

# ELECTRIC CIRCUITS LABORATORY

ENGR 250L – Section 38472  
Santa Ana College  
Department of Engineering  
Spring 2024

Lectures: Friday, 1:20 – 4:30 pm Room SC-134  
Units: 1  
Instructor: Craig Takahashi, Ph.D. takahashi\_craig@sac.edu  
Office/office hours: provided in class

## Description:

An introduction to the construction and measurement of electrical circuits, including resistive, RL, RC, RLC, and operational amplifier circuits. Basic use of electrical test and measurement instruments including multimeters, oscilloscopes, power supplies, and function generators. Interpretation of measured data under DC, transient, and sinusoidal steady-state (AC) conditions.

Prerequisite: Engineering 250 (or concurrent enrollment)

## Learning Outcomes

1. Students will learn to construct, debug, analyze, and take measurements of electric circuits using standard measuring tools & instruments.

## Textbook & Materials

Students must purchase the items below. Don't purchase yet - instructor will provide specifics in class.

1. Jumper wire kit (22 awg, \$6)
2. USB flash drive (to store oscilloscope display data)
3. DMM?

## 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 by my manipulation or your life circumstances. A final score within 0.5% of the next higher grade is 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 to 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 score > 1% from the next higher grade will round up (e.g., 78.9999 gets a C no matter what).

## Grading

Grading Scale	Weighting of grades
A = 90 – 100%	Lab completion & Write-ups 40%
B = 80-89%      D = 60-69%	Exams 30%
C = 70-79%      F < 60%	Quizzes 20%
	Lab Conduct/Participation 10%

## Tentative Spring Schedule

Wk	Date	Topic	Wk	Date	Topic
1	2/16	<b>Holiday – President’s Day</b>	9	4/19	Lab 7 - Op Amps II voltage summer, integrator, differentiator
2	2/23	Lab 1 – Laboratory Introduction Intro to equipment, safety	10	4/26	Lab 8 – RC & RL Step Response Time constant, cursors function
3	3/1	Lab 2 – Wire, Resistors, DMM, Breadboard, measuring R Wire gauge values , R codes, using DMM (meas. resistance, DC voltage, continuity), using breadboard	11	5/3	<b>Exam 2</b>
4	3/8	Lab 3 – Resistive Circuits Circuit construction (series, parallel, complex), measure voltage & current with DMM	12	5/10	Lab 9 – RLC Step Response, RL Inductive Reactance RLC damping, measuring $X_L$ , phase shift, use $X_L$ to estimate value of unknown L.
5	3/15	Lab 4 – Intro to Oscilloscope & Function Generator (FG) Scope - probe compensation, attenuation, inputs, scale, trigger, coupling, grounding. FG - wave- forms, freq, amplit, DC offset	13	5/17	Lab 10 - Diodes/ LEDs (or Solder?)
6	3/22	<b>Exam 1</b>	14	5/24	Lab 11 - Arduino LED
7	3/29	Lab 5 – Oscilloscope 2 Manual controls, autoscale, DC measurements, multiple channels, USB output, measurements	15	5/31	Lab 12 - Arduino Light & Sound (or High-power loads)
8	4/5	Lab 6 – Op Amps I Buffer/follower, inverting gain	16	6/7	<b>Exam 3</b>
Sp	4/12	<b>Spring Break</b>			

## 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 ([rsccd.instructure.com/login/ldap](https://rsccd.instructure.com/login/ldap)), a web based course management software. Contact Distance Education (714-564-6725, Room A-101, [sac\\_disted@sac.edu](mailto: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:

- *Lab Write-Ups* – or “lab homework” (lab hw) are required for each lab. They are due the week after the lab work is done at start of class. Label the work in the upper right of the front sheet (with student first & last name, course #, & lab #. E.g., John Does, Engr 250L, lab #1). The lowest lab score will be dropped to account for “life issues”. Emailed work is not accepted. Write-ups are only accepted if the student was present during the lab and completed the work. If the student misses the lab work, the write up scores a 0.
- *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.
- *Quizzes* – are conducted before lab, based on posted lab instructions (either video or handout), & are designed to test your preparedness for lab.
- *Lab conduct/participation* – is based on the level of care you give to yourself, your fellow students, the lab equipment, the classroom, & to lab organization, safety, and clean-up (putting stuff away properly and neatly). It also includes being on time, being a regular active contributor to your lab group, and having a good attitude towards your instructor and classmates.

### 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.