

7700005

MOTORS AND CONTROLS

COURSE INFORMATION

Credits: 2

PREREQUISITES AND/OR COREQUISITES

A minimum grade of C in 7900001 ELECTRICAL SYSTEMS

COURSE DESCRIPTION

This class stresses motor control systems, devices, circuit design and construction, and troubleshooting techniques. Specific topics will include electrical safety, lockout/tagout procedures, relays, timers, pilot devices, and solid state control technologies. Extensive laboratory exercises using industrial-grade components will enhance classroom studies.

COURSE GOALS

- I. Identify the factors influencing the selection of a motor control system.
- II. Identify the correct size and type of overload device for a particular installation.
- III. Identify a device from its NEMA symbol and create a circuit to accomplish a specified operation when given a sequence of operations.
- IV. Explain the various types and configurations of mechanical and solid-state timing and control relays, list the typical contact types, and explain their operation.
- V. Describe the operation and construction of common pilot devices such as: pushbutton switches, limit switches, and selector switches.
- VI. Explain how to design, wire, troubleshoot, and operate control circuits in a timely, safe, and competent manner.

STUDENT LEARNING OUTCOMES

- I. Introduction to Motor Control
 - A. List the factors influencing the selection of a motor control system.
 - B. Specify the correct size and type of overload device for a particular installation, correctly install the component, and test the system for proper function.
- II. Circuit Layout and Connections
 - A. Identify a device from its NEMA symbol, draw the symbol for a given device, and create a circuit to accomplish a specified operation when given a sequence of operations.
 - B. Explain the difference between standard-duty and heavy-duty pushbuttons and pilot devices.
- III. Relays, timers, and operations
 - A. Characterize the various types and configurations of electromechanical and solid-state timing relays, list the typical contact types, and explain their operation.
 - B. List the various criteria utilized to select a timing device for a particular application.

- IV. Control Pilot Devices
 - A. Given a particular control pilot device the student will state its type, explain its operation, list its characteristics, and demonstrate its uses.
 - B. Describe the operation and construction of common pilot devices such as: pushbutton switches, selector switches, and limit switches.
- V. Basic Control Circuits
 - A. Explain the differences between two-wire and three-wire wiring schemes, and specify the type of control for a stated installation.
 - B. List the major types of safety interlocking used in control circuits.
 - C. Design, wire, troubleshoot, and operate control circuits in a timely, safe, and competent manner.
- VI. Reduced Voltage Starters
 - A. Describe the reasons for the use of reduced voltage/current in a motor starting system.
 - B. Explain the operation of the following types of reduced voltage starting methods: primary resistor, autotransformer, part-winding, star-delta, and variable-frequency drives.
- VII. Electrical troubleshooting
 - A. Demonstrate knowledge of individual component operation to be able to troubleshoot component.
 - B. Demonstrate knowledge of individual component operation to be able to troubleshoot circuit loads.
 - C. Use meters to troubleshoot a non-functioning circuit.
 - D. Describe safety procedures for conducting live-circuit troubleshooting.

COURSE MATERIALS

Understanding Motor Controls 3rd edition, Stephen L. Herman, Cengage Learning, ISBN#978-1-305-49812-9

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 cancellations, 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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