

C.S.430  
Computer Architecture  
Spring 2015

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 non-numeric 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

### Instructor Details

Professor:	Douglas J. Ryan
Email:	ryandj@pacificu.edu
Office:	Strain 201
Phone:	(503) 352-2135
Office Hours:	MWF 10:00am – 11:00am

### Course Details

Course Title:	CS430 Computer Architecture
Prerequisite:	CS 300 Data Structures with a minimum grade of C.
Required For:	CS Major and can satisfy the Senior Capstone prerequisite
Meeting Times:	MWF 11:45am-12:50pm
Location:	MAR LL15
Textbooks:	Primary: <u>Computer Organization &amp; Architecture Designing for Performance</u> by William Stallings 9 <sup>th</sup> edition <i>PEARSON Prentice Hall</i>

### Course Website

<http://zeus.cs.pacificu.edu/ryand/cs430/2015/>

## Course Assessment

### Grade Distribution :

Homework / Programs / Projects	35%
3 Exams (closed book/ no notes of any kind)	35%
unscheduled (open note) quizzes	10%
Final	20%

### 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		

### Program Grading:

Successful execution	70%
Acceptable structure, style, documentation, and efficiency. You must follow the C Coding Standards, version 6.0	30%

## Important Dates

### *Tentative dates for Exams:*

Exam 1: Monday, February 23, 2015

Exam 2: Friday, March 20, 2015

Exam 3: Friday, April 24, 2015

### *Spring Break:*

Monday, March 23, 2015 through Sunday, March 29, 2015

### *Senior Projects Day:*

Wednesday, April 22, 2015 (No Classes for Arts & Sciences)

### *Campus Calendar:*

<http://pacificu.edu/calendar/>

### *Date of Final:*

Saturday, May 9, 2015, 8:30 am – 11:00 am

## Policies

1. 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's 11:45am and that you stay until the end of class. Any missed lecture is your responsibility to make up; just remember, if you fall behind, it will be very difficult to catch up.
2. 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.
3. Make sure to test your program before you turn it in. You may turn in your program only once.
4. A program that does not successfully compile or produces no output loses 70% of the assignment grade.
5. No early or late exams/finals will be given.
6. No incompletes will be given.
7. Pacific University has no tolerance for academic dishonesty. It is university policy that all acts of academic dishonesty be reported to the Assistant/Associate Dean. Sanctions that may be imposed for academic dishonesty range from an "F" for the assignment, an "F" for the course, and suspension or dismissal from the university. 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. Plagiarism is the use of someone else's words, ideas, or data without proper documentation or acknowledgment; it may entail self-plagiarism, i.e. reusing/resubmitting your own work without approval. Quotations must be clearly marked, and sources of information must be clearly indicated in all student work. Please consult the Academic Conduct Policies in the A&S Catalog.
8. 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.
9. Neither computer failure, software failure, nor lack of computer access are accepted as excuses for late programs; therefore, start work on the programs as soon as they are assigned, and don't put them off until the last minute. Further, corruption of programs due to bad disk media is also not accepted as an excuse for late programs; therefore, always keep a current backup of all programs on a separate disk. Please note that the Computer Science departmental servers are

not backed up.

10. 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. Just sending an email prior to missing class does not guarantee you will be cleared to miss. Only legitimate reasons will be accepted as excuses for missing class.

11. 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.

12. If you are unhappy with something related to the class, then schedule an appointment to see me so that we can discuss it in my office. Complaining in class or out of class to other students gets us nowhere.

13. You may be asked to leave the classroom if you are causing a distraction e.g. cell phone ringing, talking, etc

14. 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. The paragraph must be delivered to the instructor within one calendar week of when the graded material is returned to the student. I will not consider any grade changes later than one week after the graded material is returned.

15. 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.