Syllabus: EEL 3111C Circuits I

Term: Fall 2017

Credits: 4

Instructors:

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Teaching Assistants: Listed on Canvas

General Description: The topics in this course are part of the fundamental theory of electrical engineering and provide depth in the analysis, design, and implementation skills in those areas of electrical engineering needed to solve problems in the domain of electrical engineering.

Course Format: The format for the course consists of on-line lectures, class periods and labs. Students will be required to watch one or more lectures on-line, prior to attending class. During class, students will work within teams to solve problems provided by the instructors. During labs, students will be completing experiments utilizing the material from the lectures and class periods.

Objectives: After successful completion of this course, the student will have a basic understanding of

- Definitions and units of basic electrical quantities
- Ohm's law and Kirchoff's laws and series and parallel dc circuit analysis
- Dependent sources, input and output resistances, and operational amplifiers
- Mesh, loop and nodal analyses of general dc resistive and op-amp circuits
- DC network theorems and bridge circuits
- Use of SPICE for DC circuit analysis
- Capacitors and inductors
- First-order transient analysis of RL and RC circuits
- Use of SPICE for transient analysis
- Sinusoids, phasors, phasor circuits, impedance and admittance
- Nodal, mesh and loop analyses of general ac circuits
- Network theorems applied to ac circuits; SPICE applied to ac circuits
- Bode plots and use of SPICE to obtain frequency-response plots
- Average power, RMS values, apparent power and complex power
- Diodes
- Analyze circuits using Digilent Board

Required:

1. **A calculator** that can perform calculations with complex numbers in polar as well as rectangular form in matrices. If you plan to purchase a new one, we recommend the TI-Nspire CX CAS.
2. **Digilent Analog Discovery (DAD)*, a breadboard and wires**.
   *The Digilent Analog Discovery (DAD) board or National Instruments Analog Discovery (NAD) board is REQUIRED for this course (and many other ECE courses). A Digilent Analog Discovery kit for this course can be purchased from the UF bookstore. It includes an Analog Discovery 2, Breadboard, wiring kit, and assorted parts. Additionally, the product should be price matched to the Digilent website academic price by registering an academic account with Digilent (https://resource.digilentinc.com/verify) to see academic pricing.
3. **Text:** *Electric Circuits*, 10th or other editions, Nilsson and Riedel, Prentice Hall

Tests and Quizzes: There will be 4 tests on the tentative dates shown below, daily and weekly quizzes during class. The tests will be given in the evening starting at a time, and in a room, that will be announced later by UFL email. Quizzes will be given at the beginning of each class and once a week at the end of class.

	Date	Tentative Chapters
Test 1	September 25	1,2,3,4
Test 2	October 18	4,5,6,7
Test 3	November 15	9,14
Test 4	December 1	1-7, 9, 10, 14

Lab:
Information on the labs in this course can be found in the lab manual posted under the lab files section in Canvas. Labs start the second week of class and your section time will be determined by the end of the first week through an on-line survey. All labs take place in NEB 250 and lab instructor office hours usually take place in NEB 250 unless otherwise noted.

Grading: The grading scheme presented here reflects the requirements that students must be successful in all aspects of the material to pass the course. To that end, students must fully attend at least 85% of the classes to pass the course. Arriving late, or leaving early, will count, at a minimum, as half an absence. No excuses of any kind are required or will be allowed, the 15% of allowed absences will cover any and all reasons for absence. Also, students must earn a lab score of 80% or higher to pass the course. Rules for homework and lab information will be available in Canvas.
For those students who have fully attended at least 85% of the classes and earned a passing lab score their grades will be based on the following equation. Grade = 85% theory + 15% laboratory.
The weighted test score, T, will be calculated as follows.

$$T = \frac{\left((0.1)T_L + (0.18)T_M + (0.18)T_H + (0.24)T_4\right)}{0.7}$$

Where T_L, T_M and T_H represent the Lowest, Middle and Highest test scores for each student and T_{FE} is the final test score.
Quiz one (Q_1) will be given at the beginning of each class to insure the student watched and understood the video lecture and will be used for attendance. Quiz two (Q_2) will usually be given at the end of a class each week typically on Wednesday on the material covered in the class to that point. To determine the overall score for each of the quiz types; for Q_1 we will drop 15% of the lowest scores, and for Q_2 we will drop the two lowest quiz scores. Students leaving class early will have all quiz scores for the day reduced to zero.
The overall score, S, for the course will be calculated as follows assuming that HW represents the overall homework score, L the overall lab score.

$$S = (.85)(.08Q_1 + .08Q_2 + .08HW + .76T) + (.15)L$$

The overall score will then be used to determine the course grade based on the table shown below.

Overall Score	Grade
92.5-100	A
90-92.499…	A-
87.5-89.99…	B+
82.5-87.499…	B
80-82.499…	B-
77.5-79.999…	C+
72.5-77.499…	C
70-72.499..	C-
67.5-69.99…	D+
62.5-67.499…	D
60-62.499…	D-
Less than 60	E

Tentative Class Schedule

Date	D	Q1	Q2	HW	Vid	Topics
8/21	M					First Class
8/23	W	1			1	Introduction, units, powers of 10, current, voltage
8/25	F	2			2	Passive sign convention, power, energy, kWH
8/28	M	3			3	Sources, i-v characteristics, Ohm's law, conductance, short circuit, open circuit
8/30	W	4	1	1	4	Node, KCL, KVL, circuit validity, terminal characteristics
9/1	F	5			5	Resistors in series, resistors in parallel, equivalent resistance
9/4	M					Holiday, No classes
9/6	W	6		2	6	Delta-Wye transformations, Wheatstone Bridge
9/8	F	7	2		7	Examples of Delta-Wye transformations, Ammeter, Voltmeter
9/11	M	8			8	Nodal analysis
9/13	W	9	3	3	9	Mesh analysis, networks with dependent sources
9/15	F	10			10	Source transformations, Principle of superposition
9/18	M	11			11	Thevenin's and Norton's theorems, maximum power transfer
9/20	W	12		4	12	Thevenin's resistance in networks with dependent sources
9/22	F	13	4		13	Review, examples
9/25	M					Review in class - Test 1 (Evening)
9/27	W	14			14	Op amp models, Inverting amplifier
9/29	F	15	5	5	15	Non inverting amplifier, summer amplifiers, difference amplifiers
10/2	M	16			16	Capacitor, i-v characteristics, energy, series and parallel connections
10/4	W	17	6	6	17	Inductor, i-v characteristics, energy, series and parallel connections
10/6	F					Homecoming
10/9	M	18			18	Circuits with reactive elements in a steady state, differentiator, integrator
10/11	W	19	7	7	19	First-order transients in source-free R-C and R-L circuits
10/13	F	20			20	First-order transients in circuits with indep. sources, step-by-step approach
10/16	M	21			21	Step-by-step approach, two-step switching, pulse broadening in communications
10/18	W		8	8		Review (In class) - Test 2 (Evening)
10/20	F	22			22	Diode models, half-wave and full-wave rectifiers, time averaging, ripple filtering
10/23	M	23			23	Sinusoids
10/25	W	24	9	9	24	Frequency domain circuit, review of complex numbers
10/27	F	25			25	Phasors, impedance of resistor, inductor, capacitor
10/30	M	26			26	Equivalent impedance, reactance, admittance
11/1	W	27	10	10	27	Delta-Wye transformations, series-parallel R-L and R-C combinations
11/3	F	28			28	AC Wheatstone Bridge, Low-pass R-C filter, cut-off frequency, Bode Plots
11/6	M	29			29	High-pass R-C filter, R-L-C series band-pass filter, notch filter, phase shifter
11/8	W	30	11		30	Nodal and mesh analysis in frequency domain
11/10	F					Holiday, No classes
11/13	M	31		11	31	Thevenin's and Norton's theorems, frequency filters with op amps
11/15	W					Review (In class) - Test 3 (Evening)
11/17	F	32			32	Instantaneous AC power, average power, power factor
11/20	M	33	12		33	Max. average power transfer, reactive power, complex power, RMS phasor
11/22	W					Thanksgiving Holiday
11/24	F					Thanksgiving Holiday
11/27	M	34		12	34	Multiple loads, power factor correction
11/29	W	35			35	More examples of AC power
12/1	F					Review in class - Test 4 (Evening)

Tentative Lab Schedule:

Week 2 - Lab 1 - Analog Discovery Introduction
Week 4 - Lab 2 - Resistors
Week 5 - Lab 3 - LTspice
Week 6 - Lab 4 - New lab, advanced spice / resistor circuits
Week 7 - Lab 5 - OpAmp Parameters
Week 8 - Lab 6 - OpAmp Applications
Week 9 - Lab 7 - Capacitors
Week 10 - Lab 8 - Diodes
Week 11 - Lab 9 - Filters
Week 12 - Lab 10 - Final Project

Important:

All students need to check their UFL email and Canvas web pages daily at a minimum to keep up to date with the class and lab. Excuses such as "I didn't know because I did not check my UFL email or Canvas" are not accepted.

Academic Honesty: As a result of completing the registration form at the University of Florida, every student has signed the following statement: "I understand the University of Florida expects its students to be honest in all their academic work. I agree to adhere to this commitment to academic honesty, and understand that my failure to comply with this commitment may result in disciplinary action, up to and including expulsion from the university."

Software Use: All faculty, staff and students of the University are required and expected to obey the laws and legal agreements governing software use. Failure to do so can lead to monetary damages and/or criminal penalties for the individual violator. Such violations are also against University policies and rules, and disciplinary action will be taken as appropriate.

University of Florida Counseling Services: Resources are available on campus for students having problems or lacking clear career and academic goals which interfere with their academic performance. These resources include:

1. University Counseling Center, 301 Peabody Hall, 392-1575, personal and career counseling.
2. Student Mental Health, Student Health Care Center, 392-1171, for personal counseling.
3. Sexual Assault Recovery Services (SARS), Student Health Care Center, 392-1161, for sexual assault counseling.
4. Career Resource Center, Reitz Union, 392-1601, career development