Electrical and Computer Engineering 5750
Computer Architecture
Elective

Course Description:
Modern architecture fundamentals, instruction set analysis and design, pipelined and superscalar architectures, software-hardware interaction, memory hierarchy, virtual memory stresses, and evaluation of multi-level systems.

Prerequisites:
ECE 5720 or equivalent

Textbook:

Course Outcomes:
1. Students should understand the major structural components of a high-performance microprocessor architecture with optimization techniques such as dynamic out-of-order scheduling, multiple levels of caching, virtual memory and TLB structures.
2. Comprehend the technology trend that led to the evolution of Multicore systems.
3. Understand the basic requirements of designing a multiprocessor system, with some exposure to cache coherence.
4. Develop skills to analyze performance characteristics of an application, running on both uniprocessor system and a multicore system.
5. Experience in using a modern architecture simulator to develop models of microprocessor including multicores, and simulate application execution on such system for design and performance analysis.

Topics Covered:
- Metrics, ISA, Pipelining
- Pipeline and Memory Hierarchy
- Instruction Level Parallelism
- Data-level Parallelism
- Vector, SIMD, GPU DLP
- Memory Systems
- Multiprocessor
- Multithreading
- Warehouse-Scale Computing
- Energy Proportional Computing

Outcome Assessments (Grades):
- Brush-up Basics Quiz 5%
- Class Participation 5%
- 2 Midterms 30%
Homework/Programming Assignments  35%
Project                              25%

Class Schedule:
Class                              Twice a week for one hour and fifteen minutes.

Contribution of course to meeting the requirements of Criterion 5:
3 credit hours of Engineering Topics and contains significant engineering design content

Relationship of course to student outcomes:
  a. An ability to apply knowledge of mathematics, science, and engineering.
  b. An ability to design and conduct experiments, as well as to analyze and interpret data.
  c. An ability to design a system, component, or process to meet desired needs.
  e. An ability to identify, formulate, and solve engineering problems.
  i. A recognition of the need for, and ability to engage in, life-long learning.
  k. An ability to use the techniques, skills, and modern engineering tools necessary for
     engineering practice.

Instructor:
Koushik Chakraborty, Assistant Professor
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