The University of Texas at Tyler
Department of Electrical Engineering

EENG 4320: Computer Architecture and Design (Elective)

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. Explain a contemporary issue in computer architecture referring to relevant codes and standards as appropriate [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. Discuss relevant professional ethics related to the professional practice of modern technology e.g. product reliability, effect on environment, teamwork ethics etc. [3]

8. Recognize how the memory hierarchy (registers, cache, RAM, disk) impacts performance [1]
9. Outline how pipelining is used to improve processor performance [1]
10. Describe the architecture of a superscalar processor [1]
11. Describe the impact of multicore processors on society [3]
12. Incorporate information gained by independent learning from technical reference manuals and other sources to implement a project (write subroutines in assembly language) 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. have the ability to apply knowledge of the fundamentals of mathematics, science, and engineering; [4,5]
2. have the ability to use modern engineering tools and techniques in the practice of electrical engineering;
3. have the ability to analyze electrical circuits, devices, and systems; [3,6,8,9.10]
4. have the ability to design electrical circuits, devices, and systems to meet application requirements;
5. have the ability to design and conduct experiments, and analyze and interpret experimental results; [2]
6. have the ability to identify, formulate, and solve problems in the practice of electrical engineering using appropriate theoretical and experimental methods;
7. have effective written, visual, and oral communication skills;
8. possess an educational background to understand the global context in which engineering is practiced, including:
   a. knowledge of contemporary issues related to science and engineering; [1]
   b. the impact of engineering on society; [11]
   c. the role of ethics in the practice of engineering; [7]
9. have the ability to contribute effectively as members of multi-disciplinary engineering teams;
10. have a recognition of the need for and ability to pursue continued learning throughout their professional careers. [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:	Troy Henson	Date:	23 May 2002
Updated By:	Gordon Cumming	Date:	17 Aug 2002

Updated By:	Mukul V. Shirvaikar	Date:	06 Aug 2003
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