COMP370 Introduction to Computer Architecture

Spring Semester 2009

Instructor: Dr. Kenneth A. Williams
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office hours: MWF 8:30 to 10:00, TR 9:00 to 12:00, F 2:00 to 3:00
other times by appointment

Prerequisites: COMP280 Data Structures

Text: *Fundamentals of Computer Organization and Design*, by Sivarama P. Dandamudi, Springer, 2003, ISBN: 038795211X

Communication: The web page for this class is http://williams.comp.ncat.edu/comp370 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 teaches techniques for design and optimization of combinatorial logic circuits, flip-flops, counter, registers and arithmetic concepts necessary to understand computer logic. Additional topics include assembly language programming, interrupt handling, and data representation. The topics to be covered include:

- Numeric data representation and operations
- Fundamental Building Blocks (logic gates, flip-flops, counters, registers, PLA)
- Logic gates and circuits
- Sequential logic and state machines

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

1. Show the binary representation of multiple data types.
2. Analyze combinational circuits, derive a Boolean equation from logic circuit diagram, build a truth table and design logic gate circuits to perform simple arithmetic and logic functions
3. Use current techniques, skills, and tools to analyze digital logic.
4. An understanding the basics of computer hardware and how software interacts with computer hardware.
5. Describe the operation of machine language instructions for computation, control, and data movement.

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 partial credit for attendance.

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 % May 7, 8:00 – 10:00am

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

In addition to the normal assignments that contribute to the final grade, there will be several optional "Challenge Problems". The "grade" for the challenge problems is not included in determining the final total score. If a student's final total score is **close** to a higher letter grade (e.g. a student has a final total score of 79.8), the student *may* be given the higher grade if they have properly completed a sufficient number of the challenge problems.

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.

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 week, students must attend 25 of the 27 lectures to receive 100% of their attendance grade. For each class missed the attendance grade will be lowered by 5 points down to a minimum of 10. If a student does not attend four or more classes, they will receive an attendance grade of zero. 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 50 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 or vision difficulties) should inform the instructor at the beginning of the semester.

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Class Schedule

Monday, January 12 Intro & Number systems read A.1 & A.2, online quizzes	Wednesday, January 14 Integer representation read A.3 & A.4
Monday, January 19 *MLK Holiday* *(no class)*	Wednesday, January 21 Floating point representation read A.5 & A.6
Monday, January 26 Character & font representation read Appendix B Quiz 1	Wednesday, January 28 Compression & graphic representation
Monday, February 2 Basic logic gates read 2.1 - 2.3	Wednesday, February 4 Boolean Algebra read 2.4 – 2.6
Monday, February 9 Simplifying Boolean expressions read 2.7 Quiz 2	Wednesday, February 11 Logic simplification & review read 2.8 -2.11
Monday, February 16 **Exam 1**	Wednesday, February 18 VLSI lithography read 3.1 – 3.4
Monday, February 23 Combinatorial circuits read 3.1 – 3.4	Wednesday, February 25 Arithmetic circuits read 3.5 – 3.8
Monday, March 2 *Spring Break* *(no class)*	Wednesday, March 4 *Spring Break* *(no class)*
Monday, March 9 Arithmetic circuits read	Wednesday, March 11 Programmable Logic Arrays
Monday, March 16 Finite State Automata Quiz 3	Wednesday, March 18 Finite State Automata & review
Monday, March 23 **Exam 2**	Wednesday, March 25 Flip Flops read 4.1 – 4.5
Monday, March 30 Sequential circuit design read 4.6 & 4.7	Wednesday, April 1 Sequential circuit design
Monday, April 6 Von Neumann architecture Quiz 4	Wednesday, April 8 Instruction sets read 6.1 – 6.4
Monday, April 13 Assembler programming	Wednesday, April 15 Assembler programming
Monday, April 20 Assembler programming Quiz 5	Wednesday, April 22 Machine language & review
Monday, April 27 **Exam 3**	Wednesday, April 29 Encryption
	Thursday, May 7, 8:00 – 10:00am **Final Exam**