Course Title: Electrical Circuits II
Required: COE and ELE programs
3 credits

Department of Electrical and Computer Engineering
Hours: section 1: MWF 08:00 - 09:00 and section 2: MWF 09:00 - 10:00
room: ENG 506

Course syllabus
Instructor: Dr. Chadi Abou-Rjeily
term: Fall 2010

1. Course Description and Course Prerequisite

Frequency-domain response of circuits; transfer functions; resonant circuits and filter designs; time-domain response of circuits; step, impulse and ramp responses; linearity and time invariance; input-output descriptions of circuits; parameter representation of two-ports networks; computer-aided circuit simulation (SPICE). Prerequisites: ELE201 Electrical Circuits I, MTH204 Differential Equations.

2. Course Learning Outcomes

A student who has successfully completed this course should have the:

1. Ability to analyze circuits containing mutual inductance and ideal transformers.
2. Ability to derive two-port parameters from circuits containing resistive and impedance elements.
3. Ability to analyze RLC circuits containing switches, independent sources, dependent sources, resistors, capacitors, inductors, and operational amplifiers for transient response.
4. Ability to derive transfer functions (variable-frequency response) from circuits containing independent sources, dependent sources, capacitors, inductors, operational amplifiers, transformers, and mutual inductance elements.
5. Ability to determine the impulse response and the step response of linear circuits using Laplace transform theory.
6. Ability to use SPICE for determining circuit voltages and currents given sinusoidal or transient sources (Electrical Circuits Lab).

3. Contribution of course to meeting the professional component

<table>
<thead>
<tr>
<th>Professional Component</th>
<th>Credits</th>
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<tbody>
<tr>
<td>Mathematics and Basic Sciences</td>
<td>0</td>
</tr>
<tr>
<td>Engineering Topic</td>
<td>3</td>
</tr>
<tr>
<td>General Education</td>
<td>0</td>
</tr>
</tbody>
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4. Relationship of course to program outcomes

PO (a): an ability to apply knowledge of mathematics, science, and engineering
- Applies knowledge of mathematics: differential equations and complex variables
- Applies knowledge of engineering: electrical circuits, electronics and signal processing

PO (c): an ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability
- Expresses unambiguous needs and identifies objectives and requirements

PO (e): an ability to define, formulate, and solve engineering problems
- Demonstrates an ability to formulate engineering problems, to recognize and identify the basic governing theories and principles in the area of electrical circuits
5. **Course Outline**

**Magnetically Coupled Networks**
- Mutual Inductance
- Energy Analysis
- The Ideal Transformer

**Two-Port Networks**
- Admittance Parameters
- Impedance Parameters
- Hybrid and Transmission Parameters
- Parameters Conversion

**Variable Frequency Network Performance**
- Variable-Frequency Response Analysis
- Sinusoidal Frequency Analysis
- Resonant Circuits
- Scaling
- Filter Networks

**First-Order and Second-Order Transient Circuits**
- Transients versus Steady State
- General Form of the Response Equations for First-Order Circuits
- Analysis Techniques for First-Order Circuits
- The Basic Second-Order Circuit Equation
- The Network Response for Second-Order Circuits

**Laplace Analysis Techniques**
- Singularity Functions
- Transform Pairs
- Properties of the Transform
- Performing the Inverse Transform
- Convolution Integral
- Initial-Value and Final-Value Theorems
- Laplace Circuit Solution
- Circuit Element Models
- Analysis Techniques

6. **Required tools / software / skills**

Software: MatLab and PSPICE

7. **Textbook**


8. **Additional References**


9. **Schedule of Exams & Grading Percentage**

<table>
<thead>
<tr>
<th></th>
<th>Grading Weight</th>
<th>Tentative Schedule</th>
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<tbody>
<tr>
<td>Assignments</td>
<td>10%</td>
<td></td>
</tr>
<tr>
<td>Exam 1</td>
<td>(25% or 30%)*</td>
<td>November 15, 2010</td>
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<tr>
<td>Exam 2</td>
<td>(25% or 30%)*</td>
<td>December 20, 2010</td>
</tr>
<tr>
<td>Final Exam</td>
<td>35%</td>
<td>As scheduled by registrar</td>
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* 25% on min(Exam 1, Exam 2) and 30% on max(Exam 1, Exam 2).
10. Course Policies

- Assignments are due at the beginning of the assigned class period. **No late homework will be accepted.**
- Students may discuss assignment problems with each other; however, all assignments must be the work of the student whose name appears on the paper.
- Failure to take a test or the final exam during the assigned class period will result in a grade of zero being recorded for that test unless the student has personally contacted me and received permission to be absent from the test.
- No makeup exams will be given for the two midterms. In case a student fails to take a midterm exam, the grading percentage will be as follows: 10% on the assignments, 40% on the other midterm and 50% on the final exam.
- Makeup exams will be given for students who fail to attend the final exam.
- The student is responsible for all business conducted and announcements made during any scheduled class period. LAU attendance policies are enforced.

11. General Comments

Homework sets will be given on a regular basis. Even though assignments contribute only to 10% of the final grade, they are critical to learning the material and to doing well on the mid terms and final exam. Assignment questions may appear in the tests. You are encouraged to discuss the assignment with your colleagues.

In order to get the most out of the course, try to stay ahead. Before attending a lecture, make sure you have reviewed the material covered in the previous lectures. This way, lectures will be much more informative and meaningful. The lectures topics will follow the textbook. The student is expected to read the textbook and is responsible for all material given in the class. It is advised to read the sections of the textbook prior to the lecture.

The important topic of computer-aided circuit analysis is integrated into the course laboratory. The SPICE computer program which is used throughout is becoming an industry standard. Adaptation to other circuit analysis programs will be a simple matter. PSPICE, the personal computer version of SPICE is available on LAU computing system.

It is intended that the overall work required be approximately six hours per week, including three hours of lecture. Students who find themselves spending substantially more than six hours any week should question whether they are stuck and might make more rapid progress if they asked the instructing staff for some hints or advice. I am available at these office hours:

Office Hours: MW 10:00 – 01:00, TH 11:00 - 01:00 or by appointment.
Office: Bassil 102.
Email: chadi.abourjeily@lau.edu.lb
Course Website: [http://services.sea.lau.edu.lb/academia/courses/ele302/](http://services.sea.lau.edu.lb/academia/courses/ele302/)

12. General Rules & Regulations

- A student can miss no more than 4 sessions of instruction. By the 5th session, the instructor may ask the student to drop the course.
- Plagiarism: students caught cheating on an exam receive a grade of zero on the exam in the first cheating attempt and a warning. Students caught cheating for the second time in the same course receive an F grade in the course and a second warning. A grade of zero on an exam resulting from cheating must be counted in the student’s course grade. The zero cannot be dropped in computing the final grade in case the instructor has a policy of allowing students to drop their worst exam grade.
- Any student who receives 3 warnings will be suspended.

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

Chadi Abou-Rjeily, September 24, 2010