University of Southern California

Ming Hsieh Department of Electrical Engineering

EE 348L - Electronic Circuits

Fall 2017

Abstract

EE 348L is an introductory electronics course that explores the behavior of circuits featuring diodes, transistors, and other non-linear devices. Much of the course concerns analysis and design with discrete components. Nevertheless, the ultimate objective is to understand the internal behavior of otherwise "black box" elements such as op-amps.

The course is almost exclusively analog in emphasis. Modern digital circuits are mostly CMOS and are best approached through a VLSI class such as EE 477L. More intricate TTL digital circuits (featuring bipolar transistors) are obsolete.

EE 348L is a gateway course. Students who are interested in modern electronic circuits will want to consider EE 448L, EE 479, and EE 536a as courses leading to a strong background in mixed-signal integrated design and communication circuits. Engineers specializing in these areas continue to be in great demand.

Course Administration

EE 348L has lecture-lab sessions on MWF 12:00 – 2:00. The co-requisite is EE 338.

The last day to drop the class without a W grade is 6 October, and the last day to drop the class with a W grade is 10 November. 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.

The EE 348L grade is based on the following components:

Midterm Exam	13 October	35%
Homework		20%
Labs / Projects		10%
Final Exam	8 December	35%

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 prior to 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 an 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.

You are encouraged to use computer analysis tools such as SPICE to check homework. Be sure not to use the computer as a "crutch." You will not have access during exams.

Try not to miss class! Students who are regularly absent invariably 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 clearly an A.

Assigned letter grades will not be changed except for grossly erroneous circumstances. Grades cannot reflect additional course work --- don't even ask.

Textbook

E. W. Maby, *Solid-State Electronic Circuits* (2012)

Instructor Information

Edward Maby   PHE 606   0-4706   maby@usc.edu

                       Office hours: MW 10:00 – 11:00

Teaching Assistant   Aaron Curry   acurry@usc.edu

                       Office hours: TTh 2:30 – 3:30

The EE 348L web site is: http://ee-classes.usc.edu/ee348

Tentative Course Schedule

Aug.	21 Op-amp review	23 Non-ideal op-amps	25 Semiconductor physics
	28 Diode circuit analysis	30 Diode models, SPICE	1 Rectification, power supplies
Sept.	4 Labor Day	6 DC-DC conversion I	8 DC-DC conversion II
	11 Voltage references	13 Lab Project	15 Lab Project
	18 MOSFETs I	20 MOSFETs II	22 Lab Project
	25 BJTs I	27 BJTs II	29 Lab Project
Oct.	2 Digital CMOS I	4 Digital CMOS II	6 Review
	9 Amplifier introduction	11 Resistive biasing	13 Midterm exam
	16 IC biasing	18 Small-signal models	20 Common-gate, -drain amp
	23 Common-source amp	25 High-frequency models	27 Open-circuit time constants
Nov.	30 Cascode, tuned amps	1 Differential amplifier	3 Half circuits
	6 CMOS op-amp I	8 CMOS op-amp II	10 Series-shunt feedback
	13 Shunt-shunt feedback	15 Stability	17 Compensation
	20 No class	22 No class	24 No class
	27 Noise	29 Distortion	1 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 Section 11, *Behavior Violating University Standards*https://scampus.usc.edu/1100-behavior-violating-university-standards-and-appropriate-sanctions/. Other forms of academic dishonesty are equally unacceptable. See additional information in *SCampus* and university policies on scientific misconduct, http://policy.usc.edu/scientific-misconduct/.

Discrimination, sexual assault, and harassment are not tolerated by the university. You are encouraged to report any incidents to the *Office of Equity and Diversity* http://equity.usc.edu/ or to the *Department of Public Safety* http://capsnet.usc.edu/department/department-public-safety/online-forms/contact-us. This is important for the safety whole USC community. Another member of the university community – such as a friend, classmate, advisor, or faculty member – can help initiate the report, or can initiate the report on behalf of another person. *The Center for Women and Men* http://www.usc.edu/student-affairs/cwm/ provides 24/7 confidential support, and the sexual assault resource center webpage sarc@usc.edu describes reporting options and other resources.

Support Systems

A number of USC's schools provide support for students who need help with scholarly writing. Check with your advisor or program staff to find out more. Students whose primary language is not English should check with the *American Language Institute* http://dornsife.usc.edu/ali, which sponsors courses and workshops specifically for international graduate students. *The Office of Disability Services and Programs* http://sait.usc.edu/academicsupport/centerprograms/dsp/home_index.htmlprovides certification for students with disabilities and helps arrange the relevant accommodations. If an officially declared emergency makes travel to campus infeasible, *USC Emergency Information* http://emergency.usc.edu/will provide safety and other updates, including ways in which instruction will be continued by means of blackboard, teleconferencing, and other technology.