Foundations of Computer Organization and Architecture

Course Description

An overview of computer architecture, which stresses the underlying design principles and the impact of these principles on computer performance. General topics include design methodology, processor design, control design, memory organization, system organization, and parallel processing.

Learning Objectives

1. Understand functionalities of various digital components that are used in the organization and design of digital systems
2. Be able to optimize a design for a digital system
3. Understand the steps that a designer must go through in order to design an elementary basic computer
4. Familiarize with how data is represented internally in different computer platforms
5. Understand how instructions are represented and executed in different computer platforms
6. Understand the classification and organization of computer systems including accumulator machines, stack machines and general purpose register machines, instruction types including arithmetic, data movement and control, instruction formats and addressing modes.
7. Develop an understanding of processor design
8. Understand the concepts of pipelining and cache memory for the purpose of performance improvement

Major Course Requirements

This is a course on computer hardware, which is a difficult course that demands all students attend all classes! Regular completion of all reading, homework, and other outside assignments, are absolutely essential for success in this course. We will follow the text generally, but non-text material may also be included in the lectures. Except the final exam, all the assignments, quizzes and exams will be given during the class hours. You are responsible for all the material presented during the lecture.

Your course grade will be decided on your performance in the homework assignments, quizzes, two mid-term exams, and a final exam. The distribution of points is as follows:

1. Assignments and quizzes: 20%.
2. Two mid-term exams: 40% (Exam 1: 20% & Exam 2: 20%).
3. A term paper: 15%
4. Final exam worth 25%.

**Assignments:** Approximately five quizzes and homework assignments will be given. Partial credit will be given for incomplete assignments. Assignments will significantly build on the material from the lectures. They will be posted on the course web page or hard copies will be handed out in the class.

**Paper:** Several research papers (or a list of links to papers) will be distributed early in the class with some specific guidelines so that you may start thinking about the term paper immediately and accordingly develop an idea what to write for your paper. You may decide to write a survey paper or a paper based on comparative study of contemporary computer systems. More details regarding the term paper will be provided later in the class.

**Exams:** The first mid-term exam will be given on September 30, 2011, and the second mid-term exam will be given on November 4, 2011 during the scheduled class time. The final exam will be comprehensive and will be given on the day and time according to the university schedule. Exams will cover all lecture and reading material from the text.

**Required or Recommended Readings**

- **Website:** sci.tamu.edu/~dkar/fall2011/2334

**List of Supplies:** None

**Course Policies**

**Attendance/Tardiness**

You must attend all classes. You are responsible for any materials covered or handed out or announcements made for the tests, quizzes, and homework assignments in your absence. Records of your attendance will be maintained and reported to the university. Students found missing classes without the instructor’s permission will be automatically withdrawn from the course. Students are responsible for all materials covered in class and assigned. Should a student be absent from class, it is his/her responsibility to get the notes, etc. for that missed class. More important, should there be assignments, it is the student’s responsibility to obtain such assignments. No excuse will be accepted for assignments not turned in because the student was absent when it was due.

**Late Work and Make-up Exams**

All the assignments are due at the beginning of the class on the due date. If the student is absent on the assignment due date, it is the student's responsibility to make sure that the assignment is submitted on the designated date. An assignment that is
turned in after the class on the due date is considered one day late. There is a penalty for late submissions. Late assignments will be counted 20% off for each day after the due time. No credit will be given if an assignment is submitted after 5 days. If you have not completed your assignment by the due date, you should submit the work you have done for partial credit. No work will be accepted once the graded work has been returned or the solution has been disclosed to the class, except for unusual circumstances.

Exams must be taken on the hour they are scheduled. In the event, if you cannot attend the class to take the exam due to some emergency or some unavoidable situation (such as serious illness, death in the family, participation in university sports, religious observations, and so on) you must notify me as soon as possible before the exam and also you must validate your absence by providing me a document (e.g., with a letter from your doctor).

**Extra Credit**

None

**Cell Phone/Electronic Device Usage**

Set your cell phone/electronic device in silent mode when you are in class.

**Academic Integrity/Plagiarism**

University students are expected to conduct themselves in accordance with the highest standards of academic honesty. Academic misconduct for which a student is subject to penalty includes all forms of cheating, such as illicit possession of examinations or examination materials, falsification, forgery, complicity or plagiarism. (Plagiarism is the presentation of the work of another as one’s own work.) In this class, academic misconduct or complicity in an act of academic misconduct on an assignment or test will result in a score of 0 (zero) for the work or dismissal from the course and the Dean of Students office will be notified. No copying from another student's work, of any class, is allowed. It is the student's duty to allow no one to copy his or her work. Anyone found cheating in the exams will receive an automatic F for the course.

**Dropping a Class**

I hope that you never find it necessary to drop this or any other class. However, events can sometimes occur that make dropping a course necessary or wise. Please consult with me before you decide to drop to be sure it is the best thing to do. Should dropping the course be the best course of action, you must initiate the process to drop the course by going to the Student Services Center and filling out a course drop form. Just stopping attendance and participation WILL NOT automatically result in your
being dropped from the class. November 4, 2011 is the last day to drop a class with an automatic grade of “W” this term.

Preferred methods of scholarly citations

All referenced material used in a paper or project report must be properly acknowledged and cited. Use APA style for all scholarly citations.

Grade Appeals

As stated in University Rule 13.02.99.C2, Student Grade Appeals, a student who believes that he or she has not been held to appropriate academic standards as outlined in the class syllabus, equitable evaluation procedures, or appropriate grading, may appeal the final grade given in the course. The burden of proof is upon the student to demonstrate the appropriateness of the appeal. A student with a complaint about a grade is encouraged to first discuss the matter with the instructor. For complete details, including the responsibilities of the parties involved in the process and the number of days allowed for completing the steps in the process, see University Rule 13.02.99.C2, Student Grade Appeals, and University Procedure 13.02.99.C2.01, Student Grade Appeal Procedures. These documents are accessible through the University Rules Web site at http://www.tamucc.edu/provost/university_rules/index.html. For assistance and/or guidance in the grade appeal process, students may contact the Office of Student Affairs.

Disabilities Accommodations

The Americans with Disabilities Act (ADA) is a federal anti-discrimination statute that provides comprehensive civil rights protection for persons with disabilities. Among other things, this legislation requires that all students with disabilities be guaranteed a learning environment that provides for reasonable accommodation of their disabilities. If you believe you have a disability requiring an accommodation, please call or visit Disability Services at (361) 825-5816 in Driftwood 101.

If you are a returning veteran and are experiencing cognitive and/or physical access issues in the classroom or on campus, please contact the Disability Services office for assistance at (361) 825-5816.
Tentative Course Schedule (Subject to change)

Weeks 1-2: Chapter 1: Digital Logic Circuits
Weeks 2-3: Chapter 2: Digital Components
Weeks 4-5: Chapter 3: Boolean Algebra and Combinational Networks
Weeks 5-6: Chapter 4: Register Transfer and Microoperations

Mid-term Exam 1

Weeks 7-9: Chapter 5: Basic Computer Organization and Design
Weeks 9-11: Chapter 7: Microprogrammed Control
Weeks 12-13: Chapter 8: Central Processing Unit

Mid-term Exam 2

Weeks 13-14: Chapter 9: Pipeline and Vector Processing
Weeks 14-16: Chapter 10: Computer Arithmetic
Weeks 16-17: Chapter 12: Memory Organization

Final Exam