EEE 598: System-Level Design for Multicore Architectures

This course is an in-depth introduction to multicore computing architectures ranging from low-power multiprocessor systems-on-chip (MpSoC) to high-performance chip-multiprocessors (CMP). This course covers the fundamental topics on modeling, analysis and optimization of multicore systems. This course does not only address cross-cutting design problems common to both MpSoCs and CMPs, but also underlines their distinct characteristics. Particular attention is given to low-power and communication-centric design of multicore systems.

The first half of the course is theory oriented, while the second part is project oriented to provide extensive hands-on experience. During the first part, the students receive classical homework sets and a midterm test. In the second half, teams of three to four students need to complete a project with clearly defined milestones. The students can select their project from a list of suggested pool of projects or define their own project, which is aligned with the course topics.

Prerequisites: EEE 425/591 Digital Systems and Circuits
Background in HDL, Matlab and C++, and passion for analytical modeling and optimization are required.

Course Topics: Topics to be covered include models of concurrency and embedded applications, network-on-chip communication, many-core architectures, cache hierarchy, performance analysis, scheduling, low-power and reliable design, dynamic power and thermal management, clocking. From a practical standpoint, the course explores the use of hardware description languages (HDLs), FPGA prototyping, C++/SystemC and embedded multiprocessor platforms to implement complex applications.

Textbook: There is no required textbook. Research papers will be assigned throughout the semester. Optional reference books are: