

COMP375 Computer Architecture and Organization

Spring Semester 2012

Instructor: Dr. Kenneth A. Williams

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office hours: MWF 10:00 to 11:00, MW 3:00 to 5:30, Friday 3:00 to 5:00

other times by appointment

Prerequisites: COMP180 Discrete Structures or COMP370 Introduction to Computer Architecture or ELEN327 Digital Logic

Required Text: *Computer Organization and Architecture: Designing for Performance, eighth edition*, by William Stallings, Pearson Prentice Hall, 2010, ISBN: 0136073735 or 9780136073734

Lectures: Monday, Wednesday and Friday Graham 210, 2:00pm – 2:50pm

Communication: The web page for this class is <http://williams.comp.ncat.edu/comp375>
Assignments and information will also appear on the University's online Blackboard system, <http://blackboard.ncat.edu> Email messages will be sent to the student's A&T email address. It is the student's responsibility to regularly check their A&T email account.

Description:

3 credits

This course explores the design of computer systems and their architectures. Topics include central processing unit architecture, microcode, system interconnections, memory systems, input/output systems, interrupt handling and peripherals. The topics to be covered include:

- Assembly level machine organization
- Memory system organization and architecture
- Interfacing and communication
- Functional organization
- Multiprocessing and alternative architectures
- Performance enhancements

Goals: Upon completion of this course, the student should be able to:

1. Apply knowledge of computing, statistics and mathematics to solve problems of design and performance analysis
2. Explain how instructions can be implemented in microcode
3. Understand how the architecture affects program performance
4. Understand the basics of computer hardware and how software interacts with computer hardware
5. Use critical thinking to make informed decisions in the selection of computers
6. Write a simple program in assembler language to implement a high level program segment

Response clickers: This course will use response clickers during the lecture. Each student should have their own response clicker and must bring it to every lecture. The response clickers will be used to provide input during the lectures and to record attendance. If you do not bring your response clicker to lecture, you will only get half credit for attendance.

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Grading : A student's grade in the class will be based on their performance on the exams, quizzes, programs and homework assignments. All work will be graded on a numerical scale from 0 to 100. The final grade will be the weighted sum of all work using the following weights:

attendance	5 %
assignments and quizzes	15 % combined
3 exams	20 % each
final exam	20 % Tuesday, May 8, 10:30am – 12:30pm

The lowest homework or quiz grade will be discarded. Homework must be turned in at the beginning of class on the assigned day for full credit, unless accompanied by a valid excuse. Homework turned in within one day of the assigned time will be penalized 20%. Homework turned in within two days of the assigned time will be penalized 25%. **No homework will be accepted after two days. Students who are absent** during a class period when a test is given, **will receive a score of zero** unless previous arrangements are made or a valid written excuse is presented.

Final letter grades will be based on the following scale:

A: 80 to 100 B: 70 to 80 C: 60 to 70 D: 50 to 60 F: less than 50

Students will be allowed one and only one 8½ by 11 inch page of notes during the exams. Both sides of the note page can contain information as small as the student desires. You are not allowed to use more than 187 square inches of paper surface to hold your notes. Any additional pages, fold outs, flaps or other means of extending the page of notes will be considered cheating.

The final exam will be optional for a student when it is determined by the instructor that it is statistically unlikely that the final exam will change the student's grade. A student always has the option to take the final exam if they wish to do so. When a student is permitted to not take the final exam, their course grade will be determined by the weighted average of all other graded work.

Attendance: The lectures introduce the class material. Some material presented in the lectures is not covered in the text. Students are responsible for all class material covered or assigned in lectures. After the first three classes, students must attend 38 of the remaining 41 lectures to receive 100% of their attendance grade. For each class missed the attendance grade will be lowered by 5 points. If you come to class without your clicker, you will only receive half credit for your attendance that day. If your clicker comes to class without you, you will lose all attendance points.

Cheating: Instances of cheating will be handled according to departmental policy. Cheating covers any case in which a student has received unauthorized aid in his/her performance that contributes to a course grade or submits material contributing to a course grade with the intent to deceive the instructor or grader. If the unauthorized aid includes help from another student, then that student is considered to have cheated as well. Students are expected to submit assignments that are entirely their own work. A common example of cheating is to copy another person's program or homework assignment.

If a student cheats on a homework assignment, then he/she will receive a grade of zero (a grade of F) for that item as will anyone assisting him/her in an unauthorized way. If a student cheats on an exam or the final, he/she will receive a failing grade for the class. All cases of cheating will be reported to the Director of Undergraduate Studies. When a student cheats for the second or more time in any Computer Science class, he/she will receive an F in the class in which the most recent case occurred and will be referred to the University authorities for disciplinary action.

Special needs: Students with special needs (e.g. hearing, vision, etc.) should inform the instructor at the beginning of the semester.

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Class Schedule

	Wednesday, January 11 Introduction scan chapter 1	Friday, January 13 History & Performance scan chapter 2
Monday, January 16 <i>Martin Luther King Holiday</i> <i>(no class)</i>	Wednesday, January 18 Assembly language appendix B	Friday, January 20 Programming in assembler read 10.1 & 10.2, metric online quiz due
Wednesday, January 23 Programming in assembler read 10.4 & 10.5, HW1	Wednesday, January 25 Programming in assembler Log2 online quiz due	Friday, January 27 Programming in assembler HW1 due, HW2 Quiz 1
Monday, January 30 Machine language	Wednesday, February 1 Instruction formats read 11.1-11.4, hex online quiz due	Friday, February 3 Processor structure read 12.1-12.3, HW2 due
Monday, February 6 Microcode read chapter 15	Wednesday, February 8 Microcode read chapter 16, HW3	Friday, February 10 Microcode Quiz 2
Monday, February 13 Microcode HW3 due	Wednesday, February 15 review	Friday, February 17 Exam 1
Monday, February 20 Interrupts read 3.1 & 3.2	Wednesday, February 22 Bus read sections 3.3-3.5	Friday, February 24 Bus HW4
Monday, February 27 VLSI logic	Wednesday, February 29 Memory types read 5.1, HW4 due	Friday, March 2 Memory types Quiz 3
Monday, March 5 <i>Spring Break</i> <i>(no class)</i>	Wednesday, March 7 <i>Spring Break</i> <i>(no class)</i>	Friday, March 9 <i>Spring Break</i> <i>(no class)</i>
Monday, March 12 Memory organization read 5.2-5.3	Wednesday, March 14 Cache read chapter 4, HW5	Friday, March 16 Cache Quiz 4
Monday, March 19 Cache HW5 due	Wednesday, March 21 Multimedia & review	Friday, March 23 Exam 2
Monday, March 26 Virtual Memory read 8.3&8.4	Wednesday, March 28 Virtual Memory	Friday, March 30 I/O controllers read chapter 7
Monday, April 2 Disk performance read 6.1, HW6	Wednesday, April 4 External Storage read 6.3 Quiz 5	Friday, April 6 <i>Good Friday Holiday</i> <i>(no class)</i>
Monday, April 9 RAID read 6.2, HW6 due	Wednesday, April 11 Pipelining read 12.4	Friday, April 13 RISC read chapter 13
Monday, April 16 RISC processors read chapter 14, HW7	Wednesday, April 18 Multiprocessors read chapter 17	Friday, April 20 Multiprocessors read chapter 18, HW7 due Quiz 6
Monday, April 23 Security	Wednesday, April 25 Security	Friday, April 27 review
Monday, April 30 Exam 3	Wednesday, May 2 Advances in architecture & review	
Tuesday, May 8, 10:30am – 12:30pm Final Exam		