

**ABET COURSE SYLLABUS**

**ECSE-2010 Electric Circuits**

<b>Course Catalog Description:</b>	Electric Circuits Techniques for the analysis and simulation of linear electric circuits, and measurements of their properties. Topics include resistive and energy-storage elements, controlled sources and operational amplifiers, systematic analysis methods, AC steady state, power and three-phase systems, magnetic coupling and transformers, transients, s-plane representation and analysis, frequency response, and Laplace transform and computer-aided methods.
<b>Pre-Requisite Courses:</b>	MATH-2400 Introduction to Differential Equations PHYS-1200 Physics II
<b>Co-Requisite Courses:</b>	None.
<b>Prerequisites by Topic:</b>	<ol style="list-style-type: none"><li>1. Motion of charged particles in a magnetic field</li><li>2. Electricity</li><li>3. Ohm's Law, KVL, KCL</li><li>4. Capacitance, Inductance, and Resistance</li><li>5. Differential Equations</li><li>6. Complex Algebra</li></ol>
<b>Textbook:</b> (and/or other required material)	Thomas and Rosa, The Analysis and Design of Linear Circuits (Laplace Early Edition), Wiley (ISBN 0-471-43299-7)
<b>References:</b>	Interactive Learning Modules: <a href="http://www.academy.rpi.edu/projects/ccli">http://www.academy.rpi.edu/projects/ccli</a> , WebCT course website
<b>Course Coordinator:</b>	Don L. Millard
<b>Overall Educational Objective:</b>	<p>This studio course combines circuit analysis techniques, simulations, and experiments, including some design aspects. Most of the class time will be devoted to various learning activities, including in-class paper-and-pencil exercises/problems, circuit measurements, and computer work using PSpice and Maple; most completed by teams of two students.</p> <p>Techniques for the analysis and simulation of linear electric circuits, and measurements of their properties. Topics include resistive and energy-storage elements, controlled sources and operational amplifiers, systematic analysis methods, AC steady state, power and three-phase systems, magnetic coupling and transformers, transients, s-plane representation and analysis, frequency response, and Laplace transform and computer-aided methods.</p>
<b>Course Learning Outcomes:</b>	<ol style="list-style-type: none"><li>1. Apply techniques for the analysis and simulation of linear electric circuits, and measurements of their properties</li><li>2. Understand resistive and energy-storage elements, controlled sources and operational amplifiers, and transformers</li><li>3. Analyze the transient and AC steady state behavior of a circuit</li><li>4. Determine the power supplied and distributed in three-phase systems, perform power factor correction</li><li>5. Determine the frequency response of a circuit using the s-plane representation and analysis, Bode Plots, Laplace transforms and computer-aided methods</li></ol>

**How Course Outcomes are Assessed:**

- In-class activities (10%)
- Experiment reports (10%)
- Homework (10%)
- Exam I (15%)
- Exam II (15%)
- Exam III (15%)
- Final exam (25%)

**Relation to EE/CSE/EPE Outcomes**

**N = none**  
**M = moderate**  
**H = high**

Outcome	Level	Demonstrate Proficiency
	N, M, H	e.g. Exams, projects, HW
Mathematics, science and engineering	H	Activities, Experiments, Design Projects, Exams, HW
Basic disciplines in Electrical Engineering	H	Exams, Activities, HW
Depth in Electrical Engineering	N	
Basic disciplines in Computer & Sys. Eng.	M	Exams, Activities, HW
Depth in Computer and Systems Eng.	N	
Electromagnetics, electromechanics, power semiconductors	M	Exams, Activities, HW
Power system behavior	N	
Electrical energy conversion	N	
Conduct experiments and interpret data	M	Experiments, Activities
Identify, formulate and solve problems	H	Experiments, Design Projects
Design a system, component or process	M	Activities
Communicate in written and oral form	M	Experiments, Design Projects
Function as part of a multi-disciplinary team	M	Activities, Experiments, Design Projects
Preparation for life-long learning	M	Experiments, Activities
Ethical issues; safety, health, public welfare	N	
Humanities and social sciences	N	
Laboratory equipment and software tools	H	Experiments, Activities, Design Projects
Variety of instruction formats	M	Lecture, Recitation, Lab, Studio

**Topics Covered:**  
**(number of hours or classes for each)**

1. Ohm's Law, KVL, KCL
2. Passive Circuit Analysis
3. Thevenin/Norton Equivalent Circuits
4. Transformers
5. First/Second Order Differential Equations
6. Frequency Response
7. Phasors, Power Systems, Three-Phase Circuits
8. PSpice and Maple Utilization
9. Operational Amplifier Applications
10. Filter Circuit Analysis and Design

**Computer Usage:**

Student PCs and laboratory computers are used to work on activities utilizing PSpice, Maple, and instrumentation software.

**Laboratory Experiences:**

1. Multimeter/Oscilloscope measurements
2. Statistical analysis of measurements
3. Thevenin parameters
4. Amplifier measurements
5. Capacitance/inductance measurements
6. First order transients
7. Second order transients and systems

8. AC steady state/Bridge measurements
9. Resonance
10. Lissajous figures
11. Filter design

**Design Experiences:**

1. Design an audio filter circuit
2. Develop a temperature sensor circuit

**Independent Learning Experiences:**

1. Extra Credit Design Project

**Class/Lab Schedule:**

Classes meet in a studio environment - 3 times/week for 110min/session  
 Classes include mini-lectures and discussions  
 Students are expected to do the assigned reading and preparation in advance.  
 Students should devote about 5-6 hours per week outside of the classroom;  
 involving 1-2 hours reading and 4-5 hours on the preparation, homework, and reports.

**Contribution to the Professional Component:**

- |                                                   |                  |
|---------------------------------------------------|------------------|
| (a) College-level mathematics and basic sciences: | 1.0 credit hours |
| (b) Engineering Topics (Science and/or Design):   | 3.0 credit hours |
| (c) General Education:                            | 0.0 credit hours |

<b>Prepared by:</b>	Don L. Millard
<b>Date:</b>	04/04/06