Computer Organization and Design (ECE 4680)

Fall 2011

Syllabus

Monday and Wednesday, 03:30PM - 05:20PM, 08/31/11 - 12/20/11, 0262 MANO

No: ECE 4680

Title: Computer Organization and Design Cr. 4 (LCT: 4)

WSU Catalog Description:
Prereq: ECE 2620, 3610, and BE 2100. An introduction to computer organization and design. Instruction set design; basic processor implementation techniques; hardwired and microprogrammed control; performance analysis; memory hierarchy and cache design; pipelined processor design; I/O.

Coordinator: Dr. Nabil J. Sarhan, Associate Professor of Electrical & Computer Engineering.

Course Meeting Time: Monday and Wednesday at 03:30PM - 05:20PM

Course Meeting Location: 0262 MANO

Instructor:
Name: Dr. Nabil J. Sarhan
Office Hours: Monday and Wednesday 12:00 - 1:15PM
Office Location: 3109 Engineering Building
Phone: (313) 577-2860
Email: nabil@ece.eng.wayne.edu

Teaching Assistant:
Name: Mohammad Alsmirat
Office Hours: By appointment
Office Location: 3352 Engineering
Phone: (313) 577-1956
E-mail: msmirat@wayne.edu

Course Homepage: You are responsible for all announcements on the course homepage on Blackboard.

Goals: To learn the organization, design, and performance analysis of modern microcomputer systems.

Learning Objectives: After completing this course, students should be able to do the following:
1. Show and explain the organization of modern computer systems.
2. Demonstrate how to assess the performance of computer systems using mathematical and statistical analysis.
3. Describe and explain the techniques used by hardware designers to improve performance.
4. Write and test assembly language programs.
5. Develop and test hardware designs using Verilog Hardware Description Language.

Textbook: Computer Organization and Design - The Hardware/Software Interface, 4th edition, by Patterson and Hennessy. (Required)

Reference: none

Prerequisites by Topic: Introduction to Microcomputers (ECE 2620), Digital Logic Design (ECE 3610), Basic Engineering III: Probability and Statistics for Engineering Applications (BE 2100).

Corequisites by Topic: none

Topics:
- Introduction to Computer Architecture (Chapter 1)
- MIPS Instruction Set Architecture (Chapter 2)
- Performance Evaluation of Computer Systems (Chapter 1)
- The Verilog Hardware Description Language
- Processor Design (Chapter 4)
- Pipelining (Chapter 4)
- Memory Hierarchy and Design (Chapter 6)
- I/O (Chapter 6) (If time permits)

Course Structure: The class meets for two lectures a week. Three classes will be held in the lab during regular class time.

Computer Resources: Windows XP PCs and Sun Solaris Workstations running Cadence design tools and SPIM software.

Laboratory Resources: The laboratories contain PC and Unix workstations.

Laboratory Policy: There is absolutely no smoking: eating or drinking in any ECE instructional lab. These labs must be kept neat and each student is responsible for insuring that the equipment on his/her workbench is neatly arranged, that all the leads and other equipment are put away, and that there are no scraps of paper or other garbage left on or near his/her workstation. Coats, briefcases: Knapsacks and other personal belongings are not permitted on or near the benches. These items must be kept on the coat rack near the door, not on the benches, window sills or the floor near the benches. The door to the lab must be kept locked at all times; unlocking or propping open the door at any time is expressly forbidden. Guests are not permitted in the lab at any time, and no one but the instructor may open the door to admit anyone after the class has begun. (For further laboratory policies, please look at the laboratory manual.)
Distribution of Points:

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<td>3 Labs</td>
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<td>Personal Info Page Assignment</td>
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<td>Topic Research Report</td>
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<td>Topic Research Presentation</td>
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Grade Breakdown:

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Attendance: Every student is expected to attend all lectures.

Personal Information Page Assignment:

- Deadline: **Monday, September 12, 2011 by 11:59 AM**. No late submissions will be accepted.
- Instructions: Create your homepage on the ECE4680 Blackboard Page. Your homepage must include at least your full name, picture, the nickname (if any) you like to be called in the class, department, years at WSU, and the expected date of graduation.
- Procedure: From the ECE 4680 Blackboard Webpage, select Blogs and then select the student personal info blog. Create a new blog entry with your full name as the title and then include your personal info in the message box. Finally, attach a picture of yourself and hit the submit button. The personal info must include at least your full name, nickname (if any), department, years at WSU, and the expected date of graduation.

After creating the blog entry with your picture and info, go the "Personal Info Assignment" page and enter "I created a blog entry with my picture and required personal info" in the Assignment Materials Submission" page and then hit the "Submit" button. **To verify your submission**, go to Grade Center and make sure that you have "!" under this assignment's column. This means that the assignment is submitted and awaiting grading.
Exams:

- Exam 1 will be scheduled based on the class progress and will be announced at least one week in advance.
- Exam 2 is scheduled for **Wednesday, December 14 during normal class time. Room will be announced.** You must let me know during the first week of classes if you have a conflict with another exam or you have exam overload.
- Do NOT assume that you will be able to take a makeup exam. Regardless of your circumstances, approval to take a makeup exam is up to the instructor.
- All exams are closed-book and closed-notes except for the data sheets included in the exam study guide. Do not write anything on these data sheets.
- Calculators that can store notes are NOT allowed.
- Flagrant cheating on an exam or a quiz will result in, at minimum, a failing grade for the course.

Assignments, Labs, and Projects:

- Assignments and projects will be posted on the course homepage.
- Labs will be scheduled during class time in one of the engineering computer labs. Labs cannot be made up under any circumstances.
- Assignments, labs, and projects must represent your original work. You must not look at other solutions or show your solutions to anyone else. At minimum, duplicate or very similar assignments will receive **negative grades**.
- Save all intermediate work until an assignment has been graded, returned and recorded. Keep the final source versions of your programs. Make frequent backups of your work. Never let anyone else use your account.
- All questions on grading must be brought to my attention within one week of the assignment's return.
- You are welcome to ask any questions with regard to the assignments after class or during office hours. You do NOT have to have an appointment to come to the office hours.
- **You should always start working on the assignments and projects as soon they are announced** even if they seem to be easy for you. You may run into unexpected problems which you may not be able to solve on your own when it is too late for you to ask for help.

Late-Submission Policy:

- All assignments and projects are officially due by the start of class on the due date.
- **Late assignments and projects will NOT be accepted.** The following excuses will NOT be approved for late submissions: computer crashes, disk crashes, accidental file deletions, lab computer unavailability, forgetting to print out the checklist and/or the output, printer problems, and the like.
- **You are strongly encouraged to turn in the assignments in the class before the deadline to account for any unpredictable situations.** You must always work ahead and make backups to account for unexpected problems.
Outcome Coverage:

(a) An ability to apply knowledge of mathematics, science, and engineering. The students must apply mathematics, computing, and engineering knowledge to solve problems related to hardware design and programming. The assignments, labs, and projects will require proper application of such knowledge.

(c) An ability to design a system, component, or process to meet desired needs. Students must design efficient hardware components that meet certain specifications and must write efficient assembly language programs that achieve practical tasks. This course focuses on the design aspects by including three labs and three projects.

(e) An ability to identify, formulate, and solve engineering problems. Projects and labs focus on the application of engineering concepts to typical design problems. The assignments will also require the students to solve real-life computer engineering problems.

(i) A recognition of the need for, and an ability to engage in life-long learning. Computer architecture is a rapidly evolving field, and students will be exposed in the lectures to the changes in architecture design over time.

(k) An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice. The students will utilize CAD tools for hardware design in the labs and projects. They will also use assembly language simulators for writing, debugging, and testing programs.

Policy on Cheating, Fabrication, and Plagiarism:

Cheating, fabrication, plagiarism, and helping others to commit these acts are all forms of academic dishonesty, and they are wrong. Academic misconduct will result in at least failing the course. Therefore, avoid all appearance of improper behavior! Students who witness cheating should report the incident to the instructor as soon as possible.

Plagiarism “is the practice of claiming, or implying, original authorship or incorporating material from someone else’s written or creative work, in whole or in part, into one’s own without adequate acknowledgement” (Source: Wikipedia).

Cheating is defined by the University as “intentionally using or attempting to use, or intentionally providing or attempting to provide, unauthorized materials, information, or assistance in any academic exercise”. This includes any group efforts on assignments or exams unless specifically approved by the professor for that assignment/exam.

Students with Disabilities:

If you have a documented disability that requires accommodations, you will need to register with Student Disability Services for coordination of your academic accommodations. The Student Disability Services (SDS) office is located at 1600 David Adamany Undergraduate Library in the Student Academic Success Services department. SDS telephone number is 313-577-1851 or 313-577-3365 (TDD only). Once you have your accommodations in place, I will be glad to meet with you privately during my office hours to discuss your special needs. Student Disability Services’ mission is to assist the university in creating an accessible community where students
with disabilities have an equal opportunity to fully participate in their educational experience at Wayne State University.

**Prepared By** Dr. Nabil J. Sarhan, Associate Professor of Electrical and Computer Engineering

**Last Revised:** August 31, 2011