

EEO 316

Integrated Electronic Devices and Circuits

Fall 2017

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Course Description:

This is the circuit design course that will discuss the principles, concepts and techniques required to produce successful designs of analog integrated circuits. Topics will include the fundamentals of the operation and modeling of the diode and MOS transistor. The single-stage MOS amplifiers will be analyzed and their performance will be characterized. The basic analog circuit topologies like current mirrors, cascoding and differential pair will be introduced. Topics considered will include analysis of the frequency response of the single-stage amplifiers and the design of high-performance operational amplifiers.

Office hours : MW 10:00am-12:00pm, or by appointment

Recommended Textbook :

D.A. Johns and K. Martin, "Analog Integrated Circuit Design", 2nd edition, Wiley 2011.

References :

B. Razavi, "Design of Analog CMOS Integrated Circuits"

P.R. Gray, P.J. Hurst, S.H. Lewis, and R.G. Meyer, "Analysis and Design of Analog Integrated Circuits"

Goals:

The purpose of this course is to introduce students to principles of analysis and design of analog integrated circuits, starting from single transistor circuits to the multi-stage operational amplifier design.

Objectives:

Students should be able to:

- 1) understand the I-V characteristics of MOS.
- 2) calculate the parasitic capacitances of MOS transistor.
- 3) analyze and design single-stage amplifier.
- 4) analyze and design a current source.
- 5) analyze and design multi-stage differential amplifiers.
- 6) analyze the frequency response of a single-stage and multi-stage amplifier.

Course Schedule

Week 1.	Introduction to analog integrated circuits, analog IC design flow.
Week 2.	Fundamentals of pn junction, MOS transistor and passive devices.
Week 3.	Modeling of MOS transistor. Large and small signal model. Two-port amplifier analysis.
Week 4.	Single-stage amplifiers: common-source amplifier and common-source amplifier with source degeneration.
Week 5.	Single-stage amplifiers: common-drain and common-gate amplifier.
Week 6.	Current sources and mirrors.
Week 7.	Cascoded current sources and mirrors. <i>Midterm exam.</i>
Week 8.	Cascode and folded-cascode amplifiers.
Week 9.	Differential Pair. Single-ended output differential amplifier. Fully differential amplifier.
Week 10.	Operational amplifiers. Two-stage operational amplifier.
Week 11.	Cascode and folded-cascode single stage differential amplifiers.
Week 12.	Frequency response. MOS capacitances and AC model of MOS transistor.
Week 13.	Frequency response of single-stage amplifiers.
Week 14.	Stability and compensation of operational amplifiers.

Credit Distribution

1. Homework (15%)
2. Midterm (40%)
3. Final (40%)
4. Participation in online forum (5%)

Proctoring Policy

To ensure student authentication and academic integrity, we require students to have exams (mid-term/final) proctored at testing centers, public facilities, higher education institutions, or commercial online proctoring services.

The following are examples of proctoring facilities: National College Testing Association (www.ncta-testing.org/cctc/find.php), the SUNY Exam Proctoring Services (open.suny.edu/proctoring), public libraries, community colleges and other higher education institutions. The proctor at these facilities must be faculty or professional staff members. Proctoring by teaching assistants or graduate students is generally not acceptable, unless specifically authorized by the instructor.

Proctors who have a personal relationship with the student (such as friends, relatives, employers, colleagues, fellow students, etc.) are not appropriate. In all cases, students should obtain approval of the faculty once they have identified a proctoring facility.

Access to our class's on-line Blackboard site:

You can access class information on-line at: <http://blackboard.sunysb.edu>

If you have used Stony Brook's Blackboard system previously, your login information (Username and Password) has not changed. If you have never used Stony Brook's Blackboard system, your initial password is your SOLAR ID# and your username is the same as your Stony Brook (sparky) username, which is generally your first initial and the first 7 letters of your last name.

For help or more information see:

<http://www.sinc.sunysb.edu/helpdesk/docs/blackboard/bbstudent.php>

For problems logging in, go to the helpdesk in the Main Library SINC Site or the Union SINC Site, you can also call: 631-632-9602 or e-mail: helpme@ic.sunysb.edu

Americans with Disabilities Act:

If you have a physical, psychological, medical or learning disability that may impact your course work, please contact Disability Support Services, ECC (Educational Communications Center) Building, room128, (631) 632-6748. They will determine with you what accommodations, if any, are necessary and appropriate. All information and documentation is confidential.

Academic Integrity:

Each student must pursue his or her academic goals honestly and be personally accountable for all submitted work. Representing another person's work as your own is always wrong. Faculty are required to report any suspected instances of academic dishonesty to the Academic Judiciary. Faculty in the Health Sciences Center (School of Health Technology & Management, Nursing, Social Welfare, Dental Medicine) and School of Medicine are required to follow their school-specific procedures. For more comprehensive information on academic integrity, including categories of academic dishonesty, please refer to the academic judiciary website at <http://www.stonybrook.edu/uaa/academicjudiciary/>

Critical Incident Management:

Stony Brook University expects students to respect the rights, privileges, and property of other people. Faculty are required to report to the Office of Judicial Affairs any disruptive behavior that interrupts their ability to teach, compromises the safety of the learning environment, or inhibits students' ability to learn. Faculty in the HSC Schools and the School of Medicine are required to follow their school-specific procedures.