7700006 INSTRUMENTATION

COURSE INFORMATION
Credits: 2

PREREQUISITES AND/OR COREQUISITES

A minimum grade C in 7900001 ELECTRICAL SYSTEMS

COURSE DESCRIPTION

With the increase in computer-controlled systems in modern business and industry the study of instrumentation and transducers is vital to a maintenance technicians education. This course will concentrate on the types of instrumentation currently available, interfacing and cabling techniques, signal conditioning, noise control, and applications and troubleshooting of complete systems.

COURSE GOALS

I. Explain and identify various types of pressure, flow, level, position, temperature, and force transducers.
II. Explain the difference between analog transducers and digital sensors, and explain applications suited to each type.
III. Describe the potential advantages and disadvantages associated with voltage and current loop transducer technologies.
IV. Correctly specify and interface various sensor types for PLC applications.
V. Demonstrate how to create control systems for various specified systems.
VI. Demonstrate how to install, troubleshoot and maintain instrumentation systems.

STUDENT LEARNING OUTCOMES

I. Introduction to instrumentation
    A. Create and describe block diagrams of instrumentation systems.
    B. List general types of analog transducers.
    C. Describe various classifications of digital sensor technologies.
    D. State applications for computer-controlled instrumentation.
II. Temperature instrumentation technologies
    A. List the various styles and characteristics of thermocouples.
    B. Describe the properties of and applications for RTD's.
    C. State the applications appropriate for thermistors.
    D. Apply and maintain I.C. temperature sensor systems.
III. Pressure transducers
    A. Recognize and list the properties of Bourdon tube and diaphram devices.
    B. Describe the characteristics and applications for strain gages.
    C. Set up and maintain load cells.

IV. Flow transducers
    A. List the characteristics of various types of flowmeters.
    B. Summarize sonic flow measurement techniques and applications.
    C. State the advantages and disadvantages of venturi flow systems.
V. Level sensing systems
    A. Describe ultrasonic level measurement devices and techniques.
    B. List applications for resistive level sensors.
    C. Set up and utilize optical level transducers.
VI. Instrumentation cabling
    A. Summarize the types of cables and cabling techniques.
    B. Demonstrate proper instrumentation cabling grounding methods.
VII. Signal Conditioning
    A. Describe the methods for eliminating noise and the effects of noise.
    B. Set up and apply differential amplifiers and Wheatstone bridges.
    C. List the advantages for both voltage and current loop systems.
VIII. Instrumentation interfacing and applications
    A. Specify and apply instrumentation for a stated application.
    B. Demonstrate applications for instrumentation.
    C. Illustrate and apply various interfacing techniques.
IX. Installing, maintaining, and troubleshooting transducer systems
    A. Use laboratory equipment develop and apply instrumentation devices.

COURSE MATERIALS

Instrumentation and Process Control 6th edition, Franklyn W. Kirk, American Technical Publishers, ISBN#978-0-8269-3442-0 and, Instrumentation and Process Control Workbook 6th edition, Thomas A Weedon, American Technical Publishers, ISBN#978-0-8269-3443-7

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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