University of California, Santa Cruz
Electrical Engineering Department
EE-171, Summer 2016

Analog Electronics

Lecture Room: BE-169 MWF 9:00 – 10:15am
Laboratory Room: BE 150
Instructor: S.C. Petersen (petersen@soe.ucsc.edu)
Office: BE251

Course Description:

This course introduces basic passive and active analog devices required for the analysis and engineering design of modern discrete electrical circuits, both analog and digital. Students are expected to possess a working knowledge of basic electrical engineering network analysis techniques (EE101 or equiv.); linear systems theory (EE103 or equiv.) is recommended.

General coverage will include the following topics (but not necessarily in the order shown):

- Basic system theory, signals, linearity and distortion, time and frequency domain perspectives and analysis.
- The operational amplifier; ideal and non-ideal op-amp characteristics. How to use the op-amp in engineering design.
- Junction devices including diodes, bipolar junction transistors (BJT) and field-effect transistors (FET): relevant solid-state physics, basic biasing techniques, large and small-signal analysis and design, amplifier (BJT and FET) and switching characteristics, *h-parameters,* basic analog circuit configurations. We will survey fundamental field-effect types, JFET and MOSFET; enhancement and depletion modes; NMOS, PMOS and CMOS digital circuits.
- Differences between the design of discrete and integrated circuits.

References:
Required: Microelectronic Circuits, Sedra and Smith, Oxford 2015, 7th ed.
Useful: Microelectronics, Razavi, Wiley, 2nd ed.

Lab text: Pspice for Basic Microelectronics, Tront, McGraw-Hill Higher Education 1st ed. 2008.

Supplementary references will be discussed in lecture. Many of these will be industrial application notes, typically in PDF format and will be made available on our website and/or handed out in class.

Lecture Notes.

Homework:
Homework will be assigned and collected during class sessions, and will generally follow a weekly sequence; solutions will be handed out on the date of collection; they will not be posted to our class website. Material will consist of problems from our text, supplementary and extra-credit problems. To receive full credit, your work must be well organized, written a college level and show evidence of thoughtful attention to the problem itself. Grading will follow as described below.

- **A**: Complete and thoughtful solutions; numerical correctness is *not* the sole criterion, conceptual correctness is. Excellent college level writing.
- **B**: Thoughtful solutions displaying clear evidence of attention to each problem but some conceptual errors present.
- **C**: Numerically correct result(s) without evidence of conceptual understanding or thoughtful solution.
- **D**: Sloppy, incomplete or poorly presented problem set.

… to each of the above, + or - as appropriate…

Examinations: There will be one midterm exam and a comprehensive final exam. Both will be open-book and open-notes (no old exams permitted, however).

Grading: Letter grades will be assigned for all work. Averaging will follow the usual 4.0 point scale to determine a final grade-point and associated letter grade. Category weightings are as follows:

Homework	30%	
Midterm Exam	30%	
Final Exam	40%	passing this test is required to pass the class.

Academic Integrity:
The student-instructor relationship is based on imputed trust. Violations of this trust by deceptively offering the work of others as your own, cheating on examinations etc. will result in formal charges of academic dishonesty being brought against you.