ESE-324 Advanced Electronics Lab
Spring 2024

Syllabus

1. Course Staff and Office Hours

Instructor: Emre Salman
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Light Eng. 257

Office Hours: Mondays and Wednesdays, 1:50pm to 3:50pm
Other hours by appointment

TAs: Check Brightspace

2. Course Description

The objective of this advanced electronics lab course is to provide hands-on design experience for students. The students will have the opportunity to leverage theoretical knowledge acquired during ESE 272 and ESE 273 in order to design and test more complex and highly popular electronic circuits such as a multi-stage amplifier, voltage regulator, and DC-DC boost and buck converters, data converters, and phase-locked loop. The initial several experiments will be based on the fundamental single stage amplifiers. The rest of the experiments will be more design centric where the students will have the responsibility to determine either topology or the values of the circuit elements in each experiment in order to satisfy specific design objectives. The lectures will cover the theoretical principles as well as related design tradeoffs. Different topologies and analysis techniques will be presented for each circuit, guiding the students during the design process. Spring.

Prerequisites: ESE 272 and ESE 273

Credits: 3

3. Textbook

"Microelectronic Circuits" by A. S. Sedra and K. C. Smith.

4. Course Learning Objectives

Upon completion of the course, students will have

- an understanding of the operation of certain analog and mixed-signal electronic circuits
- skills in designing and testing analog and mixed-signal circuits to satisfy design objectives;
- skills in troubleshooting using oscilloscope and multimeter.

5. Student Learning Outcomes

	Student Outcomes	% contribution
1	an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics.	30%
2	an ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors.	35%
3	an ability to communicate effectively with a range of audiences.	
4	an ability to recognize ethical and professional responsibilities in engineering situations and make informed judgements, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts.	
5	an ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives.	
6	an ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgement to draw conclusions.	35%
7	an ability to acquire and apply new knowledge as needed, using appropriate learning strategies.	

6. Schedule and Class/Lab Meeting times

Laboratory sessions will be held at Light Engineering Room 283 (Analog lab) at the following times:
L01: Tuesdays, 7pm to 10pm
L02: Mondays, 7pm to 10pm
L03: Thursdays, 7pm to 10pm

Week 1.	Introduction to the course with general discussion on analog, digital and mixed-signal circuits, application examples, review of MOS operation
Week 2.	Analysis of propagation delay and power consumption
Week 3.	Transmission gate design and characterization
Week 4.	Phase detector design and analysis
Week 5.	Multivibrator circuits: astable, monostable, bistable circuit structures
Week 6.	Transistor level flip-flop design and setup/hold time characterization
Week 7.	Linear and nonlinear oscillators
Week 8.	Damping theory and resonance
Week 9.	Voltage regulators and linear drop-out regulator

Week 10.	Fundamentals of DC-DC switching converters
Week 11.	Data converters and quantization noise
Week 12.	Introduction to phase-locked loop (PLL) design
Week 13.	Loop filter and voltage-controlled oscillator design for PLL
Week 14	Course summary, integration and final review

7. Assignments

There will be eight laboratory experiments that you are required to attend. In these labs, you will be asked to either choose a specific topology or determine the values of certain components for a given topology to satisfy design objectives. Most of the labs will involve a prelab assignment that needs to be returned to the teaching assistant (TA) at the beginning of the lab session. The data collected during the lab will be signed by the TA and the lab report will be submitted at the beginning of the next lab session. Please check Brightspace on report guidelines.

8. Grading

Your grade will be based on lab reports and prelabs, two midterm examinations, and one final examination.

Lab reports and prelab assignments	45%
Midterm	20%
Final Exam	30%
Portfolio	5%

9. Academic Honesty

Any academic dishonesty on a written homework or lab will result in a zero grade for the assignment for all parties involved.

All exam work must be entirely your own with no collaboration or outside materials/information. Any academic dishonesty on the midterm exams or the final exam will result in failing the course. The case will be submitted to the College of Engineering's Committee on Academic Standing and Appeals.

10. Electronic Communication Statement

Email and especially email sent via Brightspace is one of the ways the faculty officially communicates with you for this course. It is your responsibility to make sure that you read your email in your official University email account. For most students that is Google Apps for Education (http://www.stonybrook.edu/mycloud), but you may verify your official Electronic Post Office (EPO) address at http://it.stonybrook.edu/help/kb/checking-or-changing-your-mail-forwarding-address-in-the-epo.

If you choose to forward your official University email to another off-campus account, faculty are not responsible for any undeliverable messages to your alternative personal accounts. You can set up Google Mail forwarding using these DoIT-provided instructions found at http://it.stonybrook.edu/help/
kb/setting-up-mail-forwarding-in-google-mail.
If you need technical assistance, please contact Client Support at (631) 632-9800 or supportteam@stonybrook.edu.

11. Student Accessibility Support Statement

If you have a physical, psychological, medical, or learning disability that may impact your course work, please contact the Student Accessibility Support Center, 128 ECC Building, (631) 632-6748, or at sasc@Stonybrook.edu. They will determine with you what accommodations are necessary and appropriate. All information and documentation is confidential.

12. Academic Integrity Statement

Each student must pursue their academic goals honestly and be personally accountable for all submitted work. Representing another person's work as your own is always wrong. Faculty is 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/commcms/academic_integrity/index.html

13. Critical Incident Management Statement

Stony Brook University expects students to respect the rights, privileges, and property of other people. Faculty are required to report to the Office of University Community Standards 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. Further information about most academic matters can be found in the Undergraduate Bulletin, the Undergraduate Class Schedule, and the Faculty-Employee Handbook.