ESE 555 VLSI Circuit Design

Spring Semester 2001

Catalog Data: ESE 555 *VLSI Circuit Design.* Credits 3. Introduces techniques and tools for scalable VLSI design and analysis. Emphasis is on physical design and on performance analysis. Includes extensive lab experiments and hands-on usage of CAD tools.

Text Books:
1. Jan Rabaey, “Digital Integrated Circuits: A Design Perspective”, Prentice Hall, 1996.
2. Neil Weste and K. Eshraghian, “Principles of CMOS VLSI Design : A Systems Perspective”, Addison-Wesley, 2nd Edition.

Instructor: Dr. Alex Doboli, 261 Light Engineering Bld., 632-1611, adoboli@ece.sunysb.edu

Goals: Upon completion of this course, the students will be able to develop, layout and simulate fabricatable designs of VLSI building-block modules, such as registers and arithmetic units, and medium-scale VLSI chips.

Prerequisites by Topic:

1. Logic Design - combinational and sequential.
2. Computer organization and microprocessors.
3. Electronics - MOS transistor theory.
4. Basic Network Analysis

Topics:

1. CMOS Device Characteristics and processing
2. Basic MOS Transistor Theory
3. Switch Level Simulation, Timing Analysis
4. Performance Estimation, resistance, capacitance, power, fall and rise times.
5. Transistor Sizing
6. Scalable Designs and Design Rules
7. Charge Sharing
8. CMOS logic families and circuit techniques.
9. Latch-Up and solutions.
10. Clocks and multiphase clocking.
11. VLSI Building Blocks - Inverters, Gates, Multiplexers, Registers, Arithmetic and Logic Units.
12. Hierarchical, modular and bit-sliced design techniques.
13. Pipelining and chaining Concepts.
14. Area-Time-Power Tradeoffs in VLSI Design
15. Design with standard cells.
16. Other VLSI Design Issues

Assignment Schedule and Grading

Assignment	Start Date	Due Date	Points
Homework 1	week 4, 2001	week 5, 2001	10
Homework 2	week 7, 2001	week 8, 2001	10
Homework 3	week 9, 2001	week 10, 2001	10
Miniproject	week 9, 2001	week 15, 2001	30
Midterm 1	week 8, 2001		20
Final	exam week, 2001		20