Course Information

Course Website:

bCourses

Office Hours:

Office hours are the primary mechanism for face-to-face individual contact with the instructors and the TA's. All students are strongly encouraged to make use of office hours.

Teaching Staff:

Name	Role	Email	Office Hours
Prof. Sayeef Salahuddin	Instructor	sayeef@berkeley.edu (mailto:sayeef@berkeley.edu)	Tues-Thurs: 1130A-1230P; 515 Sutardja Dai Hall
Noelle Davis	Head TA		
Dasom Lee	Head Discussion TA		
Chirag Garg	Discussion TA		
Jose Guajardo	Discussion TA		
Lanyi Yang	Discussion TA		
Jen Hao Chen	Discussion TA	jenhaochen@berkeley.edu (mailto:desvaun@berkeley.edu)	Thurs: 1300-1400PM; 410

			Soda Hall
Joseph Suh	Discussion TA		
Damanic Luck	Head Lab TA	damanicluck@berkeley.edu (https://bcourses.berkeley.edu/mailto:damanicluck@berkeley.edu)	Wed: 1:00 - 2:00 PM; Cory / Thurs: 8:00-10:00AM; Cory 125
Desvaun Drummond	Lab TA	desvaun@berkeley.edu (mailto:desvaun@berkeley.edu)	Tues: 8:00-11:00AM; Cory 125
Minxuan Cai	Lab TA		
Ashvin Verma	Lab TA	ashvin.verma@berkeley.edu (https://bcourses.berkeley.edu/mailto:ashvin.verma@berkeley.edu)	Wed: 11:00AM-2:00PM, Cory 125
Junha Kim	Lab TA	junhak@berkeley.edu (mailto:junhak@berkeley.edu)	Thurs: 11:00AM-2:00PM; Cory 125
Siddharth Mishra	Lab TA		
Audrey Zhang	Lab TA		
Sasvath Ramachandran	Lab TA		
Evan Kuo	Lab TA		

Amy Song	Lab TA	amysong@berkeley.edu	Thur: 4:00-5:00 PM; Cory 125
Mihir Marathe	Lab TA		
Robert Zhang	Lab TA	robertrzhang@berkeley.edu (https://bcourses.berkeley.edu/mailto:robertrzhang@berkeley.edu)	Tues: 4:00-5:00PM; Cory 125
William Li	Lab TA		

Online Discussion Platform

Due to the sheer size of this class, there might be times when it is difficult to access office hours. For these cases, and for questions on topics that concern the entire class in general, we will be using Ed Discussion, which you can access from our bCourses platform.

Prerequisites:

The prerequisite for this course is formally EECS 16A. To provide some sense of background expectations, it would be beneficial if you are familiar with the following topics:

- Calculus, including differentiation and integration
- Some physics and chemistry, such as familiarity with the Periodic Table of the Elements
- Basic electromagnetics: fields, potential, Gauss's law

Texts:

Required: F. T. Ulaby, M. M. Marharbiz and C. M. Furse, *Circuit Analysis and Design*, 2nd Edition. Ann Arbor: Michigan Publishing, 2024. ***You can download a pdf version of this book for free by completing a form on this website*** (https://services.publishing.umich.edu/Books/C/Circuit-Analysis-and-Design) ***.***

Various supplementary material may released throughout the course.

Supplementary: Tuinenga, SPICE: A Guide to Circuit Simulation & Analysis Using PSpice

References: R. C. Jaegar, Microelectronic Circuit Design, 5th Edition. New York: McGraw-Hill, 2015.

S. Sedra and K. G. Smith, *Microelectronic Circuits,* 7th Edition. New York: Oxford University Press, 2014.

These texts could be helpful as supplementary material in the event you need an alternative or desire a more advanced explanation than provided by Ulaby, Maharbiz & Furse.

Grading Policy:

- Grading will be done on an absolute scale. The letter grade thresholds will be announced soon.
- Course grades will use the following weighting:

Problem Sets: 10%

Laboratory/Projects: 35%

Midterm Exam 1: 15%

Midterm Exam 2: 15%

Final Exam: 25%

Reading Assignments:

Reading assignments include sections of the required textbook, laboratory readings, distributed readings, and supplementary notes posted on the course website, i.e., bCourses. The Course Schedule and Syllabus indicates reading assignments. Problem assignments might also specify reading assignments where appropriate. Distributed notes will supplement topics for which lecture coverage is substantially different from the textbook. Students are responsible for all material in the reading. In particular, the scope of coverage for problem sets, the midterm, the project, and the final examination includes the reading assignments as well as lecture material.

Problem Sets:

There will be several problem sets (i.e., homework assignments) over the course of the semester, assigned approximately once per week. Each new problem set will normally post on the course website on a Thursday and be due the next Friday. Turn in problem sets via Gradescope by 12 noon on the due date. Solutions will post on the web early the next week.

Late Homework Policy:

A late homework will lose 10% per day, i.e., the final graded homework score will reduce by 10% per day. For example, once a homework is late, it has lost 10%. If it late by more than a day, then it loses 20%, and so on.

Self-Grading of Problem Sets:

Self-grading of problem sets has proven successful in past courses, mainly because it compels students to actually read through the solutions for problems, removing the temptation to just look at their score and get on with busy lives. There is value in seeing a solution even when one gets the problem correct, since there are often multiple ways to solve any problem, and some are better than others. Thus, we will ask you to self-grade your problem sets. We ask that you submit grades within one week of the problem set due date.

The problem sets are worth only a small percentage of your total grade, so there should be no incentive to be dishonest. The main incentive to do the problem sets is to prepare yourself for the exams, which represent much larger percentages of your grade. To make sure people are grading consistently, we will spot check graded homework to ensure consistency of grading. If grading issues are discovered, this will raise the likelihood that your future homework will be reviewed. (Hopefully, we will not find any academic dishonesty in this process.)

Laboratory:

There will be 5 laboratories in this course, each of which will be posted on the course website, i.e., bCourses, one week before they start, as indicated in the class schedule. Laboratories 1-4 are directed labs, while Labs 5 is a more open-ended design project. The laboratory exercises aim to reinforce the material covered in lectures and in problem sets. Laboratory sessions will meet during the indicated weeks on the class schedule, which will be approximately weekly, with some gaps. For Labs 1-4 students will typically work in pairs; for the design problem during the latter part of the term, students may work individually or in pairs. The topics covered in the labs are coordinated with the lectures but will lag somewhat.

Laboratory assignments will typically consist of three sections:

Preliminary Discussions and Problems: intended to familiarize you with the laboratory topic, and in some cases, perform some design tasks

Laboratory Procedure: usually a series of measurements to illustrate specific circuit topologies and characteristics

General Questions: intended to encourage you to generalize and apply your laboratory experiences

It is vital that you read the entire laboratory and, where appropriate, do the preliminary problems prior to the laboratory sessions! Failure to do so will make it difficult to complete the assignment in the time available. **Pre-lab problems are due the Saturday 11:59PM before the corresponding lab session.**

Each laboratory has Result Sheets to simplify the grading process. In most cases, the remainder of the material should be included in a laboratory report, attached to the Result Sheets. Although you will be performing the laboratory procedures in pairs, each student must turn in their own report. Laboratory reports will be due in the subsequent laboratory session. Your lab TA will provide you with more information.

One of the objectives of this course is to convey some of the trade-offs involved in circuit design (e.g., gain vs. bandwidth, speed vs. power). For this reason, the last laboratory assignment takes the form of a more open-ended design problem, where you might be given a topology but are then asked to specify your own circuit element values to satisfy a set of specifications. To do so, you will likely need to first complete a “hand design”, confirm it via simulation, then verify it experimentally by physically implementing your design and testing it using the laboratory instruments you learned in previous labs. Note that the design problems might require considerable effort to complete, so your problem set load might be smaller during the weeks of the design lab. However, the design lab holds more grading weight than the others.

The grading policy for the laboratory assignments are as follows:

Technical Content: 90% Document Quality: 10%

The “document quality” category aims to encourage you to prepare your reports in a manner that makes them readable and easy to evaluate.

The overall point totals assigned to the laboratories for grading purposes are as follows:

Assignment	Points
Lab 1: Measuring Time and Frequency Domain Signals	100
Lab 2: Piezoresistive Strain Sensor (Fuel Tank Failure Sensor)	100
Lab 3: Electric Guitar Volume and Tone Control Circuit	100
Lab 4: Introduction to Operational Amplifiers	100
Lab 5: Design Problem — Treble Boost Pedal	200
Laboratory Performance	100
TOTAL	700

The “laboratory performance” category above covers students’ activities in the laboratory sessions themselves. Poor attendance, disruptive behavior, chronic lateness, etc. will result in a loss of credit. In addition, in any lab where physical circuits are constructed, minor (but debilitating) construction errors nearly always happen. It would be unrealistic to expect your circuit to work the first time, immediately after construction. Inevitably, some amount of debugging is required. Your ability to debug your own circuits will also reflect on your “laboratory performance” grade. In a way, circuit debugging is among the most important skills that you can learn from this laboratory. The ability to debug often indicates a superior understanding of the circuit under construction, as well as of the equipment used to measure the needed parameters.

Final Exam:

The final exam will be comprehensive, covering all the material in the course. This includes everything covered in problem sets, lectures, and readings. The exam will take place during the Examination Period at the scheduled time shown in your Calcentral.

Computer Accounts/CAD Tools:

Your CalNet account should be sufficient to access all the needed software in this class, including LTSpice and Waveforms, both of which can also be downloaded for free to any personal device. Ultimately, the software we will use should be accessible to all enrolled, waitlisted, and cross-listed students. If you are unable to login, please notify an instructor.

The supplementary text, SPICE: A Guide to Circuit Simulation & Analysis Using PSpice by Tuinenga, is a useful aid to those students seeking more information on SPICE. SPICE is the most widely used circuit simulator in the field.

Cardkey Access:

Cardkey access to the lab is automatic for enrolled students. If you are a concurrent enrollment student, please send me your name and SID number, so you can get access.

Class (Tues/Thurs: 2:00 - 3:30 PM): 150 Wheeler

Office Hours

For Office Hours information please see here (https://bcourses.berkeley.edu/courses/1542294/pages/office-hours) .

Exams

- Midterm 1: March 6th ; Midterm 2: April 10th; Final: May 12
- Midterms will be held during regular class hours.
- By default no alternate exams are offered.

Course Syllabus and Schedule:

- For Tentative Class Schedule and Syllabus, please see here (https://bcourses.berkeley.edu/courses/1542294/assignments/syllabus) .

Course Information:

- For detailed course information please see here (https://bcourses.berkeley.edu/courses/1542294/pages/course-information) .

Text:

T. Ulaby, M. M. Marharbiz and C. M. Furse, *Circuit Analysis and Design*, 2nd Edition. Ann Arbor: Michigan Publishing, 2024. ***You can download a pdf version of this book for free by completing a form on this website*** (https://services.publishing.umich.edu/Books/C/Circuit-Analysis-and-Design) ***. We will refer to this Text as UMF.***

Date		Class	Material to be Covered	Lecture	Reading (UMF)	HWs	Labs
Jan	21	1	Administrative Information, Introduction/Overview: History of Computers	Info (https://bcourses.berkeley.edu/courses/1542294/files/90766312?wrap=1) Lecture 1 (https://bcourses.berkeley.edu/courses/1542294/files/90766311?wrap=1)	§1.1		
	23	2	Circuit Representation	Lecture 2 (https://bcourses.berkeley.edu/courses/1542294/files/90790803?wrap=1)	§1.3-1.4		
	28	3	Power, Time and Frequency Domains, Mathematical Representation of Signals	Lecture 3 (https://bcourses.berkeley.edu/courses/1542294/files/90829517?wrap=1)	§1.5, §7.1		
	30	4	Circuit Elements	Lecture 4 (https://bcourses.berkeley.edu/courses/1542294/files/90850651?wrap=1)	§7.1, Class Notes		
Feb	4	5	Circuit Elements, Resistor Circuits & Analysis	Lecture 5 (https://bcourses.berkeley.edu/courses/1542294/files/90895649?wrap=1)	Class Notes,§2.1-2.4	HW#1 Due Friday	Lab #1: Guitar Signals
	6	6	Resistor Circuits & Analysis	Lecture 6 (https://bcourses.berkeley.edu/courses/1542294/files/90912110?wrap=1)	§2.1-2.4		
	11	7	Resistor Circuits & Analysis	Lecture 7 (https://bcourses.berkeley.edu/courses/1542294/files/90964203?wrap=1)	§2.1-2.4	HW#2 Due Friday	
	13	8	Resistor Circuit Analysis Examples	Lecture 8 (https://bcourses.berkeley.edu/courses/1542294/files/90977062?wrap=1)	§2.4		
	18	9	Resistor Circuit Analysis and Examples	Lecture 9 (https://bcourses.berkeley.edu/courses/1542294/files/91014690?wrap=1)	§2.5, §3.2-3.3	HW#3 Due Friday	
	20	10	Analysis Techniques	Lecture 10 (https://bcourses.berkeley.edu/courses/1542294/files/91052642?wrap=1)	§3.2,3.3, 3.4		
	25	11	Analysis Techniques	Lecture 11 (https://bcourses.berkeley.edu/courses/1542294/files/91086328?wrap=1)	§3.6-3.7		
	27	12	Capacitors	Lecture 12a (https://bcourses.berkeley.edu/courses/1542294/files/91107567?wrap=1) Lecture 12b (https://bcourses.berkeley.edu/courses/1542294/files/91107569?wrap=1)	§5.2, 5.4	HW#4 Due Friday	Lab #2 : Strain Sensor

Mar	4	13	Capacitors	Lecture 13 (https://bcourses.berkeley.edu/courses/1542294/files/91167589?wrap=1)	§5.2, 5.4		
	6		***Midterm Exam 1***				
	11	14	Capacitors, Math to Model Signals and AC Analysis	Lecture 14 (https://bcourses.berkeley.edu/courses/1542294/files/91232290?wrap=1)	§5.2, 5.4, 7.3-7.6	HW#5 Due Friday	
	13	15	Math to Model Signals and AC Analysis	Lecture 15 (https://bcourses.berkeley.edu/courses/1542294/files/91251446?wrap=1)	§7.7,7.9,9.3,9.4		
	18	16	1st Order RC Circuits	Lecture 16 (https://bcourses.berkeley.edu/courses/1542294/files/91296072?wrap=1)	§9.3,9.4	HW #6 Due Friday	
	20	17	Inductors and 1st Order RL Circuits	Lecture 17 (https://bcourses.berkeley.edu/courses/1542294/files/91328099?wrap=1)	§5.5,7.7,7.9,9.3.1		
Apr	1	18	Op Amp: Baseband Equivalent Circuit, Ideal	Lecture 18 (https://bcourses.berkeley.edu/courses/1542294/files/91373696?wrap=1)	§4.1-4.3	HW#7 Due Friday	Lab #3 Guitar Tone Circuits
	3	19	Op Amp Circuit Examples	Lecture 19 (https://bcourses.berkeley.edu/courses/1542294/files/91391215?wrap=1)	§4.3-4.7, 4.9		
	8	20	Op Amp Circuit Examples, Filters with Op Amps	Lecture 20 (https://bcourses.berkeley.edu/courses/1542294/files/91487088?wrap=1)	§4.9,4.10, 9.6,9.7		
	10		***Midterm Exam 2***				
	15	21	Second Order Circuits	Lecture 21 (https://bcourses.berkeley.edu/courses/1542294/files/91496415?wrap=1)	§6.2, 6.3,6.4,6.5,6.6	HW#8 Due Friday	Lab #4: Op Amps
	17	22	Second Order Circuits	Lecture 22 (https://bcourses.berkeley.edu/courses/1542294/files/91546875?wrap=1)	§6.2, 6.3,6.4,6.5,6.6, 6.7,6.8		
	22	23	Filters, Poles and Zeros, Resonators	Lecture 23 (https://bcourses.berkeley.edu/courses/1542294/files/91560775?wrap=1)	§9.3-9.5	HW#9 Due Friday	
	24	24	Filters, Devices	Lecture 24 (https://bcourses.berkeley.edu/courses/1542294/files/91580931?wrap=1)	§9.4,9.5,9.6 For Devices see Slides		
	29	25	Devices	Lecture 25 (https://bcourses.berkeley.edu/courses/1542294/files/91630798?wrap=1)	see Slides	HW#10 Due Friday	Lab 5: Treble Boost
May	1	26	Devices	Lecture 26 (https://bcourses.berkeley.edu/courses/1542294/files/91657106?wrap=1)	see slides		
	6		***Reading/Review/Recitation***				
	8		***Reading/Review/Recitation***				
	12		***Final Exam: Monday, May 12, 11:30-2:30 p.m. (Exam Location TBD)***				