****American University of Beirut****

Department of Electrical and Computer Engineering

Course Syllabus

****Fall Semester 2017****

# Course Number and Title

EECE 210 Electric Circuits

**Credit hours**

3 credits hours (three 50-min lectures and one 2-hr problem-solving session per week)

# Course and Problem-Solving Instructors

* Section 2: Shahwan Khoury, Problem-solving instructor: To be Assigned
* Section 3: Nassir Sabah, Problem-solving instructor: Nassir Sabah

# Catalogue Description

A course on fundamentals of electric circuits; basic elements and laws; techniques of circuit analysis: node voltage, mesh current, superposition, Thevenin’s and Norton’s theorems, and source transformation; inductors, capacitors, and duality; steady-state AC circuits; mutual inductance and transformers; transient response of RC, RL, and RLC circuits; circuit simulation using SPICE.

**Required or Elective**

Required of CCE and ECE students

**Prerequisites**

Mathematics: Algebra and calculus, including complex numbers

Physics: High-school physics, including electricity and magnetism

**Textbook**

* Nassir H. Sabah, “Circuit Analysis with PSpice: A Simplified Approach,” CRC Press, 2017

### Course Objectives

|  |  |
| --- | --- |
| *The objectives of the course are to:* | *Correlates to program objectives* |
| Introduce students to the general field of electric circuits | 1, 2 |
| Highlight the relevance of electric circuits to engineering | 1 |
| Impart a sound understanding of basic concepts of electric circuits | 1 |
| Instruct students in techniques for analyzing electric circuits | 1,2 |
| Foster problem solving skills | 1,2 |

## Course Topics

* Preliminary Considerations: current, voltage, power, ideal circuit elements, circuit approximations
* Basic Resistive Circuits: Nature of resistance, ideal resistors, ideal, independent and dependent, voltage and current sources, Kirchhoff’s laws.
* Circuit Equivalence: Series and parallel connections of resistors, star-delta transformation, linear-output sources.
* Circuit Theorems: Thevenin’s, Norton’s, and substitution theorems, source absorption.
* Circuit Simplification: superposition, output scaling, redundant resistors, source rearrangement, and symmetry.
* Circuit Equations: node-voltage and mesh-current methods.
* Capacitors, Inductors, and Duality: voltage-current relations, series-parallel connections, duality.
* Sinusoidal steady-state: phasor notation and properties, phasor relations of circuit elements; impedance and reactance; circuit representation in the frequency domain; phasor diagrams
* Linear transformer: mutual inductance, linear transformer equations, T-equivalent circuit.
* Ideal transformer: magnetic circuit, ideal transformer relations, reflection of circuits, ideal transformer, transformer imperfections.
* Basic Responses of First-Order Circuits: capacitor and inductor discharge and charging, generalized first-order Circuits.
* Basic Responses of Second-Order Circuits: natural responses of series and parallel *RLC* circuits, charging of *RCL* circuit.

**Course Learning Outcomes**

|  |  |  |  |
| --- | --- | --- | --- |
| *At the end of the course, students should be able to:* | *Correlates to program outcomes\** | | |
| *H* | *M* | *L* |
| Understand the concepts of current, voltage, power, and energy and their interrelations | *A* |  |  |
| Understand the basic attributes of voltage sources, current sources, resistors, capacitors, inductors and their voltage-current relations |  | *a, e* |  |
| Apply KCL and KVL to basic analysis of electric circuits | *K* |  |  |
| Analyze resistive circuits by the node-voltage method, mesh-current method, or superposition | *K* | *e* |  |
| Derive TEC and NEC between specified terminals of an electric circuit | *K* | *e* |  |
| Simplify a circuit by using the substitution and source absorption theorems, or by rearranging sources, or by removing redundant elements | *K* | *e* |  |
| Represent circuits in the frequency domain in terms of phasors and impedances or admittances | *K* | *e* | *m* |
| Apply circuit relations and theorems in the frequency domain in order derive steady-state sinusoidal responses | *K* | *e* |  |
| Analyze circuits that include linear or ideal transformers | *K* | *e* | *a* |
| Derive the natural and step responses of *RL*, *RC*, and *RLC* circuits | *K* | *e, m* |  |
| Simulate basic electric circuits using PSpice | *K* | *a* |  |

\* *H: High correlation, M: Medium correlation, L: Low correlation*

**Resources**

Reference Material

PSpice

Moodle

**Evaluation Methods**

Final exam 40%

Quizzes (3) 48%

PSpice Quiz 12%

**A Student who does not demonstrate learning of PSpice will automatically fail the course**

**Professional Components**

Engineering topics: 90%

General education: 0%

Mathematics and basic sciences: 10%

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

Nassir Sabah, Sep 2013

**Date of last revision**

Aug 2017