
University of Southern California
Ming Hsieh Department of Electrical Engineering

Course Number & Title:	EE 348L, Electronic Circuits
Units:	4
Semester:	Spring Semester
Schedule:	Monday, Wednesday, Friday: 10:00am-11:50am
Location:	Monday: VHE 205 Wednesday & Friday: WPH 106
Instructor:	Dina El-Damak
Office:	PHE 620
Office Hours:	TBD
Contact Information:	eldamak@usc.edu
Teaching Assistant:	TBD
Course Website:	https://blackboard.usc.edu

Catalogue Description:

Basic analog and digital circuit design using Bipolar Junction Transistors, Field Effect Transistors, and integrated circuits.

Course Description:

EE 348L is an introductory electronics course that explores the behavior of circuits featuring diodes, MOS Transistors, and other non-linear devices. The course covers the basics of device modeling and the fundamentals of analog circuits analysis, design such as dc-biasing and small-signal analysis of amplifiers as well as applications of integrated circuits .

EE 348L is a pre-requisite for other advanced electronic circuits courses such as EE 448L, EE 479, and EE 536a. Students interested in a career in the integrated circuits design field are encouraged to enroll in these follow-up classes to establish a strong background in mixed-signal integrated circuits design and communication circuits. Engineers specializing in this area continue to be in high demand.

Grading:

EE 348L grade is based on the following components:

Midterm Exam: 35% (February 27th)

Homework (5): 20%

Labs & Projects: 10%

Final Exam: 35% (Monday, May 6th 8-10 am)

References:

- B. Razavi, "Fundamentals of Microelectronics," 2nd Edition. Wiley Higher Ed. (**Main text book**)
- Edward W. Maby, "Solid-State Electronic Circuits" (2012)
Available Online: <http://ee-classes.usc.edu/ee348/Maby-SSEC.pdf>
- R. W. Erickson and D. Maksimovic, "Fundamentals of Power Electronics", Second edition, Springer US, 2001.

Course Administration:

- EE 348L has lecture-lab sessions on MWF 10:00am – 11:50am. The co-requisite is EE 338. The last day to drop the class without a W grade is February, 22nd. The last day to drop the class with a W grade is April, 5th. Incomplete grades (IN) are rarely assigned. This grade may be justified, but only in exceptional cases such as student illness or a personally tragic event that occurs after the twelfth week of the semester.
- **Make-up exams are not available.** If you are absent during an examination, you will receive a grade of zero unless you have a valid reason for your absence, **and you have discussed it with the instructor before the exam.** In the event of an excuse from a midterm, a weighted final exam score will replace the missing score. If you cheat during the exam, you will receive a grade of F in the course, and you will be reported to the Office of Student Judicial Affairs and Community Standards for disciplinary action.
- Homework is crucial in EE 348L, since it provides much-needed practice in analytical techniques, it is a good measure of whether you understand fundamental concepts, and it is a prerequisite for good performance on course exams. If your weighted course average places you on the borderline between two letter grades, a poor homework average will significantly increase the probability of the lower grade.
- **Try not to miss class!** Students who are regularly absent typically receive poor grades. The instructor has no reservations about compiling homework assignments and exams that are predicated, in part, on material discussed in class but not in assigned readings. Historically, the average grade for EE 348L is B- following the application of a "curve." Notwithstanding, the instructor is prepared to accept a higher average if the class does exceptionally well -- for example, a total class average score of 99/100 is an A.
- You are encouraged to use circuit design tools such as LTspice to check homework and compare your analytical solution to the simulation results, but please notice that you will not have access to it during the exams.

Tentative Weekly Schedule:

Week	Date	Subject	Reading	Homework
1	Mon 01/07/2019	Lecture 1: Class Introduction, Review. - Introduction to Microelectronics: Basic Concepts Analog and Digital Signals, Basic Circuit Theorems - Op-Amp Based Circuits	Handout #1 1.3, 8.1, 8.2.1, 8.2.2	
	Wed 01/09/2019	Lecture 2: Basic Physics of Semiconductors Review - Semiconductor Materials and Their Properties - PN Junction	Handout #2 Optional 2	
	Fri 01/11/2019	Discussion Session: Review and Lab Introduction		
2	Mon 01/14/2019	Lecture 3: PN Junction cont.		
	Wed 01/16/2019	Lecture 4: Diode Models - Ideal Diode - PN Junction as diode	Handout #3 3.1, 3.2	
	Fri 01/18/2019	Discussion Session: Homework1		HW 1 Out
3	Mon 01/21/2019	Martin Luther King's Birthday		
	Wed 01/23/2019	Lecture 5: Diode Circuits - Half-Wave and Full-Wave Rectifier - Limiting Circuits	Handout #4 3.5.1, 3.5.3	
	Fri 01/25/2019	Discussion Session: Homework2 Overview, LTSPICE		HW 1 Due HW 2 Out
4	Mon 01/28/2019	Lecture 6: MOSFET I - Structure of MOSFET - Operation of MOSFET	Handout #5 6	
	Wed 01/30/2019	Lecture 7: MOSFET II - MOS Device Models - PMOS Transistor - CMOS Technology		
	Fri 02/01/2019	Lab		HW 2 Due
5	Mon 02/04/2019	Lecture 8: Amplifiers: Biasing and Small-Signal models I - Common Source Stage	Handout #6 17	
	Wed 02/06/2019	Lecture 9: Amplifiers: Biasing and Small-Signal models II - Common-Gate Stage, Source Follower		
	Fri 02/08/2019	Discussion Session: Homework3 Overview.		HW 3 Out Lab Report Due
6	Mon 02/11/2019	Lecture 10: CMOS Amplifiers Examples		
	Wed 02/13/2019	Lecture 11: DC-DC Converter I - Principles of Steady-State Converter Analysis - Buck (Step-down) Converter	Handout #7	
	Fri 02/15/2019	Discussion Session: PCB Design Tutorial		HW 3 Due
7	Mon 02/18/2019	President's Day (Conference - 2019 IEEE ISSCC)		
	Wed 02/20/2019	Discussion Session: Lab Project I (2019 IEEE ISSCC)		
	Fri 02/22/2019	Midterm Review		
8	Mon 02/25/2019	Lecture 12: DC-DC Converter II - Boost (Step-up) Converter		
	Wed 02/27/2019	Mid-Term Exam (10:00am – 11:50am)		
	Fri 03/01/2019	Discussion Session: Lab Project II		
9	Mon 03/04/2019	Lecture 13: BJT I - Structure of Bipolar Transistor - Operation of Bipolar Transistor	Handout #8 4.1, 4.2, 4.3,	
	Wed 03/06/2019	Lecture 14: BJT II - Bipolar Transistor Model and Characteristics - The PNP Transistor	4.4, 4.6, 4.7	
	Fri 03/08/2019	Discussion Session: Lab Project Design Review		

	03/10 to 03/17	Spring Recess		
10	Mon 03/18/2019	Lecture 15: Cascode stages	Handout #9 9.1	
	Wed 03/20/2019	Lecture 16: Current Mirrors	Handout #10 9.2.3	
	Fri 03/22/2019	Discussion Session: Design Final Review and Submission	Handout #1 1.3, 8.1, 8.2.1, 8.2.2	PCB Design Due
11	Mon 03/25/2019	Lecture 17: Differential Amplifiers I - Differential Signals - Differential Pair	Handout #11 10.1, 10.3	
	Wed 03/27/2019	Lecture 18: Differential Amplifiers II - Large-Signal Analysis - Small-Signal Analysis		
	Fri 03/29/2019	Discussion Session: Homework4 Overview		HW 4 Out
12	Mon 04/01/2019	Lecture 19: Frequency Response I - Fundamental Concepts - High-Frequency Model of MOSFET	Handout #12 11.1, 11.2.2, 11.3, 11.4.1	
	Wed 04/03/2019	Lecture 20: Frequency Response II - Frequency Response of CS Stage		
	Fri 04/5/2019	Project Soldering and Testing		HW 4 Due
13	Mon 04/08/2019	Lecture 21: Feedback I - Properties of Negative Feedback - Types of Amplifiers	Handout #13 12.1, 12.2, 12.3,	
	Wed 04/10/2019	Lecture 22: Feedback II - Sense and Return - Polarity of Feedback - Feedback Topologies	12.4, 12.5, 12.6	HW 5 Out
	Fri 04/12/2019	Discussion Session: Homework 5 Overview		
14	Mon 04/15/2019	Project Soldering and Testing (2019 IEEE CICC)		
	Wed 04/17/2019	Project Grading (2019 IEEE CICC)		
	Fri 04/19/2019	Lecture 23: Feedback III		HW 5 Due
15	Mon 04/22/2019	Lecture 24: Digital Circuits	Handout #14	
	Wed 04/24/2019	Lecture 25: Advanced Topics	Handout #15	
	Fri 04/26/2019	Final Review		

Statement on Academic Conduct and Support Systems

Academic Conduct:

Plagiarism – presenting someone else’s ideas as your own, either verbatim or recast in your own words – is a serious academic offense with serious consequences. Please familiarize yourself with the discussion of plagiarism in SCampus in Part B, Section 11, “Behavior Violating University Standards” policy.usc.edu/scampus-part-b. Other forms of academic dishonesty are equally unacceptable. See additional information in SCampus and university policies on scientific misconduct, policy.usc.edu/scientific-misconduct.

Support Systems:

Student Health Counseling Services - (213) 740-7711 – 24/7 on call

engemannshc.usc.edu/counseling

Free and confidential mental health treatment for students, including short-term psychotherapy, group counseling, stress fitness workshops, and crisis intervention.

National Suicide Prevention Lifeline - 1 (800) 273-8255 – 24/7 on call

suicidepreventionlifeline.org

Free and confidential emotional support to people in suicidal crisis or emotional distress 24 hours a day, 7 days a week.

Relationship and Sexual Violence Prevention Services (RSVP) - (213) 740-4900 – 24/7 on call

engemannshc.usc.edu/rsvp

Free and confidential therapy services, workshops, and training for situations related to gender-based harm.

Office of Equity and Diversity (OED) | Title IX - (213) 740-5086

equity.usc.edu, titleix.usc.edu

Information about how to get help or help a survivor of harassment or discrimination, rights of protected classes, reporting options, and additional resources for students, faculty, staff, visitors, and applicants. The university prohibits discrimination or harassment based on the following protected characteristics: race, color, national origin, ancestry, religion, sex, gender, gender identity, gender expression, sexual orientation, age, physical disability, medical condition, mental disability, marital status, pregnancy, veteran status, genetic information, and any other characteristic which may be specified in applicable laws and governmental regulations.

Bias Assessment Response and Support - (213) 740-2421

studentaffairs.usc.edu/bias-assessment-response-support

Avenue to report incidents of bias, hate crimes, and microaggressions for appropriate investigation and response.

The Office of Disability Services and Programs - (213) 740-0776

dsp.usc.edu

Support and accommodations for students with disabilities. Services include assistance in providing readers/notetakers/interpreters, special accommodations for test taking needs, assistance with architectural barriers, assistive technology, and support for individual needs.

USC Support and Advocacy - (213) 821-4710

studentaffairs.usc.edu/ssa

Assists students and families in resolving complex personal, financial, and academic issues adversely affecting their success as a student.

Diversity at USC - (213) 740-2101

diversity.usc.edu

Information on events, programs and training, the Provost’s Diversity and Inclusion Council, Diversity Liaisons for each academic school, chronology, participation, and various resources for students.

USC Emergency - UPC: (213) 740-4321, HSC: (323) 442-1000 – 24/7 on call

dps.usc.edu, emergency.usc.edu

Emergency assistance and avenue to report a crime. Latest updates regarding safety, including ways in which instruction will be continued if an officially declared emergency makes travel to campus infeasible.

USC Department of Public Safety - UPC: (213) 740-6000, HSC: (323) 442-120 – 24/7 on call

dps.usc.edu

Non-emergency assistance or information.