Basic Electrical Engineering

Class Location/Time: Monday – Friday, Online. Students will watch the online videos via Canvas on their own time, following the recommended schedule.

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Course Description

A first course in electrical engineering to provide non-Electrical Engineering majors with a knowledge of DC and AC circuit theory, AC power, and numerous electrical devices, apparatus, and digital systems. **Prerequisite:** MATH 2060 and PHYS 2210 with a C or better.

Course Objectives

The goal of this course is to provide non-Electrical Engineering majors with understanding of a few of the major topics within electrical engineering that you might need in your future career. The knowledge you acquire should enable you to then teach yourself or intelligently converse and interact with EE's on projects in the future. This class is an overview of the basics of electrical engineering including DC and AC circuit theory, AC power distribution, and numerous electrical devices, apparatus, and digital systems.

Required Materials

Required Textbook
Principles and Applications of Electrical Engineering, 5th edition, by G. Rizzoni, 2007, McGraw-Hill, ISBN: 0-07-322033-7
As an alternative to the hardcopy, a cheaper electronic version of select chapters (the ones we need) from the textbook is available from McGraw-Hill Create (www.mcgrawhillcreate.com/shop) using ISBN 9781121223257.

Distribution of Course Materials
All material will be distributed electronically via Canvas. All students must have a Canvas account (**www.clemson.edu/canvas**). Non- Clemson students should have a computer account and password and access to Canvas.

Additional Policies

Logistics

Note About Summer Classes and Your Schedule: Be certain that you understand that a summer class contains the same material as a regular semester class but the amount of time is reduced from 15 weeks to 5 weeks. For a 2 credit hour class that means there are now 6 lecture hours per week. Assume that there are 3 additional hours associated with every lecture hour, that means you should budget 6*(1+3) = 24 hours of your time every week for this class. ***Warning: the class is scheduled to proceed at a rapid pace, do not get complacent between tests!***

Office Hours

Communication via email is usually most efficient for simple questions. Please email the TA first if you have any questions. If the question cannot be resolved, please email the instructor. Online sessions can be scheduled by email for more complicated questions through the Adobe Breeze server (**https://connect.clemson.edu/ece2070/**). All students can access these meetings through a website using a browser-based interface.

All that said, if you have a problem, contact the instructor! I want you to succeed in this course.

Attendance

Students will access all course materials, including tests and lectures, through the Canvas software. No on-site attendance is required. Students are responsible for all material covered and all assignments given in every lecture. Some lectures may cover material not found in the textbook. It is the responsibility of each student to follow the schedule.

Important Administrative Dates

June 28 Monday Classes Begin
June 29 Tuesday Last day to drop a class or withdraw from the University without a W grade
July 5 Monday Independence Day holiday in lieu of July 4 (Sunday)
July 16 Friday Last day for instructors to issue midterm evaluations
July 21 Wednesday Last day to drop a class or withdraw from the University without final grades
July 30 Friday Last day of classes
August 2 Monday Final Exam

Testing Procedures

Students will be testing remotely. The tests will be made available on the specified day, known well in advance, on the web through Canvas and using the Respondus lockdown browser. You must take the test on that day (6:00am-11:59pm) and will generally have 45 *minutes to complete the test from the time you start*. You will need internet access to take the tests. Be prepared for this. There will be no makeup tests. The only excuse for missing a test deadline will be in the event of true, documentable personal emergencies (i.e. hospitalization, death in the family, etc.). If such a circumstance arises, you must let me know immediately. Otherwise, a grade of zero will result from a missed or past-the deadline test. If you have a **bonafide** conflict with a scheduled test, please let me know as far in advance as possible, and we can work out an alternative.

You must administer you own time limits. You have 45 minutes to complete the midterm tests (2.5 hours for your final). You must stop at this time or you will be penalized. The timer will indicate that

your time has expired, it is your responsibility to track the time and stop. A 2 point penalty will be assessed after each minute you have gone beyond the allotted time:
<1 minute no penalty
1-2 minutes -2 pts
2-3 minutes -4 pts
3-4 minutes -6 pts
Penalty continues to escalate
Generally, computer problems are not excusable; the Canvas system is very reliable and documents your actions.

Testing
The midterm test dates are July 2, July 9, July 16, July 23, July 30 (all midterms are on Fridays). The Final Exam is on Tuesday, August 3.

Formula Sheets and Calculators on Tests
You can create your own formula sheets. For each test you may add an additional front side only of an 8 ½"x11" paper. That is, for Test 1 you have 1 page, Test 2 = 2 pages, etc. You may use any calculator of your choice and it is recommended that you have one that can perform complex matrix operations, e.g., TI 89. **No other electronic devices including cell phones, iPods, smartwatches etc. are allowed during tests. Additionally, MS Excel will not be allowed for the test as well.**

Topical Outline

Topics Covered	Hours
1. Electrical quantities and circuit elements	3
2. DC circuits, Kirchoff's laws, network theorems	5
3. AC circuit analysis	4
4. Steady-state AC circuits, reactive power, polyphase	3
5. Ideal transformers	1
6. AC and DC motors	1
7. Signal processing circuits, op-amps, rectifiers	3
8. Logic devices and digital circuits and methods	3
9. Tests	5

Grading

Final grades will be assigned according to weighted overall performance where each student's work will be weighted according to the schedule

5 Tests	80% (16% each)
Comprehensive Final Exam	20%
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Course Grade	100%

The final exam will be cumulative. We keep building on the same ideas all semester. You will be given the option to replace your single lowest test score with your score on the final exam (but not vice versa).

That allows you to have one bad test (or miss a test) assuming that you do well on the final exam. A final grade will be assigned based on the scale

90% – 100%	A
80% – < 90%	B
70% – < 80%	C
60% – < 70%	D
0% – < 60%	F

Week #	Lecture #	Date	Class Lecture	Book Sections	Homework
1	L0	Mon 6/28	Introduction to Course • Motivation • Examples • Organization and dates	1	
1	DC1	Mon 6/28	Electrical quantities and circuit elements • Component Models and Connection Definitions • Kirchhoff's Current Law (KCL)	2.1 2.2	2.6, 2.13, 2.14, 2.17
1	DC2	Tue 6/29	Electrical quantities and circuit elements • Kirchoff's Voltage Law (KVL) • Solving circuits using KCL and KVL	2.3	2.16 (use KVL)

1	DC3	Wed 6/30	Electrical quantities and circuit elements
			• Power in Electric Circuits
			• Resistance and Ohm's Law
			  • Series resistors & voltage divider
			  • Parallel resistor & current divider
				2.4
				2.6
					2.7, 2.19, 2.20, 2.22
					2.58a, 2.60, 2.65

1	DC4	Thu 7/1	DC circuits • Node Voltage Method	3.1,3.2	3.1, 3.3, 3.11
1		**Fri 7/2**	**Test 1 Covering L0-DC3**		
2		Mon 7/5	4th of July Holiday		
2	DC5	Tue 7/6	DC circuits • Mesh Current Method	3.3	3.8, 3.15, 3.16

2	DC6	Wed 7/7	DC circuits
			• Equivalent Circuits
			  • Thevenin Equivalent Circuits
			  • Norton Equivalent Circuits
			  • Source transformations
				3.6	3.54,3.56, 3.57

2	DC7	Thu 7/8	DC circuits • Superposition • Max Power Transfer • Dependent Sources	3.5 3.7 2.1, 3.4	3.40, 3.41, 3.42 3.73, 3.74 3.27. 3.31, 3.61
2		**Fri 7/9**	**Test 2 covering L0-DC7**		

Week #	Lecture #	Date	Class Lecture	Book Sections	Homework

3	AC1	Mon 7/12	AC circuit analysis
			• Capacitors and Inductors
			  • Series and Parallel Combinations
			  • Energy storage
			• AC Sources
			  • Phase, frequency
			  • RMS
				4.1, 4.2, 4.3	4.2 a&b, 4.3 a&b, 4.4 & 4.5, 4.29, 4.32

3	AC2	Tue 7/13	AC circuit analysis • Complex numbers • Total system response and steady state • Phasors	A.2 ~ 5 4.3, 4.4	4.37, 4.38, 4.39
3	AC3	Wed 7/14	AC circuit analysis • Impedance • Combining • Node Voltage	4.4, 4.5	4.43, 4.47, 4.54, 4.55 Use NVM: 4.55, 4.69, 4.72, 4.74, 4.82, 4.83 (find component voltages)
3	AC4	Thu 7/15	Steady-state AC circuits • Mesh Current • Thevenin and Norton • Superposition	4.5	4.69, 4.73, 4.81, 4.71 Supplementary problem 1
3		**Fri 7/16**	**Test 3 covering AC1-AC4**		
4	AC5	Mon 7/19	Steady-state AC circuits, reactive power, polyphase • Power in AC Circuits • Complex Power	7.1, 7.2	7.1,7.4,7.5,7.6, 7.14, 7.27
4	AC6	Mon 7/19	Steady-state AC circuits, reactive power, polyphase • PF correction	7.2	7.18, 7.19, 7.20, 7.21
4	AC7	Tue 7/20	Steady-state AC circuits, reactive power, polyphase • Transformers	7.3	7.46, 7.47, 7.56
4	AC8	Wed 7/21	Steady-state AC circuits, reactive power, polyphase • Three-phase Circuits	7.4	7.61, 7.59, Problem set from other sources.
4	SP1	Thu 7/22	Filters • Frequency response • Low pass • High pass • Band pass & band reject	6.1, 6.2 6.3 6.3 6.3	6.1 a&d, 6.2 a&d,6.6 a&b,6.7 a&b,6.11 (no plot),6.51, 6.52
4		Fri **7/23**	**Test 4 covering AC5-AC8, SP1**		

Week #	Lecture #	Date	Class Lecture	Book Sections	Homework
5	SP2	Mon 7/26	Op-amps • Ideal • Inverting • Summing • Buffer Non-inverting	8.1, 8.2	Inverting: 8.3,8.4,8.7; Summing: 8.34 (assume ideal); Non-inverting: 8.24; Buffer: 8.5, 8.31;,
5	SP3	Mon 7/26	Rectifiers • Semiconductors • Diode • Bridge Rectifier • Zener Diode	9	9.16, 9.21, 9.22, 9.50, 9.60 + supplementary problems
5	D1	Tue 7/27	Digital Systems Logic devices and circuits • Logic gates & truth tables • "And", "Or", "Not", "Nor", "Nand", "XOR" w/ circuits • Logic devices to implement binary math.	13.3	13.1, 13.3 a&b,13.4 a&b, 13.5, 13.6
5	D2	Wed 7/28	Digital Systems • Boolean Algebra • Binary Computation with Logic Gates	13.3	Supplementary problems on Digital Logic and 13.30, 31, 32, 33 only find the truth tables
5	D3	Thu 7/29	Digital Systems • Realization of logic problems using logic gates • Truth Table from logic circuits	13.3	13.11,12,13,14,16, 17,18,20,31, 32
5		**Fri 7/30**	**Test 5 covering SP2-SP4, D1-D3**		
6		Mon 8/2	Review		
6		**Tue 8/3**	**Cumulative Final Exam** The final exam is scheduled for Friday, the on-campus time is 5:00pm – 7:30pm.		