ECE 203
Circuit Analysis I

Overview

Course Catalog Description: Basic electrical elements and sources. Energy and power. Ohm's law and Kirchhoff's laws. Resistive networks, node and loop analysis. Network theorems. First-order and second-order circuits. Sinusoidal sources and complex representations impedance, Phasors, complex power. Three phase circuits.

Prerequisites: MATH 163 and ECE 131. Corequisites: MATH 316 and PHYC 161.

Textbook: J. David Irwin and R. Mark Nelms, **BASIC ENGINEERING CIRCUIT ANALYSIS**, John Wiley, 2008.

Class Goals: Introduction to basic electrical circuit analysis, DC and AC circuit analysis methods, network theorems and their applications, source transformations, independent and dependent current and voltage sources, resistors, capacitors, inductors, coupled circuits, and operational amplifiers. Develop understanding of natural, driven, and complete response for electrical circuits. Understanding of energy and power concepts, steady-state sinusoidal circuit analysis, and circuit power calculations. Understanding of basic instrument as well as units of measure for electrical circuit components and parameters. During the semester, significant problem assignments (homework) are required; these provide ample opportunity for concept practice!

Course Coordinator: Edward D. Graham, Jr., Ph.D., P.E., Senior Lecturer

Table I: Objectives, Implementation, and Assessment

Objectives		Implementation	Assessment	A	B	C	D	E	F	G	H	I	J	K
O_1	Understand basic resistor theory and DC circuit analysis techniques; understand electric energy and power concepts	7 hrs. lecture in 1st three weeks	HW 1-2, Exam I Final Exam	X				X						
O_2	Understand independent and dependent voltage and current sources, source transformations, basic network theorems	Covered in lectures during first 12 hours of lecture	HW 3 Exam I Final Exam	X		X								
O_3	Understand fundamental terminal characteristics of basic operational amplifiers	3-4 lecture hours mid semester	HW 4 Exam II Final Exam	X									X	X
O_4	Understand capacitance and inductance concepts and mathematical models for both. Understand magnetically coupled circuits.	4-6 lecture hours mid semester	HW 5, 6 Exam III Final Exam	X		X						X	X	X
O_5	Apply capacitor and inductor mathematical models to obtain first and second order equations. Recognize (solve for) the solutions of these differential equations.	6-8 hrs. lecture past mid semester	HW 7 Exam III Final Exam	X				X						X
O_6	Understand Phasors and steady-state (sinusoidal) network analysis concepts	4 lectures in latter half of semester	HW-8 Final Exam	X	X	X	X	X		X				X
	Understand sinusoidal power analysis including an introduction to 3-Φ power	4 lectures at end of semester	HW-9 Final Exam											

Table II: Expectation and Assessment Outcome
Fall 2008, Dr. G. L. Heileman

General expectations:
Homeworks:
These assignments involve two components:

1. sharpen/practice/improve skills and understanding of mathematics and electrical physics,
2. develop understanding of how the world of electrical circuits functions.

This is all supported by a general number of homework problems and considerable office hours to consult with students.
For (1), expect that all of the students will be able to answer at least 70% of the problems assigned. For (2), expect 90% of the students (who complete the full semester) to be demonstrate their skills via examination and tests such that they earn a "C" or better in the course..

Exams: Expect 75% of the students to score 70% or better on all exams.

Objectives		Outcome Assessment	Evaluation
O_1	Understand basic analytical tools necessary for rigorous study of data structures and algorithms	87.5 % of students completed 100% of exercise in HW 1 & 2. Av g. on Exam I was 57.3%, with 53% scoring 70% or better	Some students lacked some prerequisite knowledge in discrete mathematics (Math 327).
O_2	Understand particular algorithmic design techniques	73% of the students completed HW 3 satisfactorily. Av g. on Exam I was 57.3%, with 53% scoring 70% or better	
O_3	Understand fundamental object-oriented (OO) design and programming concepts	100% of the students completed HW 4 satisfactorily. Av g. on Exam II was 57.6%, with 75% scoring 70% or better	Students lacked some prerequisite knowledge from the previous programming course in this sequence (ECE 231).
O_4	Understand how OO concepts are implemented in modern programming languages	93% of the students completed HW 5 satisfactorily. Av g. on Exam II was 57.6%, with 75% scoring 70% or better Avg of 68% on Project 1, 61% on Project 2, and 47% on Project 3.	Time constraints (end of semester) affected the scores on Project 3.
O_5	Understand trade-offs associated with implementations of various Dynamic Set ADTs	Avg of 68% on Project 1, 61% on Project 2, and 47% on Project 3. Av g. on Exam I was 59.1%, with 83% scoring 70% or better	
O_6	Gain experience implementing data structures and algorithms, and using these to solve practical engineering problems	Avg of 68% on Project 1, 61% on Project 2, and 47% on Project 3.	Project 1 – Discrete Fourier Transform in C Project 2 – Discrete Fourier Transform in C++ w/ applications to filtering Project 3 – Experimental Analysis of Data Structures

Sample Course Schedule

ECE-203		Circuits I Spring 2008	Tentative	Problems
Lec#	Date	Topic	Assignment	HW
1	Jan. 23	Introduction to Course -- Cbasic Concepts	Read Chapter 1	1.3, 8, 9, 12, 17
2	Jan. 25			19, 22, 23, 26
3	Jan. 28			29, 34, 38, 39
4	Jan. 30	Resistive Circuits	Chapter 2	2.2, 6, 11,18, 22
5	Feb. 1			26, 30, 34, 39, 41
6	Feb. 4	Due 2/18/08	? ? ? ?	46, 51, 54. 61, 63
7	Feb. 6			66, 70, 73, 77, 80
8	Feb. 8			83, 86, 88, 92
9	Feb. 11	Nodal & Loop Analysis Techniques	Chapter 3	99, 104, 110
10	Feb. 13			3
11	Feb. 15			
12	Feb. 18			
13	Feb. 20	Operational Amplifiers	Chapter 4	4.3, 8, 9, 11, 18
14	Feb. 22			21, 24, 30, 32, 36
15	Feb. 25	Test Test Test Test Test Test Test	Chapters 1, 2, 3	
16	Feb. 27			
17	Feb. 29	Additional Analysis Techniques	Chapter 5	5.1, 6, 10, 15, 22
18	Mar. 3			27, 29, 40, 48, 54
19	Mar. 5			61, 70, 74, 81. 82
20	Mar. 7			86, 97, 102, 103
21	Mar. 10	Capacitance and Inductance	Chapter 6	6.1,2,5,7,8,15,17
22	Mar. 12			25,28,29,34,37,39
23	Mar. 14	Test Test Test Test Test Test Test	Chapter 4 & 5	48,53,56,65,67,70,71
	March 17-21	**** Spring Break ****	No Class	China
24	Mar. 24			
25	Mar. 26	First & Second Order Transient Circuits	Chapter 7	7.2,9,15,20,26
26	Mar. 28			34,48,50,58,65
27	Mar. 31			77,81,86
28	Apr. 2			
29	Apr. 4			
30	Apr. 7			
31	Apr. 9			
32	Apr. 11			
33	Apr. 14			
34	Apr. 16			
35	Apr. 18	AC Steady-State Analysis	Chapter 8	8.1,3,7,8,10,12
36	Apr. 21			23,27,33,41,49,
37	Apr. 23	Test Test Test Test Test Test Test	Chapter 6 & 7	57,66,75,101
38	Apr. 25	Steady-State Power Analysis	Chapter 9	
39	Apr. 28			
40	Apr. 30			
41	May 2			
42	May 5			
43	May 7			
44	May 9	Review for Final Examination		
	W 5/14/08	Final Exam	7:30 AM-9:30 AM	
	Text	BASIC ENGINEERING CIRCUIT ANALYSIS, J. David Irwin and R. Mark Nelms, John Wiley, 8th Edition		4/14/2008