Fall 2021

ESE 118: Digital Logic Design
Instructor: Dmitri Donetski
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Office Hours: Tuesday, Thursday, 1-3 PM, online in Zoom.

Prerequisite: ESE 123

Description: The course covers binary numbers, Boolean algebra, arithmetic circuits, flip-flops, analysis and design of sequential circuits, memory and programmable logic. The circuits are designed and simulated with CAD tools, assembled on breadboards and verified with the digital pattern generator and the logic analyzer.

Goal: Development of general background in theory and practical skills necessary for taking advanced courses.

Outcomes: students will develop 1) understanding fundamentals of analysis and design of digital circuits and standard building blocks; 2) skills in reading schematic of digital circuits and analysis of circuit behavior; 3) skills in design of combination and sequential circuits using conventional methods and CAD tools; 4) skills in verification and troubleshooting circuits with pattern generators and logic analyzers, determination of signal propagation delays.

Lectures: Monday, Friday, 1:00-2:20 PM, Humanities, 1003. Lectures will be recorded in Echo.

Labs: Prelabs (circuit design and simulations) will be conducted in Active-HDL, Aldec. Students complete prelabs individually and e-mail simulation reports to the instructor by midnight before the lab session. Experiments will be conducted in Lab 235 Heavy Eng. Bldg., New Addition. Final lab reports are due the following week.
Section 1, Monday, 4:25-7:20 PM (prelab reports are due in Sundays)
Section 3, Tuesday, 5:45-8:40 PM (prelab reports are due in Mondays)
Section 4, Wednesday, 6:05-9:00 PM (prelab reports are due in Tuesdays)

Textbook (recommended): M. Morris Mano, Michael D. Ciletti, "Digital Design", Pearson, 6th or 5th edition.
6th ed: 2018, ISBN-10: 0134549899, 0134529561, ISBN-13: 9780134549897, 9780134529561, 5th ed.: 2013, ISBN-10: 0132774208, ISBN-13: 9780132774208.

Windows laptop or desktop is required for circuit design and simulation (prelabs).

All assignments and instructions will be posted on Blackboard.

Grading: Lab reports (20 pts for prelabs, 10 pts for experiments), Homeworks (20 pts), Quizzes (20 pts), Test 1 (5 pts), Test 2 (10 pts), Final exam (15 pts). Final grades (tentative): A: > 90, B: 89-80: C: 79-70 pts. Passing the course with grades in A-C range requires: 1) submission of 10 individual prelab reports (simulations) to the instructor; 2) best effort in lab experiments and submission of the final lab reports; 3) demonstration of the ability to design finite state machines on the final exam.

Topical outline:
1.   Binary numbers and codes: 10 %
2.   Boolean algebra, logic transformation and minimization: 10 %
3.   Arithmetic circuits, decoders, multiplexers, latches and flip-flops: 30 %
4.   Analysis and design of sequential circuits: 40 %
5.   Memory and programmable logic: 10 %

Additional reading:

1. F. Vahid, Digital Design with RTL Design, VHDL, and Verilog, 2nd ed, 2010, ISBN-13: 978-0470531082, ISBN-10: 0470531088
2. D.M. Harris, S.L. Harris, Digital Design and Computer Architecture, 2nd ed., 2012, ISBN-13: 978-0123944245, ISBN-10: 0123944244
3. J. Wakerly, Digital Design: principles and practices, with Verilog, 5th ed., 2017, ISBN-13: 978-0134460093, ISBN-10: 013446009X

Student Accessibility Support Center 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 via e-mail at: **sasc@stonybrook.edu**. They will determine with you what accommodations are necessary and appropriate. All information and documentation is confidential.

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 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

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 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.