Course Information

Division: Applied Science and Engineering Technology

Contact Hours: 90

Total Credits: 4.0

Prerequisites: ELEC 125, ELEC 132 Co-Requisite

Course Description

This course will provide students with the necessary background, theory and laboratory experience to utilize Windows-based computers, LabView software, interface hardware and software for data recording, analysis and on-line control of industrial processes. Multiple inputs and data logging, A/D conversion and various computer interface bus standards are discussed and implemented. This course also examines the characteristics and limitations of common electronic instruments. Topics covered include safety and lab techniques, op-amp circuits, AC and DC meters, digital multimeters, oscilloscopes, potentiometers and potentiometric bridges, transducers, signal-processing circuits, fiber optics and automatic test equipment.

This course is a required core course for students pursuing a degree in Electrical Engineering Technology.

Program Outcomes Addressed by this Course:

Upon successful completion of this course, students should be able to meet the program outcomes listed below:

A. Acquire and apply technical expertise in the areas of Circuit analysis, Analog electronics, Digital electronics, Microprocessors, and Communication systems.
B. Utilize Virtual Instrumentation, Data Acquisition, Schematic Capture and Test and Applications software packages to refine skills and to analyze and design various electronic circuits.
C. Develop and Demonstrate Problem Solving Skills.
D. Develop a willingness to learn independently.
E. Develop and demonstrate effective wiring and laboratory skills.
F. Demonstrate Equipment/Instrumentation Competence
G. Develop and demonstrate Technical Documentation/Lab Report writing skills and the ability to comprehend Technical Documentation including Schematic Diagrams
H. Demonstrate effective Oral Presentation Skills
I. Value Safety Training, Safe Work Practices and acknowledge Safety Standards
J. Develop and demonstrate the synergistic relationship and integration of various technical and academic fields into the study of Electronics (i.e. Mechatronics)
K. Design, Construct, and Troubleshoot AC and DC Motor Control Circuits and demonstrate an understanding of process control.
L. Demonstrate a thorough understanding of DC and AC theory and operating concepts.
Course Outcomes

1. Identify/Recognize safety procedures and apply proper lab techniques with troubleshooting knowledge in basic areas. Define measurement and recognize primary/secondary measurement standards. Apply basic statistical methods to handle measurement errors.

   Applies to Program Outcome

   A. Acquire and apply technical expertise in the areas of Circuit analysis, Analog electronics, Digital electronics, Microprocessors, and Communication systems.
   C. Develop and Demonstrate Problem Solving Skills.
   D. Develop a willingness to learn independently.
   F. Demonstrate Equipment/Instrumentation Competence
   G. Develop and demonstrate Technical Documentation/Lab Report writing skills and the ability to comprehend Technical Documentation including Schematic Diagrams
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2. Recognize the basic theories to design various Analog or Digital Multi-meters. Recognize the input resistance, capacitance, and frequency to limit accuracy of VOMs, DVMs, and Oscilloscopes.

   Applies to Program Outcome

   A. Acquire and apply technical expertise in the areas of Circuit analysis, Analog electronics, Digital electronics, Microprocessors, and Communication systems.
   C. Develop and Demonstrate Problem Solving Skills.
   D. Develop a willingness to learn independently.
   E. Develop and demonstrate effective wiring and laboratory skills.
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3. Calculate precision and accuracy as well as to distinguish among the three types of linearity specifications and calibrate a given instrument to specified accuracy.

   Applies to Program Outcome

   A. Acquire and apply technical expertise in the areas of Circuit analysis, Analog electronics, Digital electronics, Microprocessors, and Communication systems.
   C. Develop and Demonstrate Problem Solving Skills.
   D. Develop a willingness to learn independently.
Course Outcome Summary

Required Program Core Course

ELEC 145 Instrumentation and Data Acquisition

E. Develop and demonstrate effective wiring and laboratory skills.
F. Demonstrate Equipment/Instrumentation Competence
G. Develop and demonstrate Technical Documentation/Lab Report writing skills and the ability to comprehend Technical Documentation including Schematic Diagrams
H. Demonstrate effective Oral Presentation Skills
I. Value Safety Training, Safe Work Practices and acknowledge Safety Standards
J. Develop and demonstrate the synergistic relationship and integration of various technical and academic fields into the study of Electronics (i.e. Mechatronics)
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4. Recognize/understand the basic theories, operations of Oscilloscopes for measurement.

Applies to Program Outcome

A. Acquire and apply technical expertise in the areas of Circuit analysis, Analog electronics, Digital electronics, Microprocessors, and Communication systems.
B. Utilize Virtual Instrumentation, Data Acquisition, Schematic Capture and Test and Applications software packages to refine skills and to analyze and design various electronic circuits.
C. Develop and Demonstrate Problem Solving Skills.
D. Develop a willingness to learn independently.
E. Develop and demonstrate effective wiring and laboratory skills.
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5. Recognize the basic theories, operations of Potentiometer, Potentiometric bridge, and applications. Understand the advantages and disadvantages of a Potentiometric bridge as a measure device.

Applies to Program Outcome

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D. Develop a willingness to learn independently.
E. Develop and demonstrate effective wiring and laboratory skills.
F. Demonstrate Equipment/Instrumentation Competence
G. Develop and demonstrate Technical Documentation/Lab Report writing skills and the ability to
ELEC 145 Instrumentation and Data Acquisition

Course Outcome Summary
Required Program Core Course

comprehend Technical Documentation including Schematic Diagrams
H. Demonstrate effective Oral Presentation Skills
I. Value Safety Training, Safe Work Practices and acknowledge Safety Standards
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6. Identify/Recognize suitable transducers for given physical quantity and tell whether it is active or passive.

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7. Recognize signal-process circuits and various ranges of signals as the inputs and changed to a common output. Understand the operations to convert analog signals to corresponding digital signals (A/D Conversions) and digital signals to analog signals (D/A Conversion).

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Course Outcome Summary

Required Program Core Course

ELEC 145 Instrumentation and Data Acquisition

comprehend Technical Documentation including Schematic Diagrams
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L. Demonstrate a thorough understanding of DC and AC theory and operating concepts.

8. Recognize fiber optics, automatic test equipment and understand the use of LabView software to process the measurement data.

Applies to Program Outcome

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Updated: 4/3/2019
By: Mark G Locher Sr
Updated: 2/1/2022
By: Alex Wan