

Department of Electrical and Computer Engineering

EEL 3111 - CIRCUITS I (Required)

Catalog Description:

Introductory circuits course dealing with DC, AC and transient electrical circuit analysis, involving passive elements such as resistors, capacitors, inductors, transformers, etc.
(3 Credits)

Prerequisites:

MAC 2312, PHY 2049

Corequisites:

MAP 2302, EEL3111L

Textbook:

Electric Circuits, Nilsson and Riedel, 8th ed., Prentice Hall, 2008

Learning Outcomes:

Understand the concept of voltage drop and current direction as electrical variables

1. Learn the concept of an ideal basic circuit element
2. Understand the passive sign convention and apply it to power and energy calculations
3. Understand the definitions of ideal independent and dependent sources and their corresponding graphical representation of the current - voltage characteristics
4. Understand the ideal resistance as a circuit element and Ohm's law and its corresponding graphical representation of the current - voltage characteristic
5. Understand the Kirchhoff's voltage and current laws (KVL and KCL) and apply it to circuits containing dependent sources.
6. Develop circuit models for real voltage and current sources.
7. Know how to analyze resistors connected in series and in parallel.
8. Design voltage-divider and current-divider circuits.
9. Design Volt- and Ammeters using the D'Arsonval meter movement to understand the loading effect when measuring voltage and current.
10. Understand the Wheatstone bridge in order to measure resistance.
11. Derive delta-to-wye equivalent circuits and apply it to simplify circuits.
12. Understand the node-voltage and mesh-current methods to analyze circuits containing dependent and independent sources.
13. Compare the node-voltage method to the mesh-current method.
14. Understand source transformations and apply it to analyze circuits.
15. Understand the concept of Thevenin and Norton equivalent circuits and the approaches to obtain equivalent circuits for a any given resistive two terminal circuit.
16. Apply the Thevenin equivalent circuit concept to derive the Maximum Power Transfer Theorem.

17. Apply superposition as a technique of circuit analysis.
18. Understand the concept of capacitor and inductor and their respective current – voltage, voltage-current and energy relationships.
19. Know how to analyze the series connection and parallel connections of inductors and capacitors, respectively.
20. Develop the natural response of RL and RC circuits.
21. Develop the step response of RL and RC circuits.
22. Solve sequential switching problems in RL and RC circuits, including the unbounded response case.
23. Understand the sinusoidal steady-state analysis method using the phasor concept.
24. Distinguish circuits in the time domain and phasor domain.
25. Understand the concepts of impedance, reactance, admittance and susceptance.
26. Apply Kirchhoff's voltage and current laws and perform series, parallel, and delta-to-wye simplifications in the frequency domain.
27. Use source transformations, Thevenin and Norton equivalent circuits, node-voltage and mesh-current methods to analyze circuits in the frequency domain.

Topics Covered:

1. Circuit Variables - Chapter 1
2. Circuit Elements - Chapter 2
3. Simple Resistive Circuits - Chapter 3
4. Techniques of Circuit Analysis - Chapter 4
5. Inductance, Capacitance and Mutual Inductance- Chapter 6
6. Response of First-Order RL and RC Circuits - Chapter 7
7. Sinusoidal Steady-State Analysis - Chapter 9

Class Schedule:

Twice a week, 75 minutes each session; three times a week, 50 minutes each session

Contribution of course to meeting the professional component:

Engineering Science

Relationship of course to program outcomes:

In the course EEL 3111 the student will have to show

- (a) an ability to apply knowledge of mathematics, science and engineering
- (m) an ability to apply knowledge of advanced math (D.E., Linear Algebra, Complex Variables, Discrete Math)

Person(s) who prepared this description and date of preparation:

Pierre E. Schmidt, Professor – May 14, 2007