**CompSci 251 Computer Architecture and Assembly Language Fall'14**

**Instructor:** George Georgiev

**Office:** HS, Room 217

**Office Hours:** MWF: 9:10 – 10:10, or by appointment

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**Section 1:**

**Lectures:** MW 8:00 - 9:00 , HS 237
**Labs:** F 8:00 – 9:00 , HS101C

**Required Text:** None

**References:**
Introduction to Computing Systems: From Bits and Gates to C and Beyond
(Second Edition) by Yale N. Patt and Sanjay J. Patel

**Web site for the course:** http://www.uwosh.edu/faculty_staff/georgiev/subjects/CSC251/

**Current Catalog Description**
An introduction to RISC-based instruction set architecture. Topics to be studied include: data representation, assembly language programming, and introduction to system software.

**Course Outcomes:**
At conclusion of the course, students will be able to:

**1. Data Representation**

(a) express characters and integers in binary, hexadecimal, signed and unsigned representations
(b) determine when overflows occur in signed or unsigned additions and subtractions of integers
(c) write normalized and denormalized floating point numbers in single and double precision using the IEEE 754 Floating Point Standard
(d) analyze the IEEE 754 Floating Point Standard and determine what integers cannot be represented exactly by the Floating Point Standard

**2. Instruction Set Architecture of a RISC computer**

(a) organize the memory layout of global integers and characters based on Little/Big-Endian conventions
(b) edit an assembly language program, assemble the program and print its output on the Linux console
(c) design assembly language program given high-level source code
(d) implement assembly language programs that read in integers from console, process the input and print results on the console
(e) implement high-level language control structures in assembly language
(f) implement one- and two-dimensional arrays and control structures in assembly language (do-while, if-else, and for loop)

**3. Implementation of functions**

(a) write nested function calls using stack frames and local variables
(b) write an assembly language program with recursive functions
(c) write an assembly language function to perform numerical analysis, e.g., finding the square root of a double-precision floating point numb

**4. Computer architecture below the instruction level**

(a) encode assembly language instructions into machine language instructions
(b) read, understand, and debug machine language programs

(c) design and implement machine language programs

**Course Outline:**

**1. Data Representation**

i. Character
ii. Integer
iii. IEEE 754 Floating Point Standard

**2. Instruction Set Architecture of a RISC computer**

i. CPU, memory and the system bus
ii. Program memory layout
iii. Assembly language instructions
iv. Assembly language implementation of high-level language control structures
v. Assembly language implementation of variables and expressions
vi. Assembly language implementation of one- and two-dimensional arrays
vii. Pseudo-instructions and how an assembler wor

**3. Implementation of functions**

i. System stack, stack frames and local variables
ii. Return address, register conventions
iii. Parameter-passing methods: call by value, call by referenc

**4. Computer architecture below the instruction level**

i. Fetch-execute cycle
ii. Instruction encoding

**Course Requirements:**

There will be three exams, unannounced quizzes, assignments, and laboratory works. The material for all exams will come from either a material covered in class, lab work, and/or programming assignments.

Complete all required work on time. In the event that an exam must be missed, or required work can't be completed on time, due to illness or other serious and unavoidable circumstance, notify the professor as far in advance as possible by phone or e-mail.

The assignments are due by 8 am on the due date (electronic copy (e-mail) is due by 8:00 am, and a paper (hard) copy of the assignment is due at the beginning of the class). Assignments will be accepted up to three days late subject to the following penalties:

| Turned in | Penalty |
|---|---|
| After 9:00 am on the due date | 10% |
| 1 day late | 25% |
| 2 days late | 50% |
| 3 days late | 75% |

Saturdays, Sundays, and holidays count when computing penalties.

If you work with a partner, you will submit one electronic copy and one paper copy of the assignment with all names on it. The partners will earn equal scores on the assignment. You may work alone on some assignments and with partners on others. You may change partners during the semester.

You are encouraged to discuss assigned problems with other people (teams) but you (team) must design and write own solutions/code for all assignments. Submitting modified versions of other people's (team's) work as own is considered cheating.

There will be no make up for unannounced quizzes.

There will be one make up for the exams, which will cover all topics. It will be at the end of the semester.

Make up exam will be given if you call before the exam, make arrangements, have a medical certificate signed by the physician, and have a note from the Dean of Students Office.

The three exams will be announced at least a week before taking place.

Laboratory assignments will be in the teaching lab. You are encouraged to discuss the lab assignment with others before and during the lab hours, but each student must demonstrate her or his own solution.

**Evaluation:**

| | | |
|---|---|---|
| Three Exams: | ~60% | (20% each) |
| Programming assignments: | ~25% | (equal points for each assignment) |
| Unannounced quizzes: | ~5% | (equal points for each quiz) |
| Laboratory Assignments | ~10% | (equal points for each lab) |

**Grading:**

| Score | Grade |
|---|---|
| >= 92 | A |
| 90-92 | A- |
| 88-90 | B+ |
| 82-88 | B |
| 80-82 | B- |
| 78-80 | C+ |
| 72-78 | C |
| 70-72 | C- |
| 68-70 | D+ |
| 62-68 | D |
| 60-62 | D- |
| < 60 | F |

**Feedback:**

Your comments and questions about all aspects of the course (content, grading, teaching methods, pace, textbook, etc.) are welcome. You can use e-mail or talk to me during office hours.