Introduction to Systems Programming and Computer Organization

CPSC 323, Yale University, Fall 2018

These are lecture notes for CPSC 323a, "Introduction to Systems Programming and Computer Organization," taught by Stanley Eisenstat at Yale University during the fall of 2018. These notes are not official, and have not been proofread by the instructor for the course. These notes live in my lecture notes respository at

https://github.com/jopetty/lecture-notes/tree/master/CPSC-323.

If you find any errors, please open a bug report describing the error, and label it with the course identifier, or open a pull request so I can correct it.

Contents

Syllabus

Instructor	Stanley C. Eisenstat, sce@cs.yale.edu
Lecture	MW 1:00–2:15 PM, DL 220
Recitation	TBA
Textbooks	John L. Hennessy and David A. Patterson. *Computer Architecture: A Quantitative Approach.* 6th ed. Morgan Kaufman, 2017; Neil Matthew and Richard Stones. *Beginning Linux Programming.* 4th ed. Wrox, 2007
Midterms	Monday, October 15, 2018
	Wednesday, December 5, 2018

Coursework

The class will NOT meet during reading period. There will be 6 assignments requiring an average of 6-9 hours per week (or an average of 15-25 hours per C assignment, somewhat less per non-C assignment). There will be an in-class examination on Monday, October 15th, and a final on Wednesday, December 5th. Homework will constitute ∼70% of the final grade; the examinations will constitute the remainder.

Programs will be submitted electronically and checked using test scripts: a public script, which will generally be available at least one week before the assignment is due; and a more comprehensive private script, which will be used to assign a grade. C programs may also be evaluated for "style".

Programs should be submitted electronically by 2:00 AM on the day specified in the assignment. Late work not authorized by a Dean's excuse will be assessed a penalty of 5% per calendar day or part thereof and MAY not be graded at all if more than ten days late or after solutions are released. The submit-times of the sources determine when the program was completed.

Schedule

What	Points	Due	Spec	Script	Program
Homework #1	60	09/14 (F)	08/29	09/07	farthing (C)
Homework #2	50	09/28 (F)	09/12	09/21	bshParse (C)
Homework #3	30	10/12 (F)	09/26	10/05	cpp2018 (script)
Homework #4	60	11/02 (F)	10/10	10/26	LZW2018 (C)
Homework #5	60	11/16 (F)	10/31	11/09	bshShell (C)
Homework #6	40	12/13 (R)	11/14	12/06	Networking (script)

Topics Covered

Systems programming in a high level language: user-level interfaces to a typical operating system (Linux), writing programs (e.g., a shell) that interact with the operating system;

Elementary machine architecture / computer organization: computer arithmetic and general structure/organization of machines, approaches to parallelism (vector, SIMD, MIMD, networks), instruction set architectures and pipelining instruction execution;

Operating systems: implications of concurrency, implementation of semaphores at machine level (a la Dijkstra), implementation and ramifications of virtual memory and caches;

Other: data compression, error detection and correction, computer networks.

References

[1]   John L. Hennessy and David A. Patterson. *Computer Architecture: A Quantitative Approach.* 6th ed. Morgan Kaufman, 2017.

[2]   Neil Matthew and Richard Stones. *Beginning Linux Programming.* 4th ed. Wrox, 2007.