University of California, Berkeley
College of Engineering
Computer Science Division — EECS

Fall 1997 D.A. Patterson
Handout #1

Course Information
CS152 Computer Architecture and Engineering

Lectures:	Wed, Fri 2:00–3:30, Room 203 McLaughlin
Discussion 101:	Th 2:00–4:00 405 Davis (C. Kozyrakis)
Discussion 102:	Th 12:00–2:00 75 Evans (K. Zhang)
Discussion 202:	Th 4:00–6:00 87 Evans (J. Gebis)
Laboratory:	349 and 273 Soda Hall
Instructor:	Dave Patterson, Professor office: 635 Soda Hall, e-mail: patterson@cs.berkeley.edu phone: 642-6587 office hours: Wed 1:00-2:00 (temporary)
Teaching Assistants:	Joe Gebis, gebis@cory.eecs.berkeley.edu office hours: TBD
	Christoforos Kozyrakis, kozyraki@cs.berkeley.edu office hours: Th 11:00-12:00, 415 Soda Hall (temporary)
	Kirby Zhang, silkworm@cs.berkeley.edu office hours: Wed 4:30-5:30, 466 Soda Hall (temporary)
Administrative Assistant:	Tim Ryan, 634 Soda Hall, 643-4014, tryan@cs.berkeley.edu

Course Goals:

This course will give you an in-depth understanding of the inner-workings of modern digital computer systems and tradeoffs present at the hardware–software interface. You will get an understanding of the *design process* in the context of a complex hardware system, gain practical experience with computer-aided design tools, and learn how to work in groups.

Course Content:

Topics include: The design process, performance and cost analysis, computer arithmetic, controller and datapath design, memory systems, input–output systems, interrupts and exceptions, and pipelining. There will be a large computer design project. We will implement a major subset of the MIPS architecture using pipelining and caches in the hardware description language VHDL using Powerview. The course will cover the material in the text "Computer Organization & Design, 2nd Edition" by Patterson and Hennessy. In addition, "MIPS RISC Architecture" by Kane and Heinrich is recommend as a reference.

The newsgroup `ucb.class.c152` will be used extensively to communicate information on the course and labs. You must read it regularly. There is also a Web page for CS152 that contains all assignments and copies of the slides used in lectures. Look at: `http://www-inst.eecs.berkeley.edu/~cs152/`. You can also email all the CS152 staff at cs152@cory.cs.berkeley.edu.

Exercise assignments will reinforce the readings and lectures. Laboratory assignments will help develop experience with the design tools, and let you experiment with the design of an actual processor. Although the six exercises and labs are handed out at the same time, they are due on different days to help you spread your workload. Exercises are due on Mondays in the wooden box in 283 Soda Hall by 4 PM and lab assignments are due at the beginning of your discussion sections. Graded assignments are returned in discussion section, and grades will be posted by student ID on the CS 152 web page.

For the laboratory assignments we will be using the using the workstations in 349 and 273 Soda Hall, however, you will also be able to login remotely. You should be able to access your home directory on any of the instructional computers, but the CAD tool, Powerview, will only run on the HP workstations. Although the freedom to work outside the lab is valuable, so is the collective environment of the lab, so I encourage you to do some of each.

Course Grading:

The CS Division guideline for an upper division CS class is that the overall class GPA should be between 2.7 and 3.1. Thus the average grade in this class will be a B or B+; please set your expectations accordingly.

There will be two midterm exams covering the material from the readings and class—and no final. They will be given over a 3-hour period in the evening to reduce time pressure: consult the attached schedule to see the date, time, and location.

Two Midterm Exams:	40%	combined
Design Project:	30%	
Homework Assignments:	20%	
Project Group Participation:	5%	
Class Participation:	5%	

Homework Policy:

Assignments will be handed out in class on Friday, with Exercises due on Monday 4 PM (1, 2, or 3 weeks later) in the wooden box in 283 Soda Hall and Lab assignments due in your discussion section. **No late homeworks will be accepted.** Final projects will be presented to the course staff at the end of the term, with a written project due the following week. Consult the attached schedule for due dates of exercises, labs, and projects.

Course Materials:

Required	Patterson and Hennessy, *Computer Organization & Design: The Hardware/Software Interface* (second edition), Morgan Kaufman Publishers, Inc., San Mateo, CA 1997.
Recommended	G. Kane & J. Heinrich, *MIPS RISC Architecture*, Prentice Hall, 1992,
Recommended	*CS152 1992 Project Reports,* on reserve in Engineering Library.

There is also a set of Powerview Reference Manuals in 273 Soda Hall, the web page has copies of all lecture slides and handouts, and tapes of the lectures are available in 205 McLaughlin.

Tentative Course Schedule:

Week	Date	Lec	Topic	Assignment
1	W 8/27	1	Introduction, 5 components of a computer	Ch. 1
	F 8/29	2	Performance and Cost	Ch. 2
2	W 9/3	3	Instruction Set Design/MIPS ISA Review	Ch. 3
	F 9/5	4	Prerequisite Quiz	
3	W 9/10	5	Technology, Delay Modeling	Handout
	F 9/12	6	The Design Process, Multiply	Ch. 4
4	W 9/17	7	Divide, FP Numbers, Pentium bug	Ch. 4
	F 9/19	7	Designing a Single Cycle Datapath	Ch. 5.1-3
5	W 9/24	9	Designing Single Cycle Control, VHDL	Handout
	F 9/26	10	Designing a Multiple Cycle Processor	Ch. 5.4
6	W 10/1	11	Working Effectively in Groups	
	F 10/3	12	Midterm Review 1	
7	W 10/8	13	**Midterm 1 5-8 PM**	Midterm 1
	F 10/10	14	Designing a Multiple Cycle Controller: from hardwired to microprogrammed	Ap. C
8	W 10/15	16	Designing a Multiple Cycle Controller: hands-on microprogramming and exceptions	Ch. 5.5
	F 10/17	17	Introduction to Pipelining	Ch. 6
9	W 10/22	17	Pipelining Hazards and Solutions	Ch. 6
	F 10/24	18	Introduction to Memory System Design	Ch. 7
10	W 10/29	19	Cache System Design	Ch. 7
	F 10/31	20	Virtual Memory	Ch. 7
11	W 11/5	21	I/O Devices and Systems / Buses and OS's Responsibility	Ch. 8
	F 11/7	22	Instruction Level Parallelism (VLIW / Superscalar)	Ch. 8
12	W 11/12	23	Midterm Review II	
	F 11/14	24	**Midterm II 5-8 PM**	
13	W 11/19	25	Guest Lecture	
	F 11/21	26	Guest Lecture	
14	W 11/26	27	Field Trip	
	F 11/28	-	Thanksgiving Holiday	
15	W 12/3	28	Guest Lecture	
	F 12/5	29	Course Review, lessons from 152, your Cal legacy	