

ESE 324: Electronics Laboratory C SPRING 2018

Instructor: Emre Salman

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Office: Room 257, Light Engineering Building

Office Hours: Wednesdays 9:30 to 11:30 and Thursdays 11 am to 1 pm

Course Description: Illustrates and expands upon advanced concepts presented in ESE 372. Experiments include analog circuits such as oscillators and voltage regulators; mixed-signal circuits such as analog to digital and digital to analog data converters and phase-locked loops, and several experiments emphasizing the analog design issues in digital circuits such as transmission gates and registers. Weekly lectures cover the minimum required theory for these experiments.

Text Books: Microelectronic circuits by A. S. Sedra and K. C. Smith, 6th or 7th edition (recommended)

Prerequisites: ESE 211, 372

Grading: Lab work/reports: 45% Midterm: 20% Final: 30% Portfolio: 5%

Tentative outline:

Introduction and review of MOS transistor operation
CMOS gate propagation delay and power consumption
Transmission gate (TG) design and characterization
Phase detector (PD) design (comparison of TG and static CMOS based PD)
Multivibrator circuits: Astable, monostable, bistable structures
Transistor level flip-flop design and setup/hold time characterization (Bistability)
Linear and nonlinear oscillators (A stability)
Damping theory and resonance
Fundamentals of DC-DC switching converters
Data converters and quantization noise
Introduction to phase-locked loop design
Loop filter and voltage controlled oscillator
Course summary, integration, and final review

Laboratory Experiments:

Experiment 1: Design and analysis of a CMOS gate
Experiment 2: Transmission gate design and characterization
Experiment 3: Phase detector design and analysis (Comparison of TG and static CMOS)
Experiment 4: Flip-flop design and characterization of timing constraints
Experiment 5: Design of a variable duty cycle oscillator
Experiment 6: Design and analysis of a DC-DC switching boost converter
Experiment 7: Design and analysis of an analog-to-digital and digital-to-analog converter (two weeks)
Experiment 8: Design and analysis of a phase-locked loop (two weeks)

Student Learning Objectives:

- An ability to apply knowledge of mathematics, science and engineering
- An ability to design and conduct experiments
- An ability to analyze and interpret data
- An ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability
- An ability to identify, formulate, and solve engineering problems

Disability Support Services (DSS) Statement:

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, room 128, (631) 632-6748. They will determine with you what accommodations, if any, are necessary and appropriate. All information and documentation is confidential. Students who require assistance during emergency evacuation are encouraged to discuss their needs with their professors and Disability Support Services. For procedures and information go to the following website: <http://www.stonybrook.edu/ehs/fire/disabilities>.

Academic Integrity Statement:

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/commcms/academic_integrity/index.html

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 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.