University of Massachusetts
Department of Electrical and Computer Engineering
Amherst, Massachusetts 01003

E&C-Eng 210 Circuits and Electronics I (4 credits)

Instructor:	R. W. Jackson, 215G Marcus, jackson@ecs.umass.edu Office Hours: 3-4pm MWF Professor Jun Yao, 213 Marcus, juny@umass.edu Office Hours:
Teaching Assistants	Minghao Dong, minghaod@umass.edu Office Hours: MW 7:00-8:00pm, Elab 325 Michael Zeimbekakis, mzeimbekakis@umass.edu Office Hours: SuTh 7:00-8:00pm, Elab 325
Course Synopsis:	Mathematical models for analog circuit elements such as resistors, capacitors, opamps and MOSFETs as switches. Basic circuit laws and network theorems applied to dc, transient, and steady-state response of first- and second-order circuits. Modeling circuit responses using differential equations Computer and laboratory projects.
Prerequisites:	Passing grade in MATH 132 or 135, and PHYSICS 152.
Grading Scheme:	Letter grade based on following weights (1) Homework and Laboratory Assignments (25%) (2) Midterm Exam(2) (30%) (3) Final Exam (45%) *Note on Homework:* There will be ten homework assignments. All of these will be due by 2:30 pm on Tuesdays and will be submitted using Gradescope. *No late homework will be accepted*. Four of the assignments will be Prelab homework assignments that will count 3½ times more than a regular assignment. They must be completed before the associated lab. *Note on Lab:* There are four lab experiences. *You can not pass the course without completing these labs*.

References:

Foundations of Analog and Digital Electronic Circuits. Agarwal and Lang, Elsevier, 2005 (Required)

PSpice for Linear Circuits (uses PSpice version 15.7) 2nd Edition by J.A. Svoboda; Wiley, 2002 (Required)

Openstax University Physics Vol 2 (https://openstax.org/details/books/university-physics-volume-2)

Practical Electronics For Inventors, Scherz & Monk, McGraw Hill 2016.

Software

Students will be using ORCAD PSPICE for circuit analysis. This can be downloaded free from https://www.orcad.com/resources/download-orcad-lite Versions 16.6 and 17.2 are for 32 and 64 bit machines respectively. Mac users will need a Windows emulator

Lectures: MWF, 9:05-10:10, Goessman 20

Discussions: TWTh , 2:30-3:45, Elab 306 (except weeks with labs)

Laboratories: MTWThF 2:30-5:30, Marston 221, (not every week – see schedule)

Schedule: See website for detailed schedule.

Learning Objectives:

- Understand the methodology of modeling real-life systems by lumped circuit models;
- Be able to analyze DC resistive circuits using network theorems such as superposition, Thevenin's and Norton's Theorems;
- Be able to analyze RC, RL, and RLC circuits through the use of differential equations;
- Be able to analyze DC and switching circuits using simple models for nonlinear devices such as diodes and MOSFETs
- Be able to use simple laboratory equipment such as voltmeters, ammeters, sources, and oscilloscopes.
- Be able to use modern software tools, particularly PSpice, for the analysis and simulation of electric circuits.

2018 Schedule ECE210 Circuits and Electronics I

Date	Lectu	Due Dates	Lab meetings	Topics	Text Sections
4-Sep					Chapter 1
5-Sep	1			charge, current, voltage	1.0-1.4
6-Sep					University Physics Vol 2, pp385-394, 293-304
7-Sep	2			2-terminal component modeling	1.5
10-Sep	3			power and energy	1.5, 1.6
11-Sep		HW1	Lab Intro Tu		
12-Sep	4		Lab Intro We	sources, signals, average, RMS	1.7,1.8
13-Sep			Lab IntroTh		
14-Sep	5		Lab Intro Fr	Kirchoff's laws	2.1,2.2
17-Sep	6		Lab Intro Mo	Simple Circuit analysis,	2.3,2.4
18-Sep		HW2			
19-Sep	7			Examples	2.5
20-Sep					
21-Sep	8			Nodal Analysis	3.1-3.3
24-Sep	9			Nodal Analysis	3.4
25-Sep		Prelab 1 HW	Lab 1 Tu		Laboratory 1: Measurement of voltage/ current in PV cell
26-Sep	10		Lab 1 We	Superposition	3.5
27-Sep			Lab 1Th		
28-Sep	11		Lab 1 Fr	Thevenin/Norton equivalents	3.6
1-Oct	12		Lab 1 Mo	Thevenin/Norton equivalents	3.6
2-Oct		HW3			
3-Oct	13			Dependent Sources	2.6,3.3
4-Oct					
5-Oct	14			Thevenin with dependent source	3.6
8-Oct	Holiday				
9-Oct	15(Mon)			Opamps: ideal and finite gain	15.1-15.3
10-Oct	16			Review	
11-Oct		Midterm I (eve)			
12-Oct				no class	
15-Oct	17			Opamp configurations	notes
16-Oct					
17-Oct	18			Capacitors and inductors	9.1-9.2
18-Oct					
19-Oct	19			Step, impulse	9.4, 9.5
22-Oct	20			Differential Equations in RC circu	10.1 (also pg6, 44 in Kreyszig)
23-Oct		Prelab 2 HW	Lab 2 Tu		Laboratory 2: Opamp circuits
24-Oct	21		Lab 2 We	Differential Equations in RC circu	10.1

25-Oct			Lab 2 Th		
26-Oct	22		Lab 2 Fr	Differential Equations in RL circu	10.2 10.6.4, 10.6.7
29-Oct	23		Lab 2 Mo	MOSFET SR model, inverter	6.1-6.3, 6.6-6.8, 10.4
30-Oct		HW4			
31-Oct	24			RLC circuits: overdamped	12.1-12.4
1-Nov					
2-Nov	25			RLC: underdamped	12.5,12.7
5-Nov	26			RLC: underdamped	12.5,12.7
6-Nov		Prelab 3 HW	Lab 3 Tu		Laboratory 3: Transient response in switching circuit
7-Nov	27		Lab 3 We	Inverter transfer curve	6.5, 6.9.3, 6.9.4, 6.10
8-Nov			Lab 3 Th		
9-Nov	28		Lab 3 Fr	CMOS inverter	11.5
12-Nov				Holiday	
13-Nov		HW5			
14-Nov	29 (Mon)		Lab 3 "Mo"	Inverter delay	10.4
15-Nov					
16-Nov	30			CMOS Dynamic Power	11.1-11.3
19-Nov				Thanksgiving break	
20-Nov				Thanksgiving break	
21-Nov				Thanksgiving break	
22-Nov				Thanksgiving break	
23-Nov				Thanksgiving break	
26-Nov	31			Review	
27-Nov		Midterm II (eve)			
28-Nov	32			Laplace Transforms: Circuits	In collaboration with ECE201
29-Nov					
30-Nov	33			Nonlinear circuits: diodes	4.1-4.4,16.3
3-Dec	34			Nonlinear circuits: diodes	4.1-4.4,16.3
4-Dec		Prelab 4 HW	Lab 4 Tu		Laboratory 4: CMOS Inverter
5-Dec	35		Lab 4 We	Nonlinear circuits: NMOS	6.3, 6.7,7.3
6-Dec			Lab 4 Th		
7-Dec	36		Lab 4 Fr	Nonlinear circuits: NMOS	6.3, 6.7,7.3
10-Dec	37		Lab 4 Mo	NMOS applications	
11-Dec		HW6			
12-Dec	38			Last Class: Review	
13-Dec					
14-Dec				Start Final	
17-Dec					
18-Dec					
19-Dec					
20-Dec				End Finals	

Accommodation Statement

The University of Massachusetts Amherst is committed to providing an equal educational opportunity for all students. If you have a documented physical, psychological, or learning disability on file with Disability Services (DS), you may be eligible for reasonable academic accommodations to help you succeed in this course. If you have a documented disability that requires an accommodation, please notify me within the first two weeks of the semester so that we may make appropriate arrangements.

Academic Honesty Statement

Since the integrity of the academic enterprise of any institution of higher education requires honesty in scholarship and research, academic honesty is required of all students at the University of Massachusetts Amherst. Academic dishonesty is prohibited in all programs of the University. Academic dishonesty includes but is not limited to: cheating, fabrication, plagiarism, and facilitating dishonesty. Appropriate sanctions may be imposed on any student who has committed an act of academic dishonesty. Instructors should take reasonable steps to address academic misconduct. Any person who has reason to believe that a student has committed academic dishonesty should bring such information to the attention of the appropriate course instructor as soon as possible. Instances of academic dishonesty not related to a specific course should be brought to the attention of the appropriate department Head or Chair. Since students are expected to be familiar with this policy and the commonly accepted standards of academic integrity, ignorance of such standards is not normally sufficient evidence of lack of intent