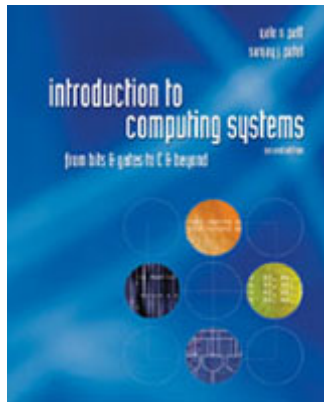


SIMON D. LEVY

Computer Science Department, Washington and Lee University

CSCI 210: Computer Organization

General Information



Professor: Simon D. Levy

Lecture: MWF 4:00-5:00 Leyburn 223

Office: Parmly 407B

E-mail: simon.d.levy@gmail.com

Office Hours: MWF 2:00-4:00 and by appointment

Textbook: Y.N. Patt and S.J. Patel, *Introduction to Computing Systems: From Bits and Gates to C and Beyond.*

Course Objectives

- Students will understand the relationship between hardware and software specifically how machine organization impacts the efficiency of applications written in a high-level language.
- Students will be able to make use of the binary number system to translate values between the binary and decimal number systems, to perform basic arithmetic operations (i.e. addition, subtraction, multiplication, and division) and to construct machine code instructions.
- Students will be able to design and implement solutions for basic programs using assembly language with a focus on data storage, selection and repetition constructs, subprograms, and array allocation and processing.
- Students will be able to design logical expressions and corresponding integrated logic circuits for a variety of problems including the basic components of a CPU such as adders, multiplexers, the ALU, a register file, and memory cells.

- Students will be able to explain the fetch-execute cycle performed by the CPU and how the various components of the data path are used in this process.

Grading

The written work for the course will consist of

- Homework assignments, done with your lab partner (both of you turn it in to your github repository by 11:59pm on the due date): **50% of grade**
- Two one-hour exams, 15% each = **30% of grade**
- Comprehensive final exam: **20% of grade**

Attendance

It is very important that you attend class. There will be considerable information given in class that is not available elsewhere. Regular attendance and class participation may influence your grade in borderline cases.

General Classroom Guidelines

- Be respectful of your classmates and the instructor. Personal Web surfing, social networking, texting, cell phone calls, or emailing during class time is strictly prohibited.
- I may use Powerpoint presentations for some of the classroom lectures. These presentations will be available for viewing or downloading from the course Web site. Therefore, you do not need to try to copy all of these notes. The purpose of the slides is to guide the class flow. They are not intended to provide a complete coverage of all the course material. In particular, they do not substitute for reading the text.
- It is important that you prepare for each class meeting in order to get the most benefit and to be able to participate fully. Read over the material to be covered and be sure you understand the material from the previous class meeting. The material in this course builds on itself; so it is important to stay on top of the material as we go.
- I will be very happy to work with you individually or in small groups. If my office hours are not convenient, I am available and will be happy to make appointments with you.
- Be on time.

Accommodations

Washington and Lee University makes reasonable academic accommodations for qualified students with disabilities. All undergraduate accommodations must be approved through the Office of the Dean of the College. Students requesting accommodations for this course should present an official accommodation letter within the first two weeks of the (fall or winter) term and schedule a meeting outside of class time to discuss accommodations. It is the student's responsibility to present this paperwork in a timely fashion and to follow up about accommodation arrangements. Accommodations for test-taking should be arranged with the professor at least a week before the date of the test or exam.

Final Exam Policy

The final exam for this course will be given during the final exam week. You can take this exam during any of the regularly scheduled exam periods that week. You must supply an exam envelope to the instructor or the department administrative assistant no later than noon on the last day of class. You must specify a provisional day and time on the envelope, which you are free to change on the clipboard provided outside the door of Parmly 407 any time that week. Email or phone requests to reschedule will not be accepted.

The exam will be given in Parmly 405, and you should arrive promptly before the appointed time. If you are more than 15 minutes late, you will have to reschedule your exam. If you are more than 15 minutes late to the last exam period on Friday afternoon, you will receive a grade of 0 on your exam.

Students who have approved academic accommodations must make arrangements to use those accommodations directly with the instructor no later than the last day of class. Students approved for extra time will receive that time at the tail end of the morning exam period or before the beginning of the afternoon exam period (for example, ending at 1:30 PM for a morning exam or beginning at 12:30 PM for an afternoon exam). Students approved for a low-distraction testing location should reserve that space during the last week of classes (following instructions distributed by Dean McCoy (sophomores, juniors or seniors) or Director of Disability Resources Lauren Kozak (first-years).

Honor System & Pair Programming

Unless stated otherwise, the exams will be done without books or notes and without assistance from other people.

Since the assignments will mostly involve programming, however, we are going to take a different approach: pair programming, which we have not used before in this course. During the first week of class, you will choose a “lab partner” with whom to work on the assignments for the rest of the course. **Both your names will go at the top of each assignment, and you will both submit the assignment to your respective sakai folders.**

The downside of this approach is that it may allow “free-loading” by one member of a team. If you feel that your partner is not contributing adequately to the team, please let me know so I can work to remedy the situation.

Tentative Schedule of Lectures

	Monday	Wednesday	Friday
18 Jan Week 1	<u>Martin Luther King</u> Day: No Class	<u>Course introduction</u> Chapters 1 and 2	<u>Number systems: binary, hex, unsigned integers</u>
25 Jan Week 2	<u>Signed integers</u> Due: Assignment #1 <u>binary.zip</u>	<u>Floating-point numbers</u>	<u>Floating-point numbers</u>
01 Feb Week 3	<u>The Boolean system</u> Chapter 3 Due: Assignment #2 <u>project2.zip</u>	<u>Combinational circuits: transistors, gates, and adders</u>	<u>Control circuits and ALU</u>
08 Feb Week 4	<u>Clocks, latches, and memory</u>	<u>The von Neumann architecture</u> Chapters 4 and 5	<u>The instruction execution cycle</u> Chapters 4 and 5

Due: Assignment #3**15 Feb****Week Exam #1****5**The LC3 instruction set:computationThe LC3 instruction set:The LC3 instruction set: datacontrolmovement**22 Feb****Week** Chapters 6 and 7**6**Assembly language:introAssembly language:processorAssembly language: I/O

Chapter 8

Due: Assignment #4 Chapters 6 and 7**01 Mar****Week 7** Chapters 7 and 8String processingString I/O

Chapter 8

Subroutines

Chapter 9

Due: Assignment #5**08 Mar****Week****8**SubroutinesRecursive subroutinesManaging a system stackType conversions

Chapter 10

Due: Assignment #6**15 Mar****Week****9**Managing a systemheap**Winter mini-break; no class**

Chapters 11-19

Chapter 10

Introduction to Cprogramming**Due: Assignment #7**

22 Mar Modular Arrays and pointers C strings and text files
Week decomposition
10
Due: Assignment #8

29 Mar Dynamic storage and Scope Analysis
Week linked structures Tools building for an
11 **Due: Assignment #9** assembler **Due: Assignment #10**

05 Apr Syntax analysis Review for Final Exam
Week LC-3 Grammar Code generation
12 **Due: Assignment #11**

Useful Links

LC-3 simulator online

LC-3 Resources

LC-3 Instruction Set Card

LC-3 Programming Style Guide

LC-3 Guide for Windows

Logisim: a logic circuit design and simulation environment

The C Library Reference Guide (by Eric Huss)

How C Programming Works (in *How Stuff Works*)

The Story of Mel (A Real Programmer)