

CS430 Computer Architecture

Fall 2008

Catalog Description

An introduction to the hardware design aspects of all major components of a computer system. Topics include computer arithmetic, Boolean algebra and gate networks, logic design, an introduction to IA-32/64 & MIPS assembly language programming, memory (virtual and cache), I/O devices, pipelined instruction execution, bus structures, microprogramming and RISC/CISC philosophies.

Topics

- Overview and history of computer architecture
- Fundamental building blocks (logic gates, flip-flops, counters, registers, PLA)
- Logic expressions, minimization, sum of product forms
- Register transfer notation
- Physical considerations (gate delays, fan-in, fan-out)
- Bits, bytes, and words
- Numeric data representation and number bases
- Fixed- and floating-point systems
- Signed and twos-complement representations
- Representation of nonnumeric data (character codes, graphical data)
- Representation of records and arrays
- Basic organization of the von Neumann machine
- Control unit; instruction fetch, decode, and execution
- Instruction sets and types (data manipulation, control, I/O)
- Assembly/machine language programming
- Instruction formats, Addressing modes
- Subroutine call and return mechanisms
- I/O and interrupts
- Storage systems and their technology
- Coding, data compression, and data integrity
- Memory hierarchy
- Main memory organization and operations
- Latency, cycle time, bandwidth, and interleaving
- Cache memories (address mapping, block size, replacement and store policy)
- Virtual memory (page table, TLB)
- Fault handling and reliability
- I/O fundamentals: handshaking, buffering, programmed I/O, interrupt-driven I/O
- Interrupt structures: vectored and prioritized, interrupt acknowledgment
- External storage, physical organization, and drives
- Buses: bus protocols, arbitration, direct-memory access (DMA)
- Introduction to networks
- Multimedia support
- RAID architectures
- Implementation of simple datapaths
- Control unit: hardwired realization vs. microprogrammed realization
- Instruction pipelining
- Introduction to instruction-level parallelism (ILP)
- Introduction to SIMD, MIMD, VLIW, EPIC
- Systolic architecture
- Interconnection networks (hypercube, shuffle-exchange, mesh, crossbar)
- Shared memory systems
- Cache coherence
- Memory models and memory consistency
- Superscalar architecture
- Branch prediction, Prefetching, Speculative execution

The above topics were copied with permission from the Computing Curricula 2001 recommendations found at: <http://www.sigcse.org/cc2001/>.

Instructor Details

Professor:	Shereen Khoja
Email:	shereen@pacificu.edu
Office:	Strain 203C
Phone:	(503) 352-2008
Office Hours:	M 02:00pm – 03:30pm W 02:00pm – 03:30pm Th 01:00pm – 02:30pm or by appointment

Course Details

Course Title:	CS430 Computer Architecture
Prerequisite:	CS300 Data Structures with a grade of C or better
Required for:	CS Major and can satisfy the Senior Capstone prerequisite
Meeting Times:	MWF 11:45am – 12:50pm
Location:	Marsh LL15
Textbooks:	Computer Organization and Architecture Designing for Performance by William Stallings - 7 th edition – Pearson Prentice Hall 0-13-185644-8
Course Website:	http://zeus.cs.pacificu.edu/shereen/cs430f08/cs430.htm

Course Assessment

As a general rule of thumb, students are expected to spend 2-2.5 hours outside of class for each hour of class time. This means that you should be spending 8-10 hours per week outside of class on the readings, projects, and homework.

Grade Distribution:

Homework / Programs / Projects	30%
3 Exams (closed book / no notes of any kind)	30%
Unscheduled Quizzes (open-note)	10%
Presentation	10%
Final Exam	20%

Programming Projects Grading:

Successful Execution	70%
Acceptable structure, style, documentation, and efficiency. You must follow the C Coding Standards, version 4.0	30%

Percent Breakdown:

			92-100%	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+		60-68%	D			
			0-60%	F			

Important Dates

Tentative dates for Exams:

Exam 1: Friday, September 19, 2008

Exam 2: Friday, October 17, 2008

Exam 3: Friday, November 14, 2008

Labor Day:

Monday, September 1, 2008 (No Class)

Fall Break:

Friday, October 3, 2008 (No Class)

Thanksgiving Break:

Wednesday, November 26, 2008 – Friday, November 28, 2008 (No Class)

Tuesday, November 25, 2008 (No Lab)

Reading Day:

Wednesday, December 3

Date of Final:

Monday, December 8, 2008, 8:30am – 11:00am

Academic Calendar:

<http://www.pacificu.edu/calendar/academic/ascalendar0809.cfm>

Course Policies

1. **Attendance:** Attendance at every class is critical to your success in this course. I expect you to be on time and ready to go once it is 11:45am and that you stay until the end of class. You will not be allowed into the classroom once I close the door and start teaching. Any missed lecture is your responsibility to make up; just remember that if you fall behind, it will be very difficult to catch up.
 - I reserve the right to raise or lower your grade based on class participation and attendance. Specifically, I may lower your grade or may officially withdraw you from the course through the tenth week of the semester for poor attendance or participation. Further, your final grade may be lowered by 1/3 of your final course grade for each day (or portion thereof) of class missed. Please notify me PRIOR to class if you must miss class for any reason.
2. **Programming Assignments:** All assignments are to be programmed using Eclipse. Both the electronic copy and hardcopy of your assignments are due at 11:45am on the day that they are due.
 - The hardcopy must be placed on the instructor's desk before 11:45am on the day the assignment is due. If the hardcopy uses more than one sheet, then all sheets must be stapled. The code must be printed in color. Failure to submit a hardcopy of the assignment will result in a loss of 30% of the assignment points.
 - The electronic copy must be submitted using the course submit script. Failure to submit an electronic copy will result in a loss of 70% of the assignment points.
 - A program that does not successfully compile or produces no output loses 70% of the assignment grade.
 - Assignments can be turned in up to 24 hours late with a penalty of 10% of the grade. If the assignment is between 24 and 48 hours late you will lose 20% of your grade. Anything later will NOT be accepted.
 - *One exception.* I do allow one programming assignment to be turned in up to ONE day late without penalty. Your reason does not matter and I do not need to know why. All other late assignments will carry the standard loss of points. To use this gift, you *must* send me an email before 11:45am on the day the assignment is due. This email is to have GIFT as the subject and you must include your name and the assignment number and name in the body of the email. If this information is not included in the email then the assignment will be considered late.

- Make sure that you test your programs before submitting them. You may only submit your assignment once.
 - All code in any form generated from this course becomes the intellectual property of Pacific University. You may not share this code with anyone without obtaining written permission from Pacific University.
3. **Homework Assignments:** All homework must be placed on the instructor's desk by 11:45am on the day it is due. The homework does not have to be word-processed, but you must make sure that it is neat and tidy, and if multiple sheets of paper are used then these must be stapled.
 4. No early or late exams / final will be given. No incompletes will be given.
 5. **Academic Dishonesty:** Pacific University has no tolerance for academic dishonesty. It is university policy that all acts of academic dishonesty be reported to the Associate Dean. Forms of academic dishonesty include, but are not limited to, plagiarism, fabrication, cheating, tampering with grades, forging signatures, and using electronic information resources in violation of acceptable use policies. Please consult the Academic Conduct Policies in the A&S Catalog for more details.
 - For programming assignments, plagiarism takes the form of, but is not limited to, copying code from someone else, whether copying files, typing from someone else's notes or typing while they dictate. The source can be a classmate, former student, website, program listing found in the trash, or anything else. Furthermore, plagiarism even on a small part of the program is cheating.
 - Working together on homework assignments is also considered cheating. Homework assignments must be completed individually.
 - You should also note that aiding someone else's cheating also constitutes cheating. You should never leave your code where someone else could have access to it, such as staying logged onto a machine or placing solutions in the recycling bin where another student may take it.
 - Sanctions that may be imposed for academic dishonesty are:
 - First offense for cheating on an exam: zero on the exam.
 - First offense for cheating on a programming assignment or written homework: zero on the assignment and 5% subtracted from your course total.
 - Second offense for cheating of any kind: 'F' in the course
 6. Any important issue pertaining to class such as the need to miss an exam or grade issues will not be discussed via email. I will not even reply to your email if the issue is important; therefore, do not assume that no response means everything is OK.
 7. You may be asked to leave the class if you are causing a distraction e.g. cell phone ringing, talking, etc.
 8. If you have a complaint regarding a grade on an assignment or exam, write a one paragraph description of why you feel the grade is incorrect and deliver it to the instructor within five working days of when the graded material was returned to you. I will not consider any grade changes later than five working days after the graded material was returned.
 9. If you have a documented disability covered under the ADA then services and accommodations are available from LSS (Learning Support Services). If you need reasonable accommodations to fully participate in course activities or meet course requirements, you must contact Edna K. Gehring, Director of LSS, at X2107. She will meet with you, review the documentation of their disabilities, and discuss the services Pacific offers.