CS 349: Introduction to Processor Design

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School of Computer Science and Dept of Electrical and Computer Engineering
Carnegie Mellon University
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1 Organization

Instructors:

Randal E. Bryant	David R. O'Hallaron
WeH 4220	WeH 8125
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Mon and Thu, 2pm – 3pm	Wed 11:30 – 1:30pm

Class Assistant:
Rosemary Battenfelder
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Lecture:
Tue Thu 10:30–11:50, Doherty Hall 1117

Recitation:
Wed 10:30–11:20 DH 1117 Dave O'Hallaron

Web page: `www.cs.cmu.edu/afs/cs/academic/class/15349-s02/www/`

2 Objectives

Our aim in CS 349 is to give you a feel for the the processor design process. We will cover simple logic design, the basic building blocks of combinational and sequential logic, and how to assemble these building blocks into a correct and efficient processor for a subset of the IA32 instruction set.

3 Textbook

The text is based on *Chapter 4: Processor Architecture* from the following text:

> Randal E. Bryant and David R. O'Hallaron, *Computer Systems: A Programmer's Perspective* (CS:APP), Prentice Hall, Aug, 2002.

We will provide you with hardcopies of the chapter.

4 Course Organization

Your participation in the course will involve the following forms of activity:

1. Attending and participating in the lectures.
2. Attending and participating in the recitations.
3. A three-part laboratory assignment.

Attendance will not be taken at the lectures or recitation sections. You will be considered responsible for all material presented at the lectures and recitations. Lectures will cover higher-level concepts. Recitations will be more applied, covering important "how-to's", especially in using tools that will help you do the lab.

The textbook contains both *practice problems* within the chapter text and *homework problems* at the end of each chapter. The intention is that you work on the practice problems right as you are reading the book. The answers to these problems are in the back of the chapter. Our experience has been that trying out the concepts on simple examples helps make the ideas more concrete.

The only graded assignments in this class will be a single three part laboratory assignment. Each part will be handed out at lecture on Tuesday and due one week later on Monday at 11:59pm.

5 Getting Help

For urgent communication with your instructors, it is best to send electronic mail (preferred) or to phone.

Prof. Bryant and Prof. O'Hallaron normally work with their office doors open and welcome visits from students whenever their doors are open. However, if their doors are closed, then that means that they are busy with a meeting or a phone call and should not be disturbed.

We will use the Web as the central repository for all information about the class. The class home page is at

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www.cs.cmu.edu/afs/cs/academic/class/15349-s02/www/
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Using the Web, you can:

- Obtain copies of any handouts or assignments. This is especially useful if you miss class or you lose your copy.
- Read clarifications and changes made to any assignments, schedules, or policies.
- Find links to any electronic data you need for your assignments

6 Policies

Working in Groups

You will do the lab assignment on your own.

Handing in Assignments

All assignments are due at 11:59pm (one minute before midnight) on the specified due date. All handins are electronic, usually consisting of one or more files that are to be copied to a specified directory. The writeup for an assignments will provide details about the handin procedure for that assignment.

Penalties for Late Assignments

Late assignments will be docked 20% each day for the first two days. Assignments more than 2 days late will not be accepted, unless you have arranged for an extension *in advance* with Prof. O'Hallaron. For example, suppose an assignment is due at 11:59pm on Wed. If you hand it in between midnight and 11:59pm Thursday, you will be docked 20%. If you turn it in between midnight and 11:59pm Friday, you will be docked 40%. You won't be able to turn it in at all after 11:59pm Friday.

Making up Exams and Assignments

Missed assignments more than 2 days late can be made up, but only if you make prior arrangements with Prof. O'Hallaron. However you should have a good reason for doing so. It is your responsibility to get your assignments done on time. Be sure to work far enough in advance to avoid unexpected problems, such as illness, unreliable or overloaded computer systems, etc.

Appealing Grades

After each exam, homework, and assignment is graded, Prof. O'Hallaron will send each of you a personalized email with your grade (as well as all of your previous grades). You have seven calendar days from the date he sends the email to appeal your grade.

Final Grade Assignment

Each student will receive a numeric score for the course, based on a weighted average of the three parts of the Laboratory Assignment.

Grades for the course will be determined by a method that combines both curving and absolute standards. The total score will be plotted as a histogram. Cutoff points are determined by examining the quality of work by students on the borderlines. Individual cases, especially those near the cutoff points may be adjusted upward or downward based on factors such as attendance, class participation, improvement throughout the course, and special circumstances.

Cheating

Each of you will turn in your own lab exercises. Here are the guidelines on what collaboration is authorized and what is not:

What is Cheating?

- *Sharing code or other electronic files*: either by copying, retyping, looking at, or supplying a copy of a file.
- *Sharing written assignments*: Looking at, copying, or supplying an assignment.

What is NOT Cheating?

- Clarifying ambiguities or vague points in class handouts or textbooks.
- Helping others use the computer systems, networks, compilers, debuggers, profilers, or other system facilities.

Be sure to store your work in protected directories.

The usual penalty for cheating is to be removed from the course with a failing grade. We also place a record of the incident in the student's permanent record.

7 Facilities: Intel Computer Systems Cluster

Intel has generously donated a cluster of 25 Linux-based Pentium III servers, specifically for CMU systems courses, that you can use for the lab. Everyone in the class will get an account. The class Web page has details.

You are also free to use any of the Andrew Linux servers or cluster machines.

8 Class Schedule

Figure 1 shows the tentative schedule for the class. The reading assignments are all in the new book. The schedule also indicates suggested practice problems from CS:APP, lab activities, and the lecturer for each class.

An updated schedule will be maintained on the class Web page.

Class	Class	Day	Topic	Reading	Problems	Labs	Lecturer
1	05/21	Tue	Instruction Set Arch.	1	1 to 5	L1a out	reb
2	05/23	Thu	Logic Design	2	6 to 8		reb
3	05/28	Tue	Sequential Impl.	3	9 to 20	L1a due, L1b out	reb
4	05/30	Thu	Pipelined Impl. I	4 - 5.4	21 to 22		reb
5	06/04	Tue	Pipelined Impl. II	5.5 - 5.10	23 to 31	L1b due, L1c out	reb
6	06/06	Thu	Modern Proc. Design	5.11			reb
0	06/20	Thu	n/a			L1c due	

Figure 1: CS 349 Class Schedule