Electrical and Computer Engineering 5720  
Computer Systems Programming and Architecture  
Required

Course Description:  
Advanced assembly language and systems programming concerned with performance. Study of modern computer architecture issues, such as caching, pipelining, concurrent instruction execution, and virtual memory.

Prerequisites:  
ECE 3710

Textbook:  

Reference:  

Course Outcomes:  
1. Understand how to implement bitside operations and 2’s complement mathematics using the C programming language.  
2. Become familiar with 32-bit assembly language programming and debugging.  
3. Understand basic computer architecture and caching.  
4. Learn techniques for performance optimization of critical software.  
5. Basic understanding of virtual memory and TLB design.

Topics Covered:  
- Bits and Bytes  
- Integers  
- Machine Programming  
- Operations, Control  
- Switch, Control Procedure  
- Stack Operations, Call Chains, Arrays  
- Arrays and Structures, Buffer Overflow  
- Y86  
- Sequential Y86 Implementation  
- Sequential Logic, Pipeline  
- Data Hazards  
- Exceptions  
- Performance Optimization
• Memory Hierarchy, Caches
• Virtual Memory
• Linking
• Stacking

Outcome Assessments (Grades):
Homework 50%
Midterm 10%
Take Home Quiz 10%
Final Exam 25%
Class Participation 5%

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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