Course Outcome Summary

Required Program Core Course

ELEC 133 Circuit Analysis

Course Information
Division: Applied Science and Engineering Technology
Contact Hours: 90
Total Credits: 4.0
Prerequisites: ELEC 125, MATH 124 or 151 or 159 or 164

Course Description
Topics covered are: Phasor analysis of series AC circuits, both resistor-capacitor and resistor-inductor; phasor analysis of parallel AC circuits, both RC and RL; magnetism; magnetic field in a coil (inductor); inductive transient response to switched DC; impedance of complex AC circuits; oscilloscope phase measurement techniques; power factor in AC circuits; series-resonant LC circuits; parallel-resonant LC circuits; filtering using resonant LC circuits; the j-operator; voltage division in DC and AC; bridge circuit analysis in DC and AC; Thevenin’s theorem in DC and AC; computer-aided circuit analysis in DC and in AC frequency domain.

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: a series resistive/reactive circuit

   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.
   G. Develop and demonstrate Technical Documentation/Lab Report writing skills and the ability to comprehend Technical Documentation including Schematic Diagrams
   J. Develop and demonstrate the synergistic relationship and integration of various technical and academic fields into the study of Electronics (i.e. Mechatronics)

2. Identify/Recognize: a phasor diagram that represents the magnitude and phase relationships for the sine-wave ac voltages existing in a series, parallel, or compound resistive/reactive circuit

   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.
   G. Develop and demonstrate Technical Documentation/Lab Report writing skills and the ability to comprehend Technical Documentation including Schematic Diagrams
   J. Develop and demonstrate the synergistic relationship and integration of various technical and academic fields into the study of Electronics (i.e. Mechatronics)

3. Identify/Recognize: a parallel resistive/reactive circuit

   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.
   G. Develop and demonstrate Technical Documentation/Lab Report writing skills and the ability to comprehend Technical Documentation including Schematic Diagrams
   J. Develop and demonstrate the synergistic relationship and integration of various technical and academic fields into the study of Electronics (i.e. Mechatronics)
4. Identify/Recognize: a Lissajous (X-Y) scope display conveying an out-of-phase relationship between the X signal and the Y signal

 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.
 G. Develop and demonstrate Technical Documentation/Lab Report writing skills and the ability to comprehend Technical Documentation including Schematic Diagrams.
 J. Develop and demonstrate the synergistic relationship and integration of various technical and academic fields into the study of Electronics (i.e. Mechatronics).

5. Demonstrate/Practice: complete analysis (all voltages and currents) of complex dc circuits

 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.
 G. Develop and demonstrate Technical Documentation/Lab Report writing skills and the ability to comprehend Technical Documentation including Schematic Diagrams.
 J. Develop and demonstrate the synergistic relationship and integration of various technical and academic fields into the study of Electronics (i.e. Mechatronics).

6. Demonstrate/Practice: the calculation, and measurement of the magnitude and phase relationships among voltages or among current and voltages in a series resistive/reactive circuit

 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.
 G. Develop and demonstrate Technical Documentation/Lab Report writing skills and the ability to comprehend Technical Documentation including Schematic Diagrams.
 J. Develop and demonstrate the synergistic relationship and integration of various technical and academic fields into the study of Electronics (i.e. Mechatronics).
7. Demonstrate/Practice: the calculation, and measurement of the magnitude and phase relationships among currents or among source voltage and currents in a parallel resistive/reactive circuit

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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8. Demonstrate/Practice: the testing of a series or parallel-resonant LCR circuit to determine resonant frequency, bandwidth, and data points for plotting a complete frequency-response curve

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D. Develop a willingness to learn independently.
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9. Demonstrate/Practice: the power-factor correction technique of connecting a capacitor in parallel with an inductive ac circuit

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10. Demonstrate/Practice: the use of the polar-to-rectangular (PYR) and rectangular-topolar (RYP) functions of a scientific hand-held calculator to facilitate the analysis of ac circuits

**Applies to Program Outcome**

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C. Develop and Demonstrate Problem Solving Skills.

D. Develop a willingness to learn independently.

E. Develop and demonstrate effective wiring and laboratory skills.

G. Develop and demonstrate Technical Documentation/Lab Report writing skills and the ability to comprehend Technical Documentation including Schematic Diagrams.

J. Develop and demonstrate the synergistic relationship and integration of various technical and academic fields into the study of Electronics (i.e. Mechatronics).

11. Demonstrate/Practice: the use of the j-operator (j-1 operator) to calculate impedances, currents, and voltages in a complex ac circuit

**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.

G. Develop and demonstrate Technical Documentation/Lab Report writing skills and the ability to comprehend Technical Documentation including Schematic Diagrams.

J. Develop and demonstrate the synergistic relationship and integration of various technical and academic fields into the study of Electronics (i.e. Mechatronics).

12. Demonstrate/Practice: the use of the node-analysis method for and-analyzing a multisource ac circuit

**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.

G. Develop and demonstrate Technical Documentation/Lab Report writing skills and the ability to comprehend Technical Documentation including Schematic Diagrams.

J. Develop and demonstrate the synergistic relationship and integration of various technical and academic fields into the study of Electronics (i.e. Mechatronics).