**EEE 625: Advanced VLSI Design**

**Course Description:** This course covers advanced aspects of modern digital CMOS IC design.

The presentation assumes not just familiarity, but *mastery* of the material in EEE525. The same

text is used, but the course covers aspects that are much more in depth. *Students must be extremely proficient at schematic entry and layout using Cadence,circuit simulation using HSPICE*. Basic knowledge of static timing analysis (Primetime), Verilog, RTL synthesis, and APR is assumed. Multiple large design projects vary each year and *students work individually on projects*. Homework includes simulation and design as well as problem solving.

**Prerequisite:**

EEE525

**Suggested prior courses:**

Computer Architecture, EEE333, EEE436 or EEE531

**Course Topics:**

1. Device variability, process corners, and impact on designs, including on dynamic

circuits and circuit races. Robust design in the presence of variation.

2. Impact of advanced devices, e.g., eSiGe and finFET on circuit design.

3. SRAM design, margins, and design parameters. Sense amplifier design and tradeoffs.

SRAM race margins and analysis. Content addressable memory.

4. Microprocessor microarchitecture as it pertains to circuit design.

5. Low power design, dealing with leakage power and state-retention schemes.

6. Single ended and differential domino circuit design, ultra-high speed circuit schemes.

7. Cache, translation lookaside buffer, branch target buffer design.

8. Clocking and advanced latch and flip-flop designs and tradeoffs.

9. Device reliability and impact on micro-architecture and circuit design.