Department of Electrical and Electronic Engineering, California State University, Sacramento

Engr 17 Introductory Circuit Analysis, graded, 3 units
Instructor: Tatro - Spring 2019
Section 2, Call No. 32401, Mon/Wed 09:00 AM – 09:50 PM, Kadema Hall, Room 145
Fri Web Online
Section 4, Call No. 32571, Mon/Wed 10:00 PM – 10:50 PM, Kadema Hall, Room 145
Fri Web Online

Course Content: Writing of mesh and node equations. DC and transient circuit analysis by linear differential equation techniques. Application of laws and theorems of Kirchhoff, Ohm, Thévenin, Norton and maximum power transfer. Sinusoidal analysis using phasors, average power.

Prerequisite: Phys 11C and Math 45; either the math or physics may be taken concurrently, but not both.

Textbook: ***Electric Circuits***, Nilsson and Riedel, 10th Edition, 2014, Prentice Hall,
ISBN: 978-0133760033

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Office Hours: See my website for current office hours.

Grading:

Midterm I	15%
Midterm II	15%
Final Exam	20%
Homework	30%
Quizzes	20%

Course Goals: Introduce the fundamental tools of linear circuit analysis which is useful to all engineers. Develop the fundamentals of circuits, including wires, resistors, capacitors, inductors, voltage and current sources, and operational amplifiers. Prepare students for more advanced courses in electronic applications and circuit analysis.

Hybrid Course: This course will be offered in a hybrid format with both in classroom sessions and online events. We will meet in the classroom on Mondays and Wednesdays. The Friday class time will be dedicated to online materials at your own pace. The online material may include pre-recorded videos, online quizzes, outside class reading assignments and other online sessions. All course materials will be available on ECS Moodle: https://moodle2.ecs.csus.edu/ . See the last page of this syllabus on how to self-enroll into the Moodle based Engr 17 course.

We tell ABET that after this course the student will be able to:

1. Identify linear systems and represent those systems in schematic form.
2. Apply Ohm's Law and Kirchhoff's current/voltage laws to circuit problems.
3. Simplify circuits using series and parallel equivalents. Simplify circuits to their Thévenin and Norton equivalents.
4. Perform node and loop analyses and state the system of linear equations in standard matrix form.
5. Apply the concepts of energy and power to solving circuit problems.
6. Identify and model first order electric systems involving capacitors and inductors.
7. Perform circuit analysis by the steady-state phasor method of time-varying signals (phasors).

Homework: Homework assignments will be completed online using ECS Moodle activities in the course Moodle site. There is homework every week and each chapter will have at least one homework assignment. Problems shall either be from the textbook or created by the instructor. Most assignments are released Monday mornings at 6 am. Most homework assignments are due on Monday mornings at 5:00 am. All homework material is testable whether covered in class or only in the homework assignment. There is no time limit on completing the homework assignment as long as you complete the homework by the due date. You can "submit" the homework as many times as you wish until you get a perfect 100% on the assignment. You receive the exact same questions on every attempt on the homework so there is no reason not to attempt a less-than perfect homework score again and again.

Quizzes: There will be a 60 minute quiz each week (except for exam weeks). The quizzes are self-paced online between the hours of 6 am and midnight each Wednesday in the ECS Moodle Quiz activity. The quiz must be completed in one session (no starting nor stopping with a break) in timed one continuous hour. The quizzes are "once and done" with only one submission allowed.

Exams: There will be two 60 minute midterm exams and a two hour final exam during the semester. The exams are a timed test completed online using an ECS Moodle Quiz module as scheduled in the syllabus. The student will use the online access of their choice and should make appropriate arrangements to take the exam online during the scheduled day/time. The exams are "once and done" with only one submission allowed.

Prior written permission is required for all make-up exams and then only with compelling reasons in accordance with and as outlined by University policy.

Grading Policy: The course will be graded in accordance with University guidelines using the "+" and "-" method as called for by the University. Grades may be curved at the instructor's discretion. The class average is usually in the C+ range. Typical (meaning somewhere around this region) grades ranges are:

"A" 94.5 and above	"A-" 89.5 to 94.49	
"B+" 87.5 to 89.49	"B" 83.5 to 87.49	"B-" 79.5 to 83.49
"C+" 77.5 to 79.49	"C" 73.5 to 77.49	"C-" 69.5 to 73.49
"D+" 67.5 to 69.49	"D" 63.5 to 67.49	"D-" 59.5 to 63.49
F Below 59.5		

Why take this course?

CpE and EEE - This material is fundamental to your understanding of upper division required courses. You must have an internal intuition as to the effects of resistance, capacitance and inductance whether explicit in the circuit or implicit based on circuit element proximity.

ME – Most mechanical systems include controls, electronic systems and move various amounts of power. Increasingly, this takes the form of software control by electronic systems, movement by electric motors, and other circuit related techniques. Your FE and PE exams include questions covered by this course and perhaps only by this course.

Instructional Strategy?
First acquire circuit analysis skills with only DC sources. This is the simplest possible circumstance. This is chapter 1 through chapter 5.
Then explore devices (capacitors and inductors) that react usefully to time varying sources. This is chapter 6.
Then bring it all together to analyze circuits when the source may be DC, time varying or both. The phasor form is extremely useful and covered in chapter 9.
Finally chapter 10 gives you the skills to examine large power transfer basics so needed in utilities, the renewable energy evolution and fundamentals of energy storage (think electric vehicles).

Course Demands?
Most students will find the pace challenging. You should plan on at least 10 hours a week on just this course. The time demand is absolutely worth it. This is fundamental career knowledge and needs your motivation and intense focus. Across the engineering disciplines – you need this. Not convinced? Go find a senior doing their senior project or a new engineer in the field. See what they say.

Engr 17 - Course Outline – Spring 2019

Week	Date	Chapter	Topics:
1	1-21 1-23 1-25	 1.1 – 1.4 1.5 – 1.6	**Martin Luther King, Jr. Holiday – Campus Closed** Course Introduction – SI Units, Voltage and Current Passive Sign Convention, Power and Energy
2	1-28 1-30 2-01	2.1 – 2.2 2.4 – 2.5	Circuit Elements – R, L and C, Electrical Resistance Kirchhoff's Laws – KCL and KVL, Circuits with Dependent Sources
3	2-04 2-06 2-08	3.1 – 3.2 3.3 – 3.4	Resistors in Series and Parallel Voltage and Current Division
4	2-11 2-13 2-15	Handout 4.1 – 4.2	Using Matlab to solve linear equations Nodal Analysis,
5	2-18 2-20 2-22	4.3 – 4.4 **Exam 1**	Node analysis with dependent sources, Special Cases **Chapters 1, 2, 3 - Sec 2 09:00 pm to 10:00 pm** **Chapters 1, 2, 3 - Sec 4 10:00 am to 11:00 am**
6	2-25 2-27 3-01	4.5 4.6 – 4.7	Mesh Analysis Mesh analysis with dependent sources, Special Cases
7	3-04 3-06 3-08	4.9 4.10 4.11 - 4.12	Equivalent Circuits - Source Transformations Thévenin and Norton Equivalent Circuits Test Voltage/Current Method and Max Power Transfer
8	3-11 3-13 3-15	5.1 5.2 – 5.6	The Ideal Operational Amplifier Analyzing the OpAmp
9	3-18 3-20 3-22		Spring Recess
10	3-25 3-27 3-29	6.1 – 6.2 6.3	Inductor & Capacitor Series/Parallel Inductors and Capacitors
11	4-01 4-03 4-05	 **Exam 2**	**Cesar Chavez Birthday Observed – Campus Closed** **Chapters 4, 5 and 6 (partial) - Sec 2 09:00 pm to 10:00 pm** **Chapters 4, 5 and 6 (partial) - Sec 4 10:00 am to 11:00 am**
12	4-08 4-10 4-12	9.1 – 9.3 9.4	Sinusoidal Source, the Sinusoidal Response, the Phasor The Phasor and Passive Circuit Elements
13	4-15 4-17 4-19	9.5, 9.7 – 9.9 6.4	Analysis of Circuit Elements in the Frequency Domain Mutual Inductance
14	4-22 4-24 4-26	9.10 9.11	The Transformer The Ideal Transformer and Impedance Matching
15	4-29 5-01 5-03	10.1 – 10.2 10.3	Instantaneous and Average Power rms Value
16	5-06 5-08 5-10		End of course wrap-up
17		**Final Exam**	**Final exam covers Chapters 6 (Mutual Inductance), 9 and 10** **Section 2 - Wed 5/15/2019 8:00 am – 10:00 am Online Exam** **Section 4 – Tue 5/14/2019 8:00 am – 10:00 am Online Exam**

Engr 17 – Quiz, homework, and video assignments

Due Dates below may shift slightly – see the online schedule for latest deadlines

Week	Date	Online Quiz	Homework	Videos
1	1-21 1-23 1-25			Chapter 1
2	1-28 1-30 2-01	Q1 - Chapter 1	H01 - Chapter 1	Chapter 2
3	2-04 2-06 2-08	Q2 - Chapter 2	H02 - Chapter 2	Chapter 3
4	2-11 2-13 2-15	Q3 - Chapter 3	H03 - Chapter 2 and 3	
5	2-18 2-20 2-22	**Exam 1**	H04 - Chapter 3 and Matlab	Chapter 4
6	2-25 2-27 3-01	Q4 – Chapter 4	H05 – Chapter 4	
7	3-04 3-06 3-08	Q5 - Using Matlab	H06 - Chapter 4	Chapter 5
8	3-11 3-13 3-15	Q6 - Chapter 4	H07 - Chapter 4	
9	3-18 3-20 3-22	Spring Break		Chapter 6
10	3-25 3-27 3-29	Q7 - Chapter 4	H08 - Chapter 5	Chapter 9
11	4-01 4-03 4-05	**Exam 2**	H09 – Chapter 6 (6.1 – 6.3)	
12	4-08 4-10 4-12	Q8 - Chapter 5	H10 – Chapter 9	
13	4-15 4-17 4-19	Q9 – Chapter 9	H11 - Chapter 9	
14	4-22 4-24 4-26	Q10 - Chapter 9	H12 - Chapter 9	Chapter 10
15	4-29 5-01 5-03	Q11 – Chapter 9	H13 - Chapter 9 and Section 6.4	
16	5-06 5-08 5-10	Q12 – Chapter 10	H14 - Chapter 10	
17		**Final's Week**		