

University of Southern California
Ming Hsieh Department of Electrical and Computer Engineering
EE 202L - Linear Circuits

Course Syllabus - Fall 2019

EE 202L is arguably the cornerstone course in the discipline of electrical engineering.

- From a classical perspective, EE 202L is an introduction to the physical principles that govern the behavior of analog circuits featuring resistors, capacitors, inductors, ideal operational amplifiers, and other linear components. The primary objective is to develop analytical techniques that simultaneously resolve current and voltage relationships within individual circuit elements and the interconnection relationships between arbitrary sets of elements (Kirchhoff's current and voltage laws). Techniques range from trivial algebra with real or complex numbers to solutions of ordinary differential equations.
- From a modern perspective, EE 202L explores ways to process electrical information. Apart from amplification, this may involve the alteration of temporal or spectral content or a conversion between analog and digital domains. Electrical signal processing is vital for many communication, control, and biomedical systems.

EE 202L leads to a study of electronic circuits (EE 348L) and more advanced methods of signal processing (EE 301).

Course Administration

EE 202L is partly offered in the "studio" format in which lectures, discussions, computer problems, and laboratory exercises all occur in the same setting. Thus, students can learn by doing, not just listening to lecture. Classes typically have short lectures interspersed with exercises that assess whether a particular concept has been mastered.

There are two studio sections: TTh 10:00 – 12:00 and TTh 2:00 – 4:00. Separate lab sections are scheduled on Mondays 4:00 – 6:00 and 6:00 – 8:00. Students should enroll in a studio section and a lab section.

The TAs will conduct regular office hours (times to be arranged).

The last day to drop the class without a W grade is 17 September, and the last day to drop the class with a W grade is 15 November. Incomplete grades (IN) are rarely assigned. The IN grade may be justified only in exceptional cases such as student illness or a personally tragic event that occurs after the twelfth week on the semester.

The EE 202L grade is based on the following components:

Midterm Exam #1 (30 September)	20%
Midterm Exam #2 (4 November)	20%

“Circuit Boot Camp”	15%
Homework	10%
In-Class Exercises, Labs, Projects	10%
Final Exam (University schedule)	25%

Circuit "Boot Camp" is a collection of thirty circuit problems that are designed to assess whether a student has mastered the techniques of circuit analysis. The assigned problems have randomized component values specified in Excel files issued to individual students. Answers are to be submitted in return Excel files. Grading has no partial credit apart from sign errors (half credit).

Homework is crucial in EE 202L, 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.

Students who are conscientious about their activities in class do not need to worry about their grade for in-class exercises --- the class work will be acknowledged but not graded. This portion of the course grade will suffer in the event of flagrant absence from class.

The end-of-semester project involves the construction of an electric guitar and a set of electrical design problems for circuits that achieve particular objectives related to audio signal processing. Students will receive assistance for their designs during scheduled class and laboratory times.

Historically, the average grade for EE 202L 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.

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 for further disciplinary action.

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 instructors have no reservations about compiling homework assignments and exams that are predicated, in part, on material discussed in class but not elsewhere.

Once assigned, the EE 202L letter grade will not be changed except for grossly erroneous circumstances. Your grade cannot be changed via additional work --- don’t even ask.

Textbook

The Analysis and Design of Linear Circuits (7e), by R. E. Thomas and A. J. Rosa

A digital edition is available from John Wiley & Sons.

Problems will not be assigned from the textbook, so any edition will suffice. The readings listed in this syllabus are consistent with the seventh edition.

If you choose not to purchase a book, the lecture slides containing everything you need to know will be posted on the class web page.

Instructor Information

Prof. Edward Maby	PHE 606	0-4706	maby@usc.edu
	Office hours: TTh 9:00 – 10:00		
Prof. Constantine Sideris	EEB 328	0-2351	csideris@usc.edu
	Office hours: TTh 1:00 – 2:00		

Teaching Assistants

Zorah Azizi	zazizi@usc.edu
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The EE 202L web site is: <http://ece-classes.usc.edu/ee202>

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

dsp.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

dsp.usc.edu

Non-emergency assistance or information.

Tentative EE 202L Class Schedule – Fall 2019

Week 1

M	26 August	No Lab
T	27 August	Current, voltage, power, Kirchhoff's laws, element constraints T&R: Chapter 1, 2.1 – 2.3
Th	29 August	Series and parallel R, voltage and current dividers T&R: 2.4, 2.5, 3.3

Week 2

M	2 September	Labor Day – No Lab
T	3 September	Superposition, source substitutions, SPICE dc circuit analysis T&R: 2.6, 2.7
Th	5 September	Node equations, loop (mesh) equations T&R: 3.1, 3.2, 4.1, 4.2 (pp. 148-157)

Week 3

M	9 September	Lab Session 1: Voltage and current measurements
T	10 September	Delta-Wye transformation, Thevenin and Norton equivalents, power transfer T&R: 3.4 – 3.6, 4.2 (pp. 157-158)
Th	12 September	Early electric power

Week 4

M	16 September	Lab Session 2: Source characterization, voltage references
T	17 September	Ideal op-amps T&R: 4.3 – 4.6
Th	18 September	Non-ideal op-amps, R-2R D/A converters Class Slides

Week 5

M	23 September	Lab Session 3: D/A converter measurements
T	24 September	Comparators, flash and pipeline A/D converters Class Slides
Th	26 September	Static and dynamic A/D conversion errors, review Class Slides

Week 6

M	30 September	Midterm Exam #1
T	1 October	Capacitance, integrating A/D converters T&R: 5.1 – 5.3, 6.1, 6.3 – 6.4
Th	3 October	Algorithmic A/D converters Class Slides

Week 7

M	7 October	Lab Session 4: A/D converter measurements
T	8 October	First-order RC circuits, inductance, first-order RL circuits T&R: 6.2, 7.1 – 7.3
Th	10 October	Timing circuits, 555 timer Class Slides

Week 8

M	14 October	Lab Session 5: SPICE analysis in the time domain
T	15 October	Second-order circuits (step response) T&R: 5.4 – 5.6, 7.5 – 7.7
Th	17 October	Fall Recess – No class

Week 9

M	21 October	Lab Session 6: Transient circuit measurements
T	22 October	Laplace transforms T&R: Chapter 9
Th	24 October	In-class lab: Feedback Class slides

Week 10

M	28 October	No lab
T	29 October	Non-zero initial conditions, transient applications, review Class slides
Th	31 October	Sinusoidal steady state, impedance, phasors, power transfer T&R: 8.1 – 8.3

Week 11

M	4 November	Midterm #2
T	5 November	First-order low-pass and high-pass filters T&R: 12.1 – 12.3
Th	7 November	Second-order filters, resonance T&R: 12.4 – 12.5

Week 12

M	11 November	Lab Session 7: SPICE analysis in the frequency domain
T	12 November	State-variable filters, higher-order filters Class slides, T&R: Chapter 15
Th	14 November	Transmission lines Class Slides

Week 13

M	18 November	Lab Session 8: Filter characterization
T	19 November	Project
Th	21 November	Project

Week 14

M	25 November	Project
T	26 November	Project
Th	28 November	Thanksgiving Recess

Week 15

M	2 December	Project
T	3 December	Project
Th	5 December	Project Evaluation