Engineering 37: Introduction to Circuit Analysis

Physical Sciences, Mathematics & Engineering (PSME) Division

Section 037.61, Spring 2017

Instructor:	Raji Lukkoor
Class Days/Time:	TTh: 6:30 PM – 8:45 PM Lecture
Location:	S48
Office Hours:	TTh 6:00 PM – 6:30 PM
Email:	lukkoorraji@fhda.edu

Course Description

Introduction to Circuit Analysis is designed to allow students to explore the major methods and techniques of circuit analysis using Ohm's Law; Kirchhoffs's voltage and current laws (*KVL*/*KCL*); Branch, Loop Current and Node Voltage theorems; Thevenin and Norton's theorems; Superposition and Linearity; Source conversions and Maximum Power Transfer theorem; basic Op-amp circuit analysis; Capacitors and Inductors; natural and forced responses relating to *RC, RL,* and *RLC* circuits; circuits with more than one energy storage element; phasors; and *AC* Voltage and Current.

Pre-requisites

Math 1D and Physics 4B (may be taken concurrently).

Required Text

Principles of Electric Circuits – conventional current version by Thomas L. Floyd, 9th Edition. Prentice Hall, an imprint of Pearson. 2010.

Course Objectives

Specific objectives of the course include:

1. Use Ohm's Law, *KVL* and *KCL* to calculate voltages and currents in a *DC* circuit consisting of resistors, current sources, voltage sources, and dependent sources.
2. Use Thevenin and Norton theorems to calculate the equivalent circuit of a *DC* circuit and then find the maximum power output of a *DC* circuit.
3. Use Mesh Current and Node Analysis to find unknown quantities in a circuit.
4. Determine the transient response of a first- and second-order circuit consisting of *RC*, *RL* and *RLC* circuits.
5. Determine the sinusoidal steady state response of a circuit consisting of *RC*, *RL* and *RLC* circuits.
6. Determine the power delivered and absorbed by an element in *RC*, *RL* and *RLC* circuits.

Student Learning Outcome (SLO)

Name	SLO
ENGR37_SLO_1	The student will be able to analyze circuits containing resistive, capacitive, inductive passive elements, along with op-amps interconnected to voltage and current sources.
ENGR37_SLO_2	The student will be able to use circuit laws and network theorems to solve *DC* steady state circuits, *RC*, *RL*, and *RLC* *DC* circuit transients and sinusoidal *AC* steady state circuits.

Materials

Scientific Calculator (TI-89 recommended)

Attendance

Attendance is mandatory. Ensure that vacations, doctor's appointments, social engagements, etc. do not interfere with attendance. Active class participation, including the completion of all class exercises, is key to achieving educational success. Class activities cannot be made up if the class is missed. If you are absent from class, the onus of checking on announcements made while you were absent is on YOU.

Classroom Protocol

Please arrive to class on time. If you do happen to arrive to class late, please enter and take your seat quietly. Expected classroom courtesies include: no text messaging, no emailing, no checking emails, no gaming, no video watching. Likewise, no recording of lectures, no in-class picture taking of lecture slides, no making/receiving phone calls. No copying or sharing of instructional material, including videos, PowerPoint slides, notes, handouts, problems, solutions, quizzes, tests, simulations, etc.

Note that any inappropriate or disruptive behaviors, including offensive/vulgar expressions, disrespecting others' viewpoints or disrespecting the instructor could lead to removal from the classroom and/or disciplinary action, as warranted. De Anza College will enforce all policies and procedures set forth in the Standards of Student Conduct.

Communication

Email communication is most appropriate for administrative matters (notification of illness, scheduling appointments, clarification of homework problems, etc.). With all communication, please maintain a high degree of respect and professionalism. Homework problems or other course materials are best discussed in person during scheduled office hours and not by email.

Academic Integrity

De Anza College is committed to the highest standards of academic integrity and honesty. Students are particularly urged to familiarize themselves with the provisions of the Code of Student Behavior. Dishonesty is unacceptable and will not be tolerated. If you are found cheating, looking at others' exams, plagiarizing or engaging in dishonest activities, you will receive an "F" for that particular work and you will be reported to the Dean of PSME. You are expected to abide with the ideals of academic integrity and accept personal responsibility for your work. Also, during exams, protect your work. Any infringement will disqualify both parties.

Dropping and Adding Class

Students are responsible for understanding the policies and procedures about adding and dropping courses. Add/drop deadlines can be found on the current academic calendar web page at http://www.deanza.edu/calendar/springdates.html. Be sure to note all current deadlines and penalties for dropping classes.

Coursework Expectation

Lecture presentations will be posted to *Canvas* at the start of each week. The *Circuit Analysis Course Schedule & Calendar* is attached. Each student is responsible to check the calendar on a regular basis to see if there is a change in the schedule.

Note: All work submitted past the due date will be docked 50%.

Homework:

Relevant homework problems will be assigned throughout the quarter. The various assignments and partial solutions/answers for each problem, will be posted to *Canvas*. The homework will not be collected, but its timely completion and understanding is essential for learning the material and performing well on the exams.

Note that problems/assignments might be added or deleted from the list as the quarter progresses.

Weekly Reading:

Specific topics from the required text will be assigned for reading during every class. Refer to the attached *Circuit Analysis Course Schedule & Calendar*. Reading the assigned topics is a required component of the curriculum. The sections highlighted in yellow are for you to complete on your own.

Note that weekly reading assignments might be added or deleted from the list as the quarter progresses.

Informal Exercises:

Informal exercises will consist of watching content-related videos, participating in discussion forums and completing occasional content-related surveys. You will watch 5 videos and submit a written evaluation/summary for each, both in *Canvas*, worth a total of 10% points as it relates to your overall grade. The aim here is to help you develop your critical thinking skills throughout the quarter. The other exercises will be graded credit/no credit.

The list of *Canvas* Discussion Forum videos is attached.

Note that informal exercises might be added or deleted from the list as the quarter progresses.

Group Project, Presentation & Demo:

During this course, as teams of two students, you will work on an electronics/electric circuit design project, which must include the following components: resistor, capacitor, switch, and power source. The design of the project must include an end application. A list of resources is attached for your reference. The cost of the project is on you.

As part of this project, each student team will write and submit a project proposal, during the third week of the quarter, that outlines the project description and objectives. The proposal must also include the project design plan and a schedule. At the end of this course, each student team will demonstrate your project and deliver a PowerPoint presentation, following which students will conduct peer evaluations by providing constructive feedback on the project presentations.

The group project, presentation & demo constitute 20% of your course grade.

Note: Participation on the group project, presentation & demo is mandatory, and you must complete it in order to pass this class.

Midterm Exam:

One Closed-Book and Closed-Notes midterm examination will be held on the date indicated in the attached *Circuit Analysis Course Schedule & Calendar*. The midterm exam is worth 30% points, as it relates to your overall grade.

In lieu of notes, a sheet of formulae will be allowed for each exam. A non-programmable calculator will be allowed on the exam, but phones and other electronic devices must be switched off and put away under the desks. Instructor permission is required to leave the classroom for bathroom visits.

Note: Unless there is a documented, serious explanation for missing an exam, make-up exams will not be allowed.

Note: You must complete the midterm exam in order to pass this class.

Final Exam:

The final exam will be Closed-Book, Closed-Notes, and worth 40% points, as it relates to your overall grade. In lieu of notes, a two-page (front and back) formula sheet will be allowed for the final exam. A non-programmable calculator will be allowed on the exam, but phones and other electronic devices must be switched off and put away under the desks. Instructor permission is required to leave the classroom for bathroom visits.

Note: Unless there is a documented, serious explanation for missing the final exam, make-up exams will not be allowed.

Note: You must complete the Final Exam in order to complete the course and pass this class.

Evaluation & Grading

Coursework will be weighted as follows:

Canvas Discussion Forum	10%
Group Project, Presentation & Demo	20%
Midterm	30%
Final Exam	40%

Note: The above weighting is subject to change, with fair notice given in class.

The final course grades will be assigned according to the following grading scale, with standard decimal rounding (i.e. 0.5 and greater rounded up):

A+ = 100-98%	A = 97-93%	A- = 92-90%
B+ = 89-87%	B = 86-83%	B- = 82-80%
C+ = 79-76%	C = 75-70%	
D+ = 69-66%	D = 65-60%	
F = 59-0%		

Note: The above grading rubric is subject to change, with fair notice given in class.

Study Tips and Strategies for Success

Regular attendance, completing homework in a timely manner, watching assigned videos, good note-taking skills, in-class participation, completing the hands-on project, and a positive, can-do attitude will greatly increase the likelihood of success in this course. Plan on spending at least 6-10 hours weekly, outside of class time, for homework, project and study.

- To stay on track throughout the quarter, begin each week by consulting the *Circuit Analysis Course Schedule & Calendar*, which presents an overview of the weekly lecture topics and indicates due dates for taking the midterm and the final exam.
- Become familiar with the De Anza Learning Management Portal *Canvas*. Regularly check *Canvas* Announcements for lecture updates, homework problems & solutions, and any changes in the *Circuit Analysis Course Schedule & Calendar*.
- Form and work in study groups.
- Do your homework and weekly reading!
- Free tutoring is available in the Tutorial Center, S41. Register for a tutor.

Circuit Analysis Course Schedule & Calendar

* Note that the schedule below is subject to change with fair notice given in class.*

Week	Date	Lecture Topic [Chapter Reading]	Deliverable
1	Apr 11	Chp 1: Quantities and Units [1-1 to 1-5] Chp 2: Voltage, Current and Resistance [2-1 to 2-5]	
	Apr 13	Chp 2: Voltage, Current and Resistance [2-6 to 2-7] [2.8] Chp 3: Ohm's Law [3-1 to 3-4] [3.5]	
2	Apr 18	Chp 4: Energy and Power [4-1 to 4-4] [4.5]	
	Apr 20	Chp 5: Series Circuits [5-1 to 5-8] [5-9 to 5-10] Lecture on Project Proposal	
3	Apr 25	Chp 6: Parallel Circuits [6-1 to 6-8] [6-9 to 6-10]	
	Apr 27	Chp 7: Series-Parallel Circuits [7-1 to 7-6] [7-7]	**Group Project Proposal**
4	May 02	Chp 8: Circuit Theorems and Conversions [8-1 to 8-4]	
	May 04	Chp 8: Circuit Theorems and Conversions [8-5]	
5	May 09	Chp 8: Circuit Theorems and Conversions [8-6 to 8-8]	
	May 11	Chp 9: Branch, Loop and Node Analysis [9-1]	
6	May 16		**MIDTERM**
	May 18	Chp 9: Branch, Loop and Node Analysis [9-3]; Lecture on Presentation Guidelines	
7	May 23	Chp 9: Branch, Loop and Node Analysis [9-4]	
	May 25	Chp 11: Introduction to AC and Voltage [11-1 to 11-6] [11-9]	
8	May 30	Chp 11; Chp 12: Capacitors [12-1 to 12-6] [12-7]	
	Jun 01	Chp 13: Inductors [13.1 to 13-5] [13-6]	
9	Jun 06	Chp 12/13; Chp 15: *RC* Circuits [15-1 to 15-8] [15-9 to 15-10]	
	Jun 08	Chp 16: *RL* Circuits [16-1 to 16-7] [16-8 to 16-9]	
10	Jun 13	Chp 15/16	
	Jun 15	Chp 17: *RLC* Circuits [17-1 to 17-6] Lecture on Op-Amps	
11	Jun 20	Group Project Presentation & Demo	**Group Project Presentation & Demo**
	Jun 22	TBA	
12	Jun 29	@ 6:15 PM	**FINAL EXAM**

Canvas Discussion Forum Videos and Due-dates:

1. *Voltage Current Resistance*
   Available: April 11 Due: April 18
2. *Series Circuit*
   Available: April 20 Due: April 27
3. *Parallel Circuit*
   Available: April 25 Due: May 02
4. *Capacitors*
   Available: May 30 Due: June 06
5. *Inductors*
   Available: June 01 Due: June 13

Group Project, Presentation & Demo Idea Resources:

https://circuitdigest.com/electronic-circuits
http://www.electronicshub.org/electronics-mini-project-circuits/
https://www.elprocus.com/top-10-simple-electronic-projects-for-beginners-in-2014/
http://circuiteasy.com/
http://www.circuitstoday.com/tag/simple-electronics-projects
http://www.circuitstoday.com/simple-electronics-projects-and-circuits
http://www.eleccircuit.com/easy-electronic-projects/
http://electronicsforu.com/category/electronics-projects/hardware-diy