CSCI 2400: Computer Systems

Fall 2019

Department of Computer Science, University of Colorado at Boulder

Course Summary

This course introduces students to Computer Systems. The course will cover key aspects of how a software program executes on a modern computer, namely modern CPU hardware. In particular, the following major concepts will typically be studied:

- Computer Architecture
- Binary Representations, e.g. Two's Complement
- Binary Arithmetic and Overflow
- Assembly Language Programming (some 32-bit and mostly 64-bit x86) with Integers
  - Data Movement between CPU Registers and Memory
  - Integer Arithmetic
  - Control Operations
  - Arrays
  - Data Structures
- IEEE Floating Point Representation
- Stack and/or Frame Pointers and their relation to Function Calls
- Buffer Overflow
- Instruction-level Parallelism
- Pipelining
- Caching
- Performance Optimization of Software Programs
- Linking
- Exceptional Control Flow, e.g. Signal Handling and Shells
- Virtual Memory
- Dynamic Memory Allocation on the Heap, e.g. malloc()

In addition, the class will gain familiarity with important software tools such as debuggers, compilers, editors, and virtual machines.

General Information

See the Moodle class Web page at http://moodle.cs.colorado.edu

Schedule & Location: 3 sections, either MWF or TTH. See also the registrar's Web site.
Course number: CSCI 2400
Prerequisites: CSCI 2270

Instructors: Professors Rick Han, Shivakant Mishra and Henry Tufo
Offices, Office Hours and Contact Info:

- Professor Han:
  - ECCR 1B16 (CS Systems Lab in Engineering Center)
  - Office hours: Mondays 2-4 pm, additional appointments as needed.
  - rhan@cs.colorado.edu
  - 303-492-0914
- Professor Mishra:
  - ECCR 1B22
  - Office hours: Thursdays 10am-12 pm
  - mishras@cs.colorado.edu
  - 303-492-4686
- Professor Tufo:
  - ECOT 527
  - Office hours: Tuesdays 12-2 pm
  - Henry.Tufo@colorado.edu
  - 303-492-2771

Textbook:

- *Computer Systems: A Programmer's Perspective*, Randal Bryant and David O'Hallaron, 3rd edition, Pearson, 2015.
  - It is important that you use the 3rd edition (focuses on 64-bit topics), not the 2nd edition.

Other useful references:

- *C: A Reference Manual* (5th Edition) (Paperback) by Samuel P. Harbison and Guy L. Steele, Prentice Hall, 2002.
- *The C Programming Language,* Brian Kernighan and Dennis Ritchie, 2nd edition, Prentice Hall, 1988.

TAs: Sandesh Dhawaskar, Saurabh Mishra, Steven Kordonowy, Insoo Lee, Sepideh Goodarzy, Kamal Chaturvedi, Hoang Truong, Prashanth Thipparthi, Jinpeng Miao, Pramod Kulkarni
TA Office/Hours: Weekly recitation sections, and more as needed. See moodle for more details.
TA Email: typically {First.Lastname}@colorado.edu will work, but see moodle for more details.

class Web site:
See the Moodle class Web page at http://moodle.cs.colorado.edu. Assignments, lecture slides, and announcements can be found there. The moodle has a variety of useful features, including a forum for posting questions. *Each student should establish an account on the moodle and then subscribe to our class on the moodle using the special enrollment key given out in class.*

Jupityr Notebook:
The TAs will provide instructions for installing the class programming environment for doing the labs. The moodle will also provide more information.

Course Assistants:
Allen Fu, Rhett Hanscom, Zack Jorquera, Story Kiser, Justin Reiss, and Weiyao Tang will be our CAs offering assistance with 2400. See moodle for more information.

Grading

The lab assignments constitute 45% of your grade.
Two to three midterms exams and the final exam are together worth 45% of your grade.
The quizzes are worth 5%.
The recitation questions make up the remaining 5%.

Grading for Lab Assignments:

Your primary assignments will be your "Lab Assignments," given every 2-3 weeks, each of which will be followed by a grading meeting to review your solution with the TA. The TAs will release an interview scheduler on the moodle before the assignment due, and you must sign up for a grading time slot (typically 12-15 minutes) before the assignment deadline. The grading meetings will then begin after the due-date of each Lab, typically the following week.

The grades for each lab will be based 40% upon the Task Success (i.e. "does it work") and 60% upon your explanation of your code/assignment and answering questions about the lab and its concepts. Historically speaking, students that have completed the assignment themselves usually have little problem passing the Q&A portion of the grade.

Students may work in teams of up to two for the labs only, but each student will still be responsible for scheduling their own grading meeting with the TA for each lab. You may help others only to the extent of answering typical questions that arise during compiling, debugging, and executing your lab assignments.

All assignments are due by the deadline stated. Extensions will not be granted except at the instructor's discretion in documented cases of extreme hardship, emergency, etc., unless otherwise noted.

- On the task success 40% portion of the grade, we *strongly encourage you* to submit even partially working code/assignment by the deadline to obtain partial credit on the 40% for task success.
- You must attend your grading meeting to receive a grade. If you miss your meeting with the TA (without notifying your TA ahead of time with a suitable reason), this will result in a zero grade for the assignment. The TA is under no obligation to reschedule your appointment if you miss your meeting, so write down your meeting times, and don't forget them! Even if you are unable to submit fully working code/assignment by the deadline, we *strongly encourage you* to keep working at a full solution for the assignment, which should benefit your understanding and ability to answer questions during the Q&A meeting with the TA.

Unless otherwise noted in the labs, the default programming language for all labs is C and the default execution environment is the Jupityr Notebook.

More information on the grading policy may be posted as needed on the moodle as the semester progresses.

Default Grading Policy:

All work should be your own on all assignments unless otherwise indicated.

Plagiarism policy.

Additional Policies:

Disability Policy

Religious Observances Policy

Discrimination and Sexual Harassment Policy

Classroom Behavior Policy