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

Department of Electrical and Computer Engineering

Course Syllabus

****Fall Semester 2011 – 2012****

# Course Number and Title

EECE 210 Electric Circuits

**Credit hours**

3 credits hours

# Catalogue Description

A course on fundamentals of electric circuits; basic elements and laws; techniques of circuit analysis: node voltage, mesh current, Thevenin, Norton, and source transformation; inductors, capacitors, mutual inductance, and transformers; transient response of RC, RL, and RLC circuits; steady state AC circuits; power calculations; 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**

* Sabah, N.H.: *Electric Circuits and Signals*. CRC Press, Boca Raton, Florida. (Chapters 1-7, and Chapter 9)

### 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

* Circuit variables: electric current, voltage, and power; assigned positive directions
* Active circuit elements: ideal, independent and dependent, voltage and current sources
* Passive circuit elements: ideal resistors, Ohm’s law and power dissipation; capacitors; inductors
* Basic circuit laws: Kirchhoff’s current law, Kirchhoff’s voltage law and their application to series and parallel connections of elements, Δ-Y transformation, and source transformation
* Basic analysis of resistive circuits: node-voltage and mesh-current methods; superposition
* Circuit simplification techniques: Thevenin’s and Norton’s equivalent circuits; substitution theorem; source rearrangement; removal of redundant elements
* Sinusoidal steady-state: response to complex excitation; phasors and phasor relations of circuit elements; impedance and reactance; circuit representation in the frequency domain; phasor diagrams
* Mutual inductance, linear and ideal transformers; reflection of circuits; transformer imperfections
* Power relations: instantaneous and average power, complex power, power factor correction, maximum power transfer
* Measurement of current, voltage and power; effect of finite resistance of measuring instruments
* Responses to periodic inputs: Fourier series; symmetry properties; circuit responses to periodic inputs; average power and rms values

**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* |
| Analyze power circuits in terms of real, reactive, and complex power and apply these to power factor correction | *K* | *e, m* |  |
| Apply the condition for maximum power transfer and determine the maximum power transferred | *K* |  | *h* |
| Derive the Fourier series expansion of a periodic function | *K* | *m* | *a* |
| Determine the response of a circuit to a periodic input | *K* |  | *a* |
| Simulate basic electric circuits using PSpice | *K* | *a* |  |

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

**Resources**

Textbook

PSpice

Moodle

**Evaluation Methods**

Final exam 40%

Quizzes (3) 48%

PSpice Quiz 12%

**Professional Components**

Engineering topics: 90%

General education: 0%

Mathematics and basic sciences: 10%

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

Karim Kabalan, Fadi Karameh and Nassir Sabah, Sept 2008

**Date of last revision**

Sep 2009