ENGR 856: Advanced VLSI Design

Offered in Spring 2006
Class webpage: http://online.sfsu.edu/~mahmoodi/engr856/

I. Course Aims and Objectives:

Aims
This course introduces advanced topics in VLSI circuit and system design. High-performance and low-power design issues in modern and future processes are discussed in detail. The challenges of technology scaling are covered and state of the art technologies and solutions at different levels of abstraction are discussed. A class project is an integral part of this course.

Specific Learning Objectives:
By the end of this course, students will have the following understanding and skills:

- Knowledge of silicon technology scaling and trends
- Knowledge of challenges of technology scaling in nano-scale regimes
- Applying low power design approaches and techniques at different levels of abstraction
- Knowledge of challenges associated leakage currents and process variations
- Developing a new design techniques under excessive leakage and process variations
- Exploiting non-classical CMOS devices for circuit design in such technologies
- Knowledge of prospects of future non-silicon nanotechnologies

II. Prerequisite:
Basic knowledge of logic circuits and digital electronics and VLSI which is covered in the following courses:
ENGR 378: Digital System Design
ENGR 453: Digital Integrated Circuit Design

III. Textbooks:

Primary textbook:
Design of High-Performance Microprocessor Circuits, A. Chandrakasan, Bowhill, & Fox, IEEE Press © 2001

Class notes:
Lecture notes will be made from the latest presentations made in leading conferences in the field by industry leaders

Technical Journals and Conferences:
1) IEEE journal of solid-state circuits
2) International Conference of Solid-State Circuits (ISSCC)

IV. Topics:

1. Technology scaling and trends
2. CMOS scaling challenges in sub 100nm regimes
3. Low power design
4. Energy recovery techniques
5. Techniques for leakage power reduction
6. Process variations in devices and interconnects
7. Circuit design in nano-scaled technologies
8. Self-timed circuits
9. High speed VLSI arithmetic units
10. Emerging memory technologies
11. SOI technology and circuits

V. Grading Policy:

1 mid-term exam accounting for 30% of the grade
Project accounting for 70% of the grade

VI. Accommodations for students with disabilities:

The Disability Program and Resources Center provides university academic support services and specialized assistance to students with disabilities. Students in need should contact Services for Students with Disabilities (SSB 110, 338-2472) for information regarding accommodation. Please notify your instructor so that reasonable efforts can be made to accommodate you.