

ELECTRIC CIRCUITS

ENGR 250 – Section 38471
Santa Ana College
Department of Engineering
Spring 2024

Lectures: Friday, 9:55 am – 1:05 pm Room SC-134
Units: 3
Instructor: Craig Takahashi, Ph.D. takahashi_craig@sac.edu
Office/office hours: provided in class

Description:

An introduction to the analysis of electrical circuits. Use of analytical techniques based on the application of circuit laws and network theorems. Analysis of DC and AC circuits containing resistors, capacitors, inductors, dependent sources, operational amplifiers, and/or switches. Natural and forced responses of first and second order RLC circuits; the use of phasors; AC power calculations; power transfer; and energy concepts.

Co-requisites: Math 280 (vector calculus) and Physics 227 (Engineering Physics II, “E & M”)

Learning Outcomes

1. Students will learn to analyze & solve AC and DC circuits using basic laws, various methods, and theorems.

Textbook & Materials

1. Fundamentals of Electric Circuits; Alexander & Sadiku; McGraw-Hill, 5th Edition, 2013 (ISBN: 978-0073380575) (REQUIRED).

Grading

Grading is determined on a percentage system, not on a curve. Note – I do not GIVE out grades, you EARN them! Grading is based on mathematical computation & not on life circumstances. A final score within 0.5% of the next higher grade are rounded up (e.g., 79.50% = B; 79.49% = C). A final score within 1.00-0.51% of the next higher grade, will round up the next grade (e.g., 79.0 to 79.49% gets a B) ONLY IF the student does not “miss” (i.e., score < 50%) on more than 1 assignment for the whole semester. NO scores > 1% from the next higher grade will round up (e.g., 78.9999 gets a C no matter what).

Grading Scale	Weighting of grades
A = 90 – 100%	Assignments 25%
B = 80-89% D = 60-69%	Exams (3) 75%
C = 70-79% F < 60%	

Tentative Spring Schedule

Wk	Date	Topic	Wk	Date	Topic
1	2/16	Holiday – President’s Day	9	4/19	First-Order Circuits (Ch 7) Lec – source-free RC & RL, step-response RC & RL (online vid) Hw 7 – (from Ch. 7)
2	2/23	Basic Concepts (Ch 1) Lec – atomic theory, charge, units, electrical quantities, water analog Hw 1 – syllabus, website	10	4/26	Second-Order Circuits (Ch. 8) Lec – initial & final values, source-free RLC, step-response series & parallel RLC, general 2 nd -order circuits, op amps Hw 8 – (from Ch. 8)
3	3/1	Basic Laws (Ch 2) Lec – Ohms & Kirchoff’s Law; nodes, branches, loops; series & parallel resistance; equivalent R, delta-wye transformations Hw 2 – (from Ch. 2)	11	5/3	Exam 2 Lecture – none Hw 10 – TBD, compute grade
4	3/8	Methods of Analysis (Ch 3) Lec – nodal & mesh analysis, nodal w/ voltages sources, mesh w/ current sources, nodal & mesh by inspection Hw 3 – (from Ch. 3)	12	5/10	AC Circuits (Ch. 9) Lec – sinusoids, phasors, phasor relationships w/ circuit elements, impedance & admittance Hw 9 – (from Ch. 9)
5	3/15	Circuit Theorems (Ch 4) Lec – linearity, superpositon, source transformation, Thevenin/ Norton, max power transfer Hw – none (study for exam)	13	5/17	Sinusoidal Steady State Analysis (Ch. 10) Lec – nodal, mesh, superposition, source transformation, Thevenin/ Norton, op amps Hw 11 – from Ch. 10
6	3/22	Exam 1 Lec – none Hw 4 – from Ch. 4	14	5/24	AC Power Analysis (Ch. 11) Lec – instantaneous/avg power, max avg power transfer, RMS value, apparent power & power factor, complex power Hw 12 – from Ch. 11
7	3/29	Op Amps (Ch. 5) Ideal properties; inverting, non-inverting, summing, difference, cascaded op amp circuits. Hw 5 – from Ch. 5	15	5/31	Intro to 3-Phase Circuits (Ch. 12), Transformers (Ch 13), & Frequency Response (Ch 14)
8	4/5	Capacitors & Inductors (Ch. 6) Lec – series & parallel capacitors & inductors (online?) Hw 6 – from Ch. 6	16	6/7	Final Exam
Sp	4/12	Spring Break			

Online Communication

Students must be capable of electronic communication.

Course Website - most course items are posted on a course website (provided in class), NOT Canvas.

Canvas - students must know Canvas (rscd.instructure.com/login/ldap), a web based course management software. Contact Distance Education (714-564-6725, Room A-101, sac_disted@sac.edu) for Canvas issues.

Canvas is mainly used to post grades & may possibly be used submit work, and conduct exams for some classes (except for transfer classes like 235, 240, 250 where exams are written on paper). Canvas utilization is subject to change based on instructor discretion.

Email – I regularly send class-wide emails using email addresses from the SAC enrollment system (Self Service), not Canvas, so you MUST have a valid email on this system. Students who miss emails (e.g., don't check them or have incorrect/inactive email on SAC system) must obtain the information from classmates. When emailing me, always indicate which class you are in (E.g. Engr 235). If you change your email address in SAC enrollment system, notify me by email, indicating the class of mine you are in.

It is YOUR responsibility to check Canvas, the course website, and email regularly. Note: if there is any question about the date of exams or due dates, the precedence is: (1) what is discussed in class, (2) course web, and then (3) Canvas.

Assessments:

- *Assignments* – include homework (hw), labs, projects, etc. Submissions may be in class (due at start of class) or via Canvas (due as specified on Canvas). The instructor will inform you which to submission to use. Late work is receives no credit. Label paper submissions in the upper right of the front sheet with student first & last name, course #, & hw # (e.g., John Doe, Engr 100A, hw #1). Paper submissions must be written on WHITE COPY PAPER. Digital notes (eg - One Note) must use plain white background and black writing. Engineering paper, graph or heavy lined paper is not acceptable as it is hard to see your work. Work must be submitted with problems in the order assigned and with upright orientation or points will be deducted. The lowest assignment score will be dropped (Canvas drops the lowest grade automatically from day one). Emailed work and work attached in comments on Canvas are not accepted. Canvas submissions must meet requirements discussed in class.
- *Exams* – (**3 exams**) exams must be taken during the allotted time (not before, not after). Exams must be taken in class. Missed exams receive a score of 0. There are NO MAKE-UP EXAMS (an exam not taken during the allotted time). In these classes an EXAM SCORE SUBSTITUTION (ESS) must be requested by the student within 1 week of the missed exam & is granted at the instructor's discretion. An ESS substitutes the missed exam score with the lowest of the remaining earned exam scores minus 15% (regardless of the cause of the missed exam). Students must request provide documentation to verify the cause of the missed exam. ESS's will NOT be granted to anyone with excessive absence (>10%), insufficient participation (>10% of graded work scoring < 50%), or a previous ESS. An ESS will not be granted for the last exam.

Course policy and conduct

- *Academic Honesty* – students are encouraged to communicate with classmates about course concepts (e.g., study groups) but may only turn in their own work. Graded work (assignment, exam, etc.) deemed plagiarized or copied receives a score of 0 (for both the copier and the one who allowed the copying). More generally, academic honesty policy of this course, including any resulting disciplinary action, is per the college catalog.
- *Grading* – students may challenge a grade on a graded work by submitting a "grade review" request using the following procedure: *Type* the request with a cover sheet having your full name, student number, date, description of the work in question, detailed explanation of why you feel the grade was incorrect, and a rationale for a higher score (using sketches or drawings if necessary). Submit the request within 1 week of the work being returned (except work in the last week of class, where it must be submitted within 2 days).

A review evaluates the *entire* assignment, not just the questionable issue. Thus, the review may result in a lower overall score. Grades incorrectly entered on Canvas do not require a review, but inform me within 7 days of the grade posting (show or email a picture of the grade on the work).

- *Attendance/absences* – the instructor has the authority to drop any student for excessive absence as defined in the college catalog. Class meetings missed prior to adding class are also considered absences. Attendance is based on when the instructor takes roll, but it also requires student presence for the entire class. Students are considered absent if they arrive late, leave early, or disappear in-between. Students who miss class must obtain any missed material from a classmate.
- *Lack of participation drop & grade policy* – the instructor has the authority to drop students for lack of participation per the college catalog. Graded work scoring < 50% is considered "missed." Attending class alone is not participation.
- *Withdraws* –students are responsible for dropping themselves from courses they no longer wish to complete. Withdraw policies, including withdraw deadlines, are specified in the college catalog. Dropped students may be reinstated at the instructor's discretion.
- *Student with Disabilities* – students requesting academic accommodations for a verifiable disability must first be evaluated by Disabled Student Programs & Services (DSPS; x6260, 6384 TDD for deaf students, U103) for authorization, and the student must inform the instructor within the first 2 weeks of class.
- *Cell Phones or Technology* – Silence cell phones. Disruptive students may be removed from class. Students may not make recordings (e.g., audio or video with a cell phone) in the classroom without prior instructor approval.
- *Food* – students may not bring food or drink into the classrooms. Water in a closable container is okay.
- *Other* – any student claims about something I verbally "allowed" (e.g., "you said there was no hw", "you said I could miss most of the lecture", etc.) must be substantiated with some type of verifiable documentation (e.g. – email from me). If it isn't documented, it didn't happen.
- *Digital submissions* – some work may be submitted digitally. Students must have the ability to produce digital documents (usually jpg or pdf, and for videos, mp4) and upload those to Canvas. The instructor will provide further details on the rules for submitting work on Canvas.
- *Illness procedures* – please do not come to class if you are sick (covid or any other respiratory illness). The instructor will try work with you to figure out how to accommodate lost class time due to illness. Cover coughs and sneezes. Please wear a mask & try to maintain social distance from other people.

Engineering Dept Mission Statement: Santa Ana College engineering department prepares students for university transfer or employment in engineering and engineering-related fields.

SAC Mission Statement: Santa Ana College inspires, transforms, and empowers a diverse community of learners.