EEE598: VLSI Modulation Circuits

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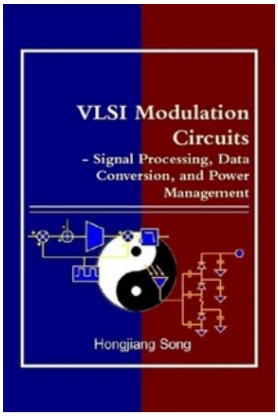

Credits: 3 hours

Prerequisites:
- Basic VLSI analog circuits
- Basic VLSI digital circuits

Grading:

Homework/mini projects	15%
Midterm Exams	40%
Final Exam	25%
Project	20%

Catalog Description:
- VLSI modulation circuit techniques are widely used in VLSI circuits and systems for signal processing, data conversion and power management. This course covers advanced VLSI analog circuit concepts and design techniques based on Linear Time Variant (LTV) circuit structures.
- This course is intended for first year graduate students with the objective to build the practical knowledge and hands-on design and modeling skills of VLSI modulation circuits. There will be weekly (bi-weekly) homework and design projects. CAD tools such as CADENCE will be used intensively during the class.

Text book:
- "VLSI Modulation Circuits – Signal Processing, Data Conversion and Power Management" by Hongjiang Song.
- http://www.lulu.com/shop/hongjiang-song/vlsi-modulation-circuits-signal-processing-data-conversion-and-power-management/paperback/product-21978103.html

Reference:
- Selected journal/conference papers on VLSI modulation circuit design that support covered topics

Course Topics:
- VLSI linear time variant (LTV) circuits & modulation principles
  - Clamping; Multiplication; Switched-Network
- Basic VLSI Modulation Circuit Theory & Operations
  - Frequency Translation;
  - Pulse Density Modulation (PDM); Pulse Code Modulation (PCM); Pulse Width Modulation (PWM);
  - Phase/Delay Modulation; and Chopping
- VLSI PCM Circuits & Design
  - Quantization; Oversampling; Noise shaping
  - A/D, D/A Data Conversions
- VLSI PWM Circuits & Design
  - Class-D amplifications
  - Step-Up/Step-Down DC/DC Conversions
- VLSI Charge-Pump Circuits & Design
  - Passive; Active; Regulated Charge-pumps
- VLSI Lock-In Amplifier Circuits & Design
  - Principle & Design Implementations
- Design of VLSI Spread Spectrum Clocking & Fractional-N Phase-Locked Loop
  - EMI/EMC Concepts
  - Modulation techniques and Implementations