ENGR 210 Electric Circuits, Cuyamaca College

Spring Semester 2012, Section 5256
Monday, Wednesday 4 – 5:25 pm, Room F301

ENGR 210 teaches basic concepts of electrical engineering, including impedance, frequency response, resonance, and filtering. By the end of the course you should be able to analyze any passive-element network and design circuits to perform basic functions like amplification and filtering.

Professor

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Office Hours: MW 1 – 2:30 pm, MW 5:30 – 6 pm, Th 5 – 6 pm, or by appointment

Texts

1) *Fundamentals of Electric Circuits, 4th Edition*, Charles Alexander and Matthew Sadiku

Units and Prerequisites

3 units, Prerequisites: MATH 280, PHYC 200

Grading

A: 90 - 100
B: 80 - 89.9999
C: 70 - 79.9999
D: 60 - 69.9999
F: < 60

Homework	25%
On-line Reading Quizzes	10%
Midterm 1	20%
Midterm 2	20%
Midterm 3	20%
Final	25%

Notes on grades:

1) On-line reading quizzes are to be done no later than 1 hour *before* the associated class meeting, or will not be accepted.
2) Homework will be assigned every Monday and will be due Monday of the following week. Homework delivered more than 5 minutes after the start of class will receive half credit, and homework delivered after the due date will *not* be accepted. If you must miss class, you may submit the work early, or ask a classmate to submit it for you. Homework will be graded in class following the grading rubric found later in this syllabus. The instructor will provide more information on this.
3) All exam problems will be graded according to the grading rubric given later in the syllabus.
4) There will be no make-up exams. However your lowest grade from Midterms 1 - 3 will be dropped. Pre-class quiz grades, homework, and final exam grades will not be dropped.

Policies

1) Always read the material to be covered in class *before* the lecture. The reading quizzes are there to remind you of this.
2) Always bring textbook and calculator to class.
3) Cell phones must be off and tucked away before lecture begins. This includes text messages transmitted or received.
4) Cheating. If I think you are cheating on an exam:
   a) You will get a zero for that exam
   b) I will invite you to withdraw from the class
   c) Cell phones anywhere in evidence during an exam will be considered *a priori* evidence of cheating. I'll take a picture of your cell phone with my cell phone, give you a zero, and kick you out of the room.

Important dates

3 February: Final day to add classes, or to drop without a 'W'.
20 April: Final day to drop classes.

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Tentative Schedule

Lesson	Date	Topic	Reading	homework due
1	23 Jan	Introduction, Basic definitions and conventions	1.1 – 1.5	
2	25 Jan	Circuit elements: Voltage and current sources, resistors	1.6 – 1.9, 2.1 – 2.2	
3	30 Jan	Kirchhoff's laws, Series and parallel resistors	2.3 – 2.6	1
4	1 Feb	Voltage and current dividers, Equivalent resistance of networks		
5	6 Feb	Electric measurement	2.8 – 2.9	2
6	8 Feb	Circuit analysis: Node-voltage method	3.1 – 3.3	
	13 Feb	**Midterm Exam 1**		3
7	15 Feb	Circuit Analysis: Mesh-current method	3.4 – 3.7	
	20 Feb	**Presidents' Day Holiday**		
8	22 Feb	Linearity and superposition, source transformations	4.1 – 4.4	4
9	27 Feb	Thevenin and Norton equivalents, Max power transfer	4.5 – 4.10	5
10	29 Feb	Operational Amplifiers	5.1-5.4	
11	5 Mar	Op amp circuits	5.5-5.11	6
12	7 Mar	Capacitors	6.1-6.3	
13	12 Mar	**Midterm 2**		7
	14 Mar	Inductors, Intro to RLC	6.4 – 6.7	
14	19 Mar	Natural response of RC and RL circuits	7.1-7.3	
15	21 Mar	Step response of RC and RL circuits	7.4 – 7.6	8
16	26 Mar	General response of RC and RL circuits, sequential switching		
17	28 Mar	RLC circuits	8.1 – 8.2	9
	2-6 April	**Spring Break**		
18	9 Apr	RLC circuits continued	8.3-8.4	
19	11 Apr	RLC cont'd	8.5 – 8.7	10
20	16 Apr	**Midterm 3**		
21	18 Apr	Sinusoids and Phasors	9.1 – 9.3	11
	23 Apr	Phasor transform, impedance	9.4 – 9.6	
22	25 Apr	Filters, Sinusoidal steady state analysis	9.7 – 9.9, 10.5 – 10.7	12
23	30 Apr	Sinusoidal steady state analysis, continued	10.2 – 10.4, 10.8	
24	2 May	AC Power Analysis – Instantaneous and Average Power	11.1 – 11.4	13
25	7 May	Complex Power	11.5 – 11.8	
26	9 May	Transformers, Power Transmission, House Power		14
	16 May	**Final Exam**		15

This course adheres to policies outlined in the Cuyamaca College catalog. Please see the section in the catalog entitled *Academic Policies*.

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Course Objectives (Expected Student Learning Outcomes)

Students will be able to:

1) Describe the voltage, current, and power relationships of the following circuit elements: Independent and dependent voltage sources, resistors, capacitors, and inductors, and apply these relationships to the analysis of electric circuits.
2) Describe steady-state AC signals, including various representations of amplitude, frequency, and phase.
3) Apply Ohm's and Kirchhoff's laws to the simplification and analysis of circuits, including series and parallel combination of circuit elements, and voltage and current division.
4) Analyze DC and steady-state AC circuits using both the node-voltage and mesh-current methods.
5) Apply the following techniques and theorems to DC and steady-state AC circuit analysis: Superposition, source transformations, Thevenin and Norton equivalents, maximum power transfer.
6) Analyze simple circuits containing both ideal and non-ideal operational amplifiers.
7) Predict the natural, step, and general response of RL and RC circuits.
8) Predict the natural and step response of both series and parallel RLC circuits.
9) Perform steady-state AC power analysis including instantaneous, average, RMS, and power, and power factor.

Exams will be composed of multiple choice, short answer, and longer problems. The longer problems will be graded according to the following sample rubric.

Level		Description
5	100%	Answer is correct, main concepts and principles are clearly demonstrated. Solution is clear and logical. Circuit diagrams and graphs are clearly labeled and show all relevant voltages, currents, etc. Graph axes are fully labeled. Solution has been checked as thoroughly as possible.
4	88%	Same as level 5, but answer is incorrect due to a checkable math error. Answer is nevertheless credible (not obviously wrong).
3	80%	Same as level 4, but some part of the answer is obviously wrong, or answer is correct but lacks units or uses incorrect units (e.g. Amps instead of Volts).
2	72%	Answer is incorrect due to a minor conceptual error, or due to several math errors. Main concepts and principles are clearly demonstrated, and the solution is clear and logical. Circuit diagrams and graphs are generally clear. Answer may or may not be credible.
1	40%	Answer is incorrect. Some evidence of understanding of main concepts and principles, but solution is not clearly demonstrated. This includes missing circuit diagrams and graphs. If errors are due to sloppiness in units, this is the highest possible grade. Also if the reasoning is absent, *even if the answer is correct.*
0	0%	Scant evidence of understand of the main concepts and principles.

On-line Reading Quizzes

These are taken within the Blackboard environment.

1. To get to Blackboard, go to www.cuyamaca.edu and click on the Blackboard link, located under **Online Services**, or go directly to https://gcccd.blackboard.com .
2. Your user name is firstname.lastname, your password is whatever you set it to, or your 6-digit birthday (month day year) if you haven't changed it. For example if you were born September 12, 1990, your password will be 091290.
3. Go to the ENGR 210 link on the right and select it.
4. Go to Lessons (if you're not already there). Choose the appropriate lesson folder.
5. Do the reading quiz and other activities within that folder.

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Homework

Each homework set will be worth 10 points. The grade will be based both on **completeness** and **presentation** as follows:

Completeness – 5 points

Level	Points	Description
4	5	Homework is complete, all problems have been done, or at least seriously attempted. Work is neat and legible. Each problem is on its own page.
3	4	Same as level 4, but problems are not each on their own page.
2	3	Several problems have not been attempted (an attempt means more than just writing down the problem). Work is neat and legible.
1	1	Only a few problems have been attempted. Work is neat and legible.
0	0	Homework was not handed in, or makes little sense, or is illegible.

Presentation – 5 points

Every Monday when the homework has been submitted, I will select 1 student at random to present his/her solution to one of the problems (I choose which problem) to the class. This student will be working entirely from his/her homework, not from the text. Obviously several things will be needed for this to be a success:

1. A clear problem statement, with the circuit sketched if necessary.
2. A clearly written step-by-step solution, with each step either explained or obvious.
3. Your solution should not overly resemble the one from the solution manual (should you have access to it). In other words, do your own work, don't just copy from the solution manual.

Note 2 things: 1) Refusal to present means losing all 5 points, and someone else will take your place. You're much better off coming up and presenting your work as best you can. If you do struggle, other students will be there to help you.
2) Random selection means you may be selected more than once in the semester.

I will later grade the same problem in everyone's homework, based on the following presentation criteria:

Level	Points	Description
4	5	Problem is clearly stated, with a clear solution that is easy to follow. Circuits and graphs are provided as needed.
3	3	The problem is clearly stated, and there is a solution, but it is not easy to follow. Circuits and graphs may be missing. Or a solution has been reasonably attempted, but not successfully completed.
2	2	A solution has been reasonably attempted, but not successfully completed. Truth tables, Boolean expressions, and circuits may be missing.
1	1	Only the problem statement is present. No solution has seriously been attempted. Or there is a solution, but it is identical, or suspiciously similar, to the one in the solution manual.
0	0	The problem has not been attempted, or makes very little sense.

Additional comments regarding homework:

1. I will devote no more than two minutes to grading your homework set. That's enough for me to assess completeness and presentational clarity. However, it is not enough for me to figure out where you went wrong on a problem unless your presentation is crystal clear. Therefore, if you have questions about the homework, please come see me during office hours. I will also be providing solutions (on-line or in the library) *after* the homework has been submitted.
2. I will drop your lowest homework grade.

Advice on homework problems

1. Always do the example problems in the section you're working on. The examples hold clues to the reasoning needed to solve the homework.

2. The first steps in solving any problem are 1) to sketch the circuit, and 2) state what it is you're solving for. There are several reasons for this:
   a) It helps you define the problem in your own mind, and lays the groundwork for the solution.
   b) I won't help you with a homework problem unless you've done this.

3. Engineering problems often must be left to fester in your mind. You may not see the solution right away, whereas if you come back to the problem the next day, it may be more obvious. *Moral of the story*: don't wait until the last day to try the homework problems.

4. Plan on a *minimum* of 1 hour per homework problem. It really does take time to wrap your brain around these problems. It's worth the time: you will do 95% of your learning in this class doing the homework

5. Work on the homework problems alone, then get together with a study group. Make sure everyone in your study group understands the problems and the solutions. Helping other people understand is not only good karma, it improves your mastery of the topic.

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