CLEMSON
ELECTRICAL AND COMPUTER ENGINEERING

ECE 2070 Section 400 | Summer 2025

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.

Instructor: Dr. Apoorva Kapadia
Email: akapadi@clemson.edu
Office: 307 Fluor Daniel EIB
Phone: (864) 656-3946
Canvas Website: http://www.clemson.edu/canvas

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 me if you have any questions. If a video conversation is required, one can be set up on Zoom. ***All that said, if you have a problem, contact me! 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 can be found here: https://www.clemson.edu/registrar/academic-resources/calendar.html?year=2025&semester=summer

Testing Procedures
Exams must be taken with a pre-approved proctor. Proctors must be a supervisor of the student at a place of employment, or a US Based Testing Center. Proctors should fill out all of the information on the proctor form and email a PDF to the instructor by Monday, July 3. The proctor form is on Canvas. If you are in or around Clemson, you have the option of requesting the instructor as your proctor as well. Note that the notification deadline applies still holds. You are not allowed to use online proctors. *Also note that the proctor form must be mailed to the faculty from the proctor's official email address.*

Testing
The test dates are May 21, June 4, June 25, July 9, July 23 (all midterms are on Wednesdays). The Final Exam is on Monday, August 4.

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, iPads, 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 grading scale above.

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	Tue 5/13	Introduction to Course • Motivation • Examples • Organization and dates	1	
1	DC1	Wed 5/14	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	Fri 5/16	Electrical quantities and circuit elements • Kirchoff's Voltage Law (KVL) • Solving circuits using KCL and KVL	2.3	2.16 (use KVL)

2	DC3	Mon 5/19	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

2		**Wed 5/21**	**Test 1 Covering L0-DC3**		
2	DC4	Fri 5/23	DC circuits Node Voltage Method	3.1, 3.2	3.1, 3.3, 3.11
3		**Mon 5/25**	**Memorial Day Holiday**		
3	DC5	Wed 5/28	DC circuits Mesh Current Method	3.3	3.8, 3.15, 3.16

3	DC6	Fri 5/20	DC circuits
			• Equivalent Circuits
			  • Thevenin Equivalent Circuits
			  • Norton Equivalent Circuits
			  • Source transformations
				3.6	3.54,3.56, 3.57

4	DC7	Tue 6/2	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
4		**Wed 6/4**	**Test 2 covering L0-DC7**		

4	AC1	Fri 6/6	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

Week #	Lecture #	Date	Class Lecture	Book Sections	Homework
5	AC2	Mon 6/9	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
5	AC3	Wed 6/11	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)
5	AC4	Fri 6/13	Steady-state AC circuits • Mesh Current • Thevenin and Norton Superposition	4.5	4.69, 4.73, 4.81, 4.71 Supplementary problem 1
6		**Mon-Fri 6/16-6/20**	**Long Summer Break**		
7	AC5	Mon 6/23	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
7		**Wed 6/25**	**Test 3 covering AC1-AC4**		
7	AC6	Fri 6/27	Steady-state AC circuits, reactive power, polyphase • PF correction	7.2	7.18, 7.19, 7.20, 7.21
8	AC7	Mon 6/30	Steady-state AC circuits, reactive power, polyphase • Transformers	7.3	7.46, 7.47, 7.56
8	AC8	Wed 7/2	Steady-state AC circuits, reactive power, polyphase • Three-phase Circuits	7.4	7.61, 7.59, Problem set from other sources.
8		**Fri 7/4**	**4th of July Holiday**		
9	SP1	Mon 7/7	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
9		Wed **7/9**	**Test 4 covering AC5-AC8, SP1**		
9	SP2	Fri 7/11	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;

Week #	Lecture #	Date	Class Lecture	Book Sections	Homework
10	SP3	Mon 7/14	Rectifiers • Semiconductors • Diode • Bridge Rectifier • Zener Diode	9	9.16, 9.21, 9.22, 9.50, 9.60 + supplementary problems
10	D1	Wed 7/16	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
10	D2	Fri 7/18	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
11	D3	Mon 7/21	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
11		**Wed 7/23**	**Test 5 covering SP2-SP4, D1-D3**		
11/12		Fri-Wed 7/25-7/30	Review		
13		**Mon 8/4**	**Cumulative Final Exam** On Campus option time to be determined		