The University of Texas at Tyler
Department of Electrical Engineering

EENG 5340: Computer Architecture and Design

Syllabus

Catalog Description:

Introduction to computer architecture, RISC/CISC, processors, data path, control, ALU; pipelining, memory, cache, I/O, digital logic; micro architecture, instruction sets, addressing modes; operating systems, virtual memory, processes, assembly language.

Prerequisites: EENG 3302 - Digital Systems and EENG 3307 - Microprocessors

Credits: (3 hours lecture, 0 hours laboratory per week)

Text(s): Patterson and Hennessy, **Computer Organization and Design, 5th ed.**, Morgan Kaufman, 2013, ISBN: 9780124077263

Additional Material: TBD

Course Coordinator: Mukul V. Shirvaikar, Professor, Electrical Engineering

Topics Covered: (paragraph of topics separated by semicolons)

Introduction to Computer Architecture: structured computer organization, hardwired and programmed control, example computer families; Computer Systems: processors, memory organization, cache design, I/O organization; Digital Logic: circuits, memory, buses, hardware for integer and floating point operations; Microarchitecture: microprogramming, microinstructions, data path and control unit design; Instruction Set Architecture: opcodes, addressing modes, instruction formats and types; Operating Systems: virtual memory, processes; Assembly Language: macros, assemblers, linking and loading;

Evaluation Methods: (only items in dark print apply):

1. Examinations / Quizzes
2. Homework
3. Report
4. Computer Programming
5. Project
6. Presentation
7. Course Participation
8. Peer Review

Course Learning Outcomes[1]: By the end of this course students will be able to:

1. Describe the interface between software and hardware [3]
2. Evaluate the performance of a computer system given the hardware specifications [1]
3. Justify the need to design multicore processors to improve computer performance [1]
4. Solve design problems at the digital logic, microarchitecture, instruction set architecture level and explain the function of each level [1]
5. Convert decimal numbers to IEEE floating point numbers [1]
6. Contrast the differences between a RISC versus CISC architecture [1]
7. Recognize how the memory hierarchy (registers, cache, RAM, disk) impacts performance [1]
8. Outline how pipelining is used to improve processor performance [1]

9. Describe the architecture of a superscalar processor [1]
10. Understand the issues with parallelizing code to execute on multicore processors [3]
11. Write subroutines in assembly language [4]
12. Incorporate information gained by independent learning from technical reference manuals and other sources to implement a project and enhance reports [3,4]

[1]*Numbers in brackets refer to method(s) used to evaluate the course objective.*

Relationship to Student Outcomes (only items in dark print apply)[2]: This course supports the following Electrical Engineering Student Outcomes, which state that our students will:

1. Breadth and Depth: Students will be able to apply knowledge at a graduate level in two of the following areas: electronics, power systems, controls, advanced engineering mathematics, signal processing. [1,2,3]
2. Modern Engineering Tools: Students will be able to use modern engineering tools for analysis and design as applied to engineering problems. [11]
3. Advanced Engineering Mathematics: Students will be able to apply principles of advanced engineering mathematics including probability and statistics to engineering problems. [5, 7]
4. Systems Design: Students will be able to apply systems design approaches including modeling and simulation of interacting sub-systems to complex engineering problems. [4, 6]
5. Design Methods: Students will be able to demonstrate application of design methodology by comparing and evaluating solutions to engineering problems. [8, 9, 10]
6. Communication Skills: Students will demonstrate effective oral, visual and written communication skills from a technical perspective. [12]

[2]*Numbers in brackets refer to course objective(s) that address the Student Outcome.*

Contribution to Meeting Professional Component: (in semester hours)

Mathematics and Basic Sciences:		hours
Engineering Sciences and Design:	3	hours
General Education Component:		hours

Prepared By:	David Hoe	Date:	28-Oct 2009 19-Aug 2010 15-Jan 2013
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