

Syllabus

Course Title and Number: Computer Architecture II: Advanced Computer Design and Implementation – CS 3320

Instructor: Dr. Michela Taufer

Class Time: Monday, Wednesday, Friday 11:30-12:20

Room: CS 322

Instructor: Dr. Michela Taufer
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Teaching Assistant:

Gang Xiang
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Office Hours: Monday 2PM – 3PM
or by appointment (requested and scheduled via email)

Gang's office hours: MWF 8:20 – 10:20
TR 12:30 – 2:30

Prerequisites: Math1410, CS1401, CS2401, Math2300, CS2302 and CS3432

Course Description: The organization and structuring of the major hardware components of computers; the mechanics of information transfer and control within a digital computer system; the fundamentals of logic design; machine instructions; addressing techniques.

Purpose of Course:

When you finish this course, you will now:

- How a computer executes a program
- What makes execution time smaller on some computers - Performance!
- How execution time is measured for different implementations of a computer system
- The components of execution time
- How these components are mapped to the computer architecture
- How the computer architecture is designed to achieve better performance

Knowledge and abilities required before the students enter the course:

Students entering the course:

1. are able to apply the following in new situations: knowledge of
 - a. basic data structures
 - b. pointers
 - c. memory allocation
 - d. basic computer organization, control, and operation
 - e. program design, implementation (modularization), testing, and documentation

- f. problem solving techniques
- g. written and oral communication skills w.r.t. expressing themselves precisely
- 2. are able to apply: knowledge of
 - a. fetch/decode/execute cycle, program counter, “machine state”
 - b. finite state machines
 - c. use of registers and memory (stored program concept), addressing bytes, words, and blocks in memory
 - d. data, text, and stack segments
 - e. interrupt handling
 - f. interrupt-driven vs. memory-mapped I/O
 - g. functions of a compiler, assembler, linker, and loader and relocatable code, assembler directives
- 3. have been introduced to:
 - a. RAM, ROM, EPROM
 - b. disk architecture/access time (seek time, rotational latency, transfer time)

Learning Outcomes:

On successful completion of this course, students will

- 1. be able to apply the following in new situations: knowledge of
 - a. computer performance in terms of space and time tradeoffs
 - b. instruction set architecture design and implementation
 - c. representation of integer numbers
 - d. datapath and control mechanisms used in processor implementations
 - e. processor implementation alternatives (single-cycle, multiple-cycle, and pipelined implementations)
 - f. memory hierarchy design
- 2. be able to apply: knowledge of
 - a. arithmetic algorithms multiprocessor and real-time scheduling
 - b. cache design
- 3. have been introduced to:
 - a. representation of floating-point numbers
 - b. virtual memory
 - c. interfacing processors and peripherals

Textbook: *Computer Organization & Design: The Hardware/Software Interface*, Third Edition by David A. Patterson and John L. Hennessy

Important Dates:

First class meeting:	August 21, 2006
First midterm exam:	September 27, 2006 (tentative)
Second midterm exam:	November 15, 2006 (tentative)
Course drop deadline with W:	October 27, 2006
Final exams:	December 4-8, 2006

For deadlines related to homework, project, reading, and RATs, please check WebCT and the tentative schedule sheet.

*Beginning the 1997 Fall semester, students or faculty members may initiate a drop with a grade of W until the drop deadline (October 18.). After that date, students may be dropped only with a grade of F. After that date, grades of W may only be assigned in exceptional

circumstances after a written petition from a student and with the approval of the faculty member and the academic dean.

Tentative Class Schedule:

Week 1: Syllabus

Chapter 1, Computer Abstractions and Technology

Week 2: Introduction in C

Chapter 2 and Appendix A, Instructions: Language of the Machine

Week 3: Chapter 2 and Appendix A, Instructions: Language of the Machine

Week 3: Chapter 3 and Appendix B, Arithmetic for Computers

Week 4: Chapter 3 and Appendix B, Arithmetic for Computers

Week 5: Exam / Review (chap 1 / 2 / 3)

Week 6: Chapter 4, Assessing and Understanding Performance

Week 7: Chapter 5 and Appendix C, The Processor: Datapath and Control

Week 8: Chapter 5 and Appendix C, The Processor: Datapath and Control

Week 9: Chapter 5 and Appendix C, The Processor: Datapath and Control

Week 10: Chapter 6, Enhancing Performance with Pipelining

Week 11: Chapter 6, Enhancing Performance with Pipelining

Week 12: Chapter 7, Large and Fast: Exploiting Memory Hierarchy

Week 13: Exam / Review (chap 4 / 5 / 6)

Week 14: Chapter 7, Large and Fast: Exploiting Memory Hierarchy

Week 15: Chapters 8, Interfacing Processors and Peripherals

Review (chap 7 / 8)

Grade Basis:

RATs (approx. 12 during the semester, before to start new topics):	10%
Midterms (2 during the semester, 10% each, see tentative date above):	20%
Final (see date above):	25%
(60-point overall average over 100 points on exams required to pass course)	
Homework (approx. 10, weekly due on Tuesdays 12am):	10%
Project (4 parts):	35%
(6-point overall average over 10 points required on project to pas course)	
Article Summaries (max 3, due end of Sep., Oct., and Nov.):	extra 9%

Guidelines:

You can access the material related to this course (e.g., syllabus, news, notes of the class, assignments, etc.) through WebCT. In WebCT, a mailbox and a public forum for discussions are also available. Please note that several pieces of information (e.g., class schedule, assignments) might change during the semester. It is your responsibility to consult the information available on WebCT regularly.

A grade on a RAT, exam, homework, or project must be contested within one week of notification. One article summary can be submitted per month (September, October, and November). The article must be from a published journal, conference proceedings, magazine, newspaper, or a URL; it must be at least 4 pages in length and related to topics covered in the course. The summary must be at least two pages in length (11 point font, 1" margins, double spaced). A maximum of three points will be given per summary. Full credit will not be given if

there is any spelling-, grammar-, or technical error in the summary. No credit will be given if plagiarism (i.e., copy and past from paper of sentences) is detected.

You are expected to do the reading assignment **BEFORE** the specified class meeting date. Reading assignments will be announced in class and posted on WebCT. Not all assigned material will be covered in class. It is your responsibility to ask questions in class regarding assigned material that is not fully understood.

Some homework will be assigned before the related material is covered in class; other homework will be assigned after the related material is covered in class. You will be given full credit only for problems that you have made a serious effort to solve. You will be given no credit for problems that you have not made a serious effort to solve.

Since much learning takes place via discussion, you are encouraged to participate in class and to have open discussions with classmates about the topics covered in the course in person and via WebCT tools (i.e., public forum). However, this does not imply in any way that your homework or project should represent a cooperative effort. With respect to homework and projects, you are encouraged to discuss with others the related concepts that will help you solve homework problems and projects, but the solutions that you submit must be **your own**, in the sense that they should be in your **own words or code** and should be **understood by you**.

RATs, homework, project, and exams will test your individual understanding of the course material; therefore, you should have a firm understanding of the material. **Homework** will be assigned on Monday and will be due on the following Monday and graded homework will be returned one week after it is submitted. At that time, the homework solution will be posted on WebCT. Homework must be **legibly printed (with a dark pen) or typed**, and must be handed in on time. No credit will be given for homework handed in after the due date. Late projects will be downgraded 10% per day of lateness.

RATs will be posted in WebCT at least one week before the associated reading assignment deadline to test your understanding of the text. RAT deadlines are fixed and only RATs completed before the deadlines will be graded. Only one attempt is allowed. The RAT duration is 2 hours and answer submission is disallowed if the time has expired.

Two **midterm exams** will take place during the semester, each of 50 minutes. The original copy of the midterm exams should be returned to the instructor no later than one week after they have been graded and returned to the students for their vision. If the original of the exam is not returned, the grade will be automatically converted in a D. Midterm exam solutions will be discussed in class. In general, **makeup RATs** will not be given and **makeup exams** will be given only under extraordinary circumstances.

Students are expected to behave courteously and professionally according to the standards published at http://hoop.utep.edu/Student_Affairs_Chapter_One-HOP.htm. Disciplinary infractions, e.g., submitting homework, projects, RATs, or exams that represent collaborative effort, will be submitted to the Dean of Students.

Mobile telephones **MUST** be switches off during the lesson. The use of laptops is also not allowed during the lesson. Discussions related to graded work (i.e., homework, exams, RATs) will take place in in-person meetings scheduled by appointment via e-mail or during office hours.

Course Withdrawals: If you decide to withdraw from the course, you are responsible for ensuring that all steps are taken to formally withdraw. Do not assume that you will be dropped automatically.

I Grades: The grade of I (incomplete) will be given ONLY if you are unable to complete the course due to documented appropriate circumstances beyond your control that develop after the last day to withdraw from the course. Appropriate circumstances include illness and death or crisis in your immediate family. In NO case will an I grade be assigned to avoid a grade of D or F in the course.

Disabilities: If you feel you may have a disability that requires accommodation, contact the Disabled Student Services Office at 747-5148, go to Room 106E Union, or e-mail dss@utep.edu.