Comp 411 – Computer Organization

Bulletin Description

Digital logic, circuit components. Data representation, computer architecture and implementation, assembly language programming.

General Course Info

Term:	FALL 2018
Department:	COMP
Course Number:	411
Section Number:	001
Time:	MW, 9:05 – 10:20
Location:	SN 014
Website:	http://www.csbio.unc.edu/mcmillan/?run=Courses.Comp411F18

Instructor Info

Name:	Prof. Leonard McMillan
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Phone:	919-590-6078
Web:	http://www.cs.unc.edu/~mcmillan
Office Hours:	M, 2:00 – 4:00

Textbooks and Resources

This semester I will be teaching from my notes and online materials.

Course Description

Comp 411, Computer Organization, explores the topic of how computers work, in terms of both software and hardware. It covers a wide range of topics including what a bit is, and why bits are the atoms in the universe of computation. We also discuss how information is represented and processed in hardware, and arrive to the conclusion that, to a computer, everything is data, including the instructions that underlie software.

Comp 411 also covers the wide range of languages, and layers of translation, used for computation-- spanning from machine language to assembly language to high-level compiled and interpreted languages. We will also touch on the conventions that will enable us to construct large programs, modular software systems, and even programs that manage the loading, execution, and creation of other programs.

We will explore how simple combinational logic can be made to perform math and manipulate bits and how logic with state can be made to perform a series of operations. This will culminate in the virtual construction of a simple, yet fully functional computer.

The last third of the class concentrates on issues of performance. What the measures of MIPS and CPI mean, and how they can be improved. We will discuss simple techniques for increasing the rates which computer execute instructions including pipelining and parallelism. We will then address techniques for improving the apparent memory bandwidth of a computer and finally how to simulate more memory that we can actually afford,
This course is suitable for both computer science and biology students at both undergraduate and graduate levels. Students taking this course should have some programming experience in a modern language.

Target Audience

This course is required of all undergraduate computer science majors. It is also well suited for graduate students from departments outside of computer science who are interested in the inner workings of computers.

Prerequisites

All students are expected to have taken introductory courses in programming languages and design equivalent to COMP 401.

Goals and Key Learning Objectives

Comp 411 exposes the underlying mechanisms and operation of modern computers. It also exposes students to a broad range of abstractions relating to the engineering that are required to design and orchestrate large digital systems. Students will be exposed to logic, information theory, data representations, assembly language programming, and the layers of translation required to convert a program specification into a functioning program.

Course Requirements

In addition to lecture notes students will be assigned occasional reading supporting the topics presented in lecture. All materials will be provided on-line. Student will be assigned problem sets, with associated programming assignments to be completed on their own computers. There will be six homework assignments, two midterm exams, 10 laboratory exercises, and a final exam. No late assignments or laboratories will be accepted. However, the lowest homework and lowest laboratory scores will be dropped.

Key Dates

Midterm 1:	TBA (a Wednesday in early October)
Midterm 2:	TBA (a Wednesday in mid-November)
Final Exam:	December 8, 2018 (Saturday, Darn it!, 8:00am-11:00am)

Grading Criteria

The final grade will be based on the follow weighting factors:

6 – Problem Sets (lowest dropped)	25%
10 – Labs (lowest dropped)	18%
2 – Midterm Exams	32%
1 – Final Exam	25%

Course Policies

This section should address the following:

- Attendance is expected, but no roll will be taken.
- Late problem sets or laboratory write-ups will be accepted.

The course final is given in compliance with UNC final exam regulations and according to the UNC Final Exam calendar.

Honor Code

Collaboration on assignments is encouraged. However, what you hand in must be your own work. Good scholarship requires that all collaboration must be acknowledged. Thus, if you collaborate on the solution of a problem set, I expect that you list your collaborators at the top of the page.

Collaboration on tests (exams and final) is, of course, a violation of the Honor Code. This includes discussion of questions on a midterm, or final with students that have not yet taken the test.

Using any unauthorized information sources on an exam is a violation of the honor code.

Course Schedule

A course schedule and handouts from each lecture will be posted on the course website.

Disclaimer

“The professor reserves to right to make changes to the syllabus, including project due dates and test dates. These changes will be announced as early as possible.