Course Syllabus

ELCT 221 - CIRCUITS

**Course Coordinator:** Undergraduate Program Committee

**Catalog Description:** Linear circuit analysis and design

**Credit Hours** 3

**Prerequisite(s) by course** MATH 142 and ELCT 102 or 220

**Prerequisite by topics** Electrical Charges & Forces, Current & Voltage, Ohm’s Law, Calculus


**Course Outcomes:**
Students who are successful in this class (i.e. earn a C or better) will demonstrate at least the abilities to:

- solve problems on DC and AC linear circuit analysis using nodal, mesh and source transformation (Thevenin and Norton) techniques.
- find the impedance of and power in R, L, C network components.
- use MATLAB (or equivalent) tool to solving mesh and nodal matrix equations, calculating voltages, currents, impedances and powers in linear circuits.
- use SPICE simulations to build the schematics and generate frequency dependencies of currents and voltages in linear circuits.

Students who demonstrate higher proficiency will earn higher grades.

**Course Topics:**
- Potential and Voltage (review)
- Current and Ohm’s Law (review)
- KCL & Parallel Circuits, KVL & Series Circuits (Review)
- Nodal and Mesh Analysis
- MATLAB (FreeMAT) tool
- Thevenin and Norton transformations
- Superposition and Linearity Techniques
- Sinusoidal (AC) Signals
- Capacitors and inductors in AC circuits
- Phasors and complex numbers
- Nodal and Mesh Analysis in AC circuits
- Thevenin and Norton transformations in AC circuits
- Power in AC Circuits
- SPICE simulations of RLC circuits
- Three-phase circuits

**Course Contribution to Program Outcomes:**
ELCT 221 contributes to an achievement of:

- Outcome A – an ability to apply knowledge of mathematics, science and engineering
- Outcome K – an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.
General Course Policies

Academic Integrity
Unless otherwise stated, assignments and examination work are expected to be the sole effort of the student submitting the work. Students are expected to follow the University of South Carolina Honor Code and they should expect that every instance of a suspected violation will be reported. Students found responsible for violations of the Code will be subject to academic penalties under the Code in addition to whatever disciplinary sanctions are applied.

Accommodating Disabilities
Reasonable accommodations are available for students with a documented disability. If you have a disability and may need accommodations to fully participate in this class, contact the Office of Student Disability Services: 777-6142, TDD 777-6744, email sasds@mailbox.sc.edu, or stop by LeConte College Room 112A. All accommodations must be approved through the Office of Student Disability Services.

Diversity
In addition to scheduling exams, I have attempted to avoid conflicts with major religious holidays. If, however, I have inadvertently scheduled an exam or major deadline that creates a conflict with your religious observances, please let me know as soon as possible so that we can make other arrangements.

Recommended Study Habits
- Read the assigned material before class.
- Bring thoughtful questions to class for discussion.
- Prepare for the exams in study groups.
- Take notes during class discussions and while completing reading assignments.

Deviations
Minor deviations from the syllabus are a normal part of any adaptive teaching and learning process.
Instructor’s Addendum for Fall 2015

Instructor: Dr. Grigory Simin
Office: Swearingen 3A16
E-mail: simin@cec.sc.edu

Phone: 803.777.0986
Office hours: by appointment

Class Location: 300 Main, B201
Teaching Assistant: Mirwazul Islam,
islam4@email.sc.edu

Course Delivery Structure:
Lectures

Course Assessment
Course assignments include homework (given every one-two weeks, quizzes, tests, midterm and final examinations

Approximate grading scheme is as follows:

<table>
<thead>
<tr>
<th>Score Range</th>
<th>Grade</th>
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<tbody>
<tr>
<td>≥ 90</td>
<td>A</td>
</tr>
<tr>
<td>85 ≤ score &lt; 90</td>
<td>B+</td>
</tr>
<tr>
<td>80 ≤ score &lt; 85</td>
<td>B</td>
</tr>
<tr>
<td>75 ≤ score &lt; 80</td>
<td>C+</td>
</tr>
<tr>
<td>70 ≤ score &lt; 75</td>
<td>C</td>
</tr>
<tr>
<td>60 ≤ score &lt; 70</td>
<td>D</td>
</tr>
<tr>
<td>&lt; 60</td>
<td>F</td>
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The weight of the assignments in the final course grade is as follows:

- HWs and Quizzes 50%
- Midterm and Tests 25%
- Final Exam 25%

Course Outline/Schedule
Topics for each class meeting are listed below. However, circumstances may call for a departure from this schedule. Any changes to the schedule will be made in advance. Homework assignments will be handed out at least one week prior to the due date.

<table>
<thead>
<tr>
<th>Course Schedule</th>
<th>Time</th>
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<tbody>
<tr>
<td>Introduction</td>
<td>Week 1</td>
</tr>
<tr>
<td>Review: Potential and Voltage</td>
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<tr>
<td>Review: Current and Ohm’s Law</td>
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<tr>
<td>Review KCL &amp; Parallel Circuits; Review KVL &amp; Series circuits; Nodal Analysis;</td>
<td>Week 2</td>
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<tr>
<td>Nodal Analysis using MATLAB</td>
<td>Week 3</td>
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<tr>
<td>Nodal analysis by inspection and special cases; Mesh analysis; Mesh Analysis using MATLAB</td>
<td>Week 4</td>
</tr>
<tr>
<td>Mesh analysis by inspection and special cases; Thevenin and Norton transformations;</td>
<td>Week 5</td>
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<tr>
<td>Maximum power transfer Superposition and Linearity techniques</td>
<td>Week 6</td>
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<tr>
<td>Pre-midterm review Midterm Examination</td>
<td>Week 7</td>
</tr>
<tr>
<td>Sinusoidal (AC) signals; Capacitors and inductors in AC circuits; Phasors and complex numbers;</td>
<td>Week 8</td>
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<tr>
<td>Phasors and complex numbers (cont);</td>
<td>Week 9</td>
</tr>
<tr>
<td>AC Circuit analysis using complex variables AC Circuit analysis using MATLAB</td>
<td>Week 10</td>
</tr>
</tbody>
</table>
Course Schedule

<table>
<thead>
<tr>
<th>Time</th>
<th>Course Content</th>
</tr>
</thead>
<tbody>
<tr>
<td>Week 11</td>
<td>• AC Nodal analysis</td>
</tr>
<tr>
<td></td>
<td>• AC Mesh Analysis</td>
</tr>
<tr>
<td>Week 12</td>
<td>• AC Thevenin and Norton techniques</td>
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<tr>
<td></td>
<td>• AC circuit analysis using SPICE</td>
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<tr>
<td>Week 13</td>
<td>• Power in AC circuits</td>
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<td>Week 14</td>
<td>• Three-phase circuits</td>
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<tr>
<td>Week 15</td>
<td>• Final Exam preview</td>
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</tbody>
</table>

Instructor Policies

Attendance Policy
Students are expected to attend each scheduled class meeting, to be on time, and to be prepared for each class session. Class absences will affect your class participation grade. Quizzes, homework, and participation points cannot be made up except in the case of extreme illness or loss.

Expectations for Classroom Behavior
Please be respectful of each other, the instructor, and any guest presenters while in class. We are all here to learn! Any disrespectful or disruptive behavior may result in your referral to the Office of Student Judicial Programs.

Assignment Submission
Assignments are always due before class starts on the day noted. Late assignments will be accepted only in cases of emergency.

Midterm and Final Exams
Makeup exams will be allowed only with pre-approval of the instructor or with an acceptable, documented reason. Acceptable reasons for makeup exams include severe illness, family emergencies or other unavoidable events including dangerous weather conditions and car accidents. Exam format for makeup exams may be different than the original exam.

Expectations of the Instructor
I understand that students expect me to facilitate their learning, to answer their questions appropriately, to be fair and objective in grading, to provide timely and useful feedback on assignments, to maintain adequate office hours, and to treat them as I would like to be treated in their place.