ECE 212 -- Computer Organization and Microprocessors

Spring 2007

COURSE SYLLABUS

Instructor: **Vassos Soteriou**
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Office Hours: Wed. 3:30-5:30 p.m. or by appointment

Lecture: Monday and Thursday, 4:30-6:00 pm
University Campus, ΧΩΔ01 101

Teaching Assistant: **Elpis Papaiakovou**
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Course Objectives

Introduce students in Electrical and Computer Engineering to the design and organization of modern digital computers by showing the relationship between hardware and software and focusing on the concepts that are the basis of the current computers. Includes machine language, instruction set architecture, datapath and control design, pipelining and performance, memory hierarchy, and input/output and communication. Provides a foundation to Computer Engineering students for subsequent study in computer architecture.

Course Outcomes

- Understanding of the fundamentals of modern computing systems, the functionality of their components, design of instruction sets and their underlying execution.
- In-depth understanding of datapath and control unit design, and memory hierarchy.
- Ability to understand and analyse the performance of computer systems and know how to improve it effectively.

Course website: http://www.ece.ucy.ac.cy/courses/ECE212/

Prerequisites: **ECE 210** and **ECE 211**
or demonstrated knowledge in all of the following:
Computer programming
Number systems
Boolean Algebra
Combinational circuits
Sequential circuits

Required Reading Material

- **Text:** D. A. Patterson and J. L. Hennessy, *Computer Organization and Design: The Hardware/Software Interface*, Morgan Kaufman, 3rd Ed., 2005. Companion Website http://www.mkp.com/companions/1558606041

Recommended Readings (with order of preference)

- M. M. Mano and C. R. Kime, *Logic and Computer Design Fundamentals,* Prentice-Hall, 3rd Ed., 2004.
- J. Hayes, *Computer Architecture and Organization*, McGraw Hill, 2nd Ed., 1988.
- J. L. Hennessy and D. A. Patterson, *Computer Architecture: A Quantitative Approach,* Morgan Kauufman, 3rd Ed., 2003
- M. Mano, *Computer System Architecture*, Prentice-Hall, 3rd Ed., 1993
- D. Steetman, *See MIPS Run*, Morgan Kaufman, 2002.
- E. Farquhar and P. Bunce, *The MIPS Programmer's Handbook,* Morgan Kaufman.

Topical Overview (number of 90 min. lectures)

- Introduction: Computer abstraction and technology (**2**)
- Machine Language: Instruction formats, types, sets, MIPS assembly language (**4**)
- Computer Arithmetic: Review of addition/subtraction/multiplication/division, floating-point arithmetic (**2.5**)
- Performance Analysis: Definition, measurement, improvement, evaluation (**1.5**)
- Processor Design, Datapath and Control units: Basic MIPS implementation, logic design conventions, building a datapath, simple implementation, multicycle implementation, exceptions (**6**)
- Pipelining: Pipelined datapath and control, pipeline hazards (**4**)
- Memory Hierarchy: Basics of caches, measuring and improving cache performance, virtual memory, common framework (**3**)
- Input/Output and Communication: Disk storage, buses, I/O interfacing, I/O performance measures (**2**, time permitting)

Work Expected from Students

- Regular readings of the assigned material.
- Regular homework assignments.
- Required laboratory attendance and regular laboratory exercises. Preparation PRIOR to laboratory is often required.
- Two midterm and one final examinations.

Grading

Homework	10%
2 Midterm Exams (20% each)	40%
Final Exam (Comprehensive)	50%

Passing this course requires a total grade of at least 50% and a grade of at least 50% at the final exam.

The instructor reserves the right to make minor changes in the above grade distribution. Moreover, the instructor reserves the right to adjust borderline grades up or down based on attendance and class participation.

Course Policies

• **Course Material:** Lecture notes and homework assignments will not be distributed in class, but will be available to view and print through the course Website. Homework solutions will not be posted on-line, but will be distributed in class.

• **Grading:** Inquiries and disputes about graded work should be made **within one week** after it has been handed back. Only written inquiries that clearly explain the complaint will be considered. Not readable/sloppy work will incur an automatic 20% penalty, if accepted. Also, in order to get full credit you must show all of your computations.

• **Late Work:** All work must **always** be turned in at the **beginning** of the class period of the day it is due. Late submissions incur a 20% penalty for each day being late, up to a maximum of 3 days after which no points will be granted. All extensions should be arranged with the instructor prior to the due date.

• **Absences:** Excused absences due to illness or approved University travel must follow University policy (singed note from health care provider, etc). No make-up exams or homework assignment due date extensions will be granted, unless your absence is excused. In the case of foreseen absences (such as approved University travel), you must contact your instructor prior the related absence date.

• **Academic Honesty:** You are encouraged to work and talk with other students about lectures, homework assignments, and exams preparation. **However, when writing your homework solutions, program code and documentation, the work must be solely your own.** Work that has significant overlap with another one is a violation of Academic Honesty and will be reported to the Department Council. The instructor may use appropriate software to check the integrity of a report.