the current status of college closings, class cancelations, delay start, or early dismissal information.

STUDENTS' SPECIAL NEEDS STATEMENT

Hawkeye Community College (HCC) strives for student-centered, quality education with flexibility to allow for students' special needs. Students with physical, mental, or learning disabilities should contact the Special Needs Coordinator in Student Services at 319-296-4014 or specialneeds@hawkeyecollege.edu to learn how to apply for accommodations at HCC. Or, visit our website for more information and forms: <http://www.hawkeyecollege.edu/students/services/student-disability-services/default.aspx>

NONDISCRIMINATION STATEMENT

Hawkeye Community College does not discriminate on the basis of sex; race; age; color; creed; national origin; religion; disability; sexual orientation; gender identity; genetic information; political affiliation; or actual or potential parental, family, or marital status in its programs, activities, or employment practices as required by Iowa Code §§ 216.6 and 216.9, Titles VI and VII of the Civil Rights Act of 1964 (42 U.S.C. §§ 2000d and 2000e), the Equal Pay Act of 1973 (29 U.S.C. § 206, et seq.), Title IX (Educational Amendments, 20 U.S.C. §§ 1681-1688), Section 504 (Rehabilitation Act of 1973, 29 U.S.C. § 794), and Title II of the Americans with Disabilities Act (42 U.S.C. § 12101, et seq.). Veteran status is also included to the extent covered by law. Any person alleging a violation of equity regulations shall have the right to file a formal complaint. Inquiries concerning application of this statement should be addressed to: John Clopton (Equity Coordinator and Title IX Coordinator for Employees) or Nancy Henderson (Title IX Coordinator for Students), Hawkeye Community College, 1501 East Orange Road, P.O. Box 8015, Waterloo, Iowa 50704-8015, telephone 319-296-4405, email: equity-titleIX@hawkeyecollege.edu, or the Director of the Office for Civil Rights, U.S. Department of Education, Citigroup Center, 500 W. Madison, Suite 1475, Chicago, IL 60661, phone number 312/730-1560, fax 312/730-1576.

DISCLAIMER

This syllabus is believed to be accurate at the time it was written. However, the instructor reserves the right to make changes as deemed necessary, provided notification is given to the students.

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