Computer Systems

"No more magic" -- Your Instructor
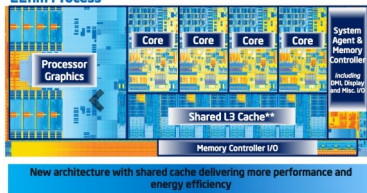
mmm, systems!

Course Information

- **Course Number**: CS 5007
- **Semester**: Summer 2019
- **Hours**: 6:00pm-9:15pm
  - Thur. Schedule: Lecture | Activity | Lab
- **Location**: WeWork- 600 California Street 20C
- **Piazza**: Forum Board (https://piazza.com/class/jv45fray2iq3qx) (Office Hour and locations are listed in forum)

- **Instructor**: Mike Shah
- **E-mail**: mikeshah(a t)Northeastern
  - (Read How to send an e-mail (./../../email.html))
- **Office hour location**: 20th floor lobby area.
- **Office Hours**: Wednesday from 5-7:30 pm PST.

- **Teaching Assistant**: Guoxing "Andy" Wang
- **E-mail**: wang.guox@husky.neu.edu
- **Office Hours**:
  - `Friday: 3-10pm PST SF campus`

- **Teaching Assistant**: Kai Wu
- **E-mail**: wu.kai2@husky.neu.edu
- **Office Hours**:
  - `Wed: 5-10pm PST SF campus.`
  - `Fri: 5-10pm PST SF campus.`

Schedule/Road Map

The following is our tentative syllabus for the course, some small changes should be expected throughout the semester. I will announce in class or through e-mail any major changes.

Acquire the Course Monorepo by clicking here (removed) **Do not do a 'git pull' until class officially starts** (Occasionally I make changes/spelling corrections)

Module	Date	Topic	Assignments
1	Thursday, May 9, 2019	Module 1 - Overview of Computer Systems, and Linux Crash Course	A1 - Scripting (Due May 17 anywhere
2	Thursday, May 16, 2018	Module 2 - The C Programming Language: Building Blocks and Data Structures!	A2 - Data Structures (D
3	Thursday, May 23, 2019	Module 3 - Assembly and Machine Representation, CPU Architecture, and Operating Systems	A3 - Assembly and Debugging
4	Thursday, May 30, 2019	Module 4 - Compilers, Linkers, and Code Generation	A4 - Compiler Interpositioni
5	Thursday, June 6, 2019	Module 5 - Processes and The Memory Hierarchy	A5 - Mini Shell (Due

Module	Date	Topic	Assignments
6	Thursday, June 13, 2019	Module 6 - Concurrency	
7	Thursday, June 20, 2019	Module 7 - Final Exam and Course Wrap-Up	Exam (https://docs.google.com/document/d/1eMqXc2(usp=sharing) |
-	Onwards!	See you in CS 5006 Algorithms! New topic same instructor -- course resumes on June 27 :)	

Course Description

In short, we are going to learn how to work in the terminal, program in C, program in Assembly, and understand how a computer works. This course is heavily project based, meaning we will be spending time building programs and using tools to understand how a computer works.

Registrar Description: Introduces the basic design of computing systems, computer operating systems, and assembly language using a RISC architecture. Describes caches and virtual memory. Covers the interface between assembly language and high-level languages, including call frames and pointers; the use of system calls and systems programming to show the interaction with the operating system; and the basic structures of an operating system, including application interfaces, processes, threads, synchronization, interprocess communication, deadlock, memory management, file systems, and input/output control.

Course Objectives

By the end of this course, you will be ready to:

- Be comfortable managing memory in the C language.
- Be comfortable using the terminal.
- Understand various tradeoffs made within a computer for performance.
- Position yourself to be successful for future systems courses or perhaps jobs as a systems programmer!

Prerequisites

By the end of this course, you will be ready to:

- You should have a working knowledge of some high-level programming language.
- You should have experience compiling, writing, and debugging programs in your favorite text editor.
- You should be familiar with your operating system and comfortalbe performing many basic tasks.
- You should have basic knowledge in github (https://try.github.io/levels/1/challenges/1), using any text-based editor, and how to compile, run, and debug programs.

Resources

There will be no required textbook for this course. However, these resources have been vetted, and I recommend for mastery (while taking this course, and reviewing later on in your career).

- (Free) ostep Book (http://pages.cs.wisc.edu/~remzi/OSTEP/)
- (Free, required) Essential C (http://cslibrary.stanford.edu/101/EssentialC.pdf)
- (Recommended) C Programming Language (https://www.amazon.com/Programming-Language-2nd-Brian-Kernighan/dp/0131103628)
- (Recommended) Computer Systems: A Programmers Perspective (https://www.amazon.com/Computer-Systems-Programmers-Perspective-3rd/dp/013409266X)

Academic Integrity and Non-Discrimination

Students and instructors are to follow the Northeastern policies on these important issues.

- Northeastern Non-Discrimination Policy (http://www.northeastern.edu/oidi/compliance/equal-opportunity-affirmative-action/) - This classroom is a safe space for the instructor and students to talk about ideas, share viewpoints, and learn.
- Northeastern Academic Integrity Policy (http://www.northeastern.edu/osccr/academic-integrity-policy/) - You only cheat yourself if you are not honest. Most often cheating occurs when an individual falls behind or perhaps has other circumstances occurring in their life. Please consult the

instructor before ever considering cheating.
- If you are caught cheating I have to report the violation. My official policy is you receive a 0 in the course. Always remember, if you use any external sources, you must cite them.
- Student Code of Conduct (http://www.northeastern.edu/osccr/wp-content/uploads/2017/06/code-of-student-conduct-2017-2018.pdf): Students and instructors will follow the following guide for how we conduct ourselves. This is to create a respectful environment where everyone can learn.

Make-Up Policy

Students participating in varsity athletics(this does not include club sports or intramurals) or other University sanctioned events may have the need for a make-up. Please contact me in advance of such events, so that appropriate accommodations can be made.

Occasionally, other life events and circumstances occur that were not planned. If this is the case, please e-mail me privately.

E-mailing me asking for extensions *just because* is unfortunately not fair to your classmates. The 10% penalty for each day late has to be enforced so I do not get taken advantage of.

Accessibility

Part of what makes Northeastern University unique, is our diverse cohort of students, faculty, and staff. In order to support this, Northeastern is committed to providing equal access and support to all qualified students through the provision of reasonable accommodations so that each student may fully participate in the University experience. If you have a disability that requires accommodations, please contact the Student Accessibility Services office at DRC@northeastern.edu or (617) 373-2675 to make an appointment with the Disability Resource Center (http://www.northeastern.edu/drc/accessing-accommodations-and-services/) representatives in 20 Dodge Hall to determine appropriate accommodations.

Lateness and Attendance Policy

Students who do well in this course tend to show up to the course consistently, participate, and engage with their peers. Come to class, come on time, and build good habits! In-Class activities that are not attended are a zero.

Assessment/Course Polices

Please find below the grading distribution that will be used for this course to compute a weighted average (https://en.wikipedia.org/wiki/Weighted_arithmetic_mean#Mathematical_definition) for your final grade. You will find grades you earn through the semester on blackboard (https://northeastern.blackboard.com/) and your final grade in banner.

```
• In-Class Activity: 5%
• In-Class Labs:     20%
• Exam/Quiz:         20%
• Assignments:       55%
```
- (Each Assignment worth the same % of points)

- The grade system follows the University Grading System (https://www.northeastern.edu/registrar/gradingsystem.html).
```
  ○ A  = 95 — 100
  ○ A– = 91 — 94
  ○ B+ = 87 — 90
  ○ B  = 83 — 86
  ○ B– = 80 — 82
  ○ C+ = 77 — 79
  ○ C  = 73 — 76
  ○ D+ = 67 — 69
  ○ D  = 63 — 66
  ○ F  =  0 — 62
```
- In the event of a snow day (i.e. we miss a lab or in-class activity) the weight of each assignment increases (There may also be shuffling of course material if we are interrupted).
- The expectation is that the assignments are fair but difficult, so you should start early!
- **Late Submissions of Assignments** receive 10% off per day submitted late (up to 3 days max, then 0% received).
  - Unfortunately, with 100+ students I cannot make individual exceptions fairly to your classmates who are likely making other personal sacrifices.
- **Assignments that do not compile/open receive no credit** Simply put, programs that do not compile do not do anything.
- There are no "re-grades" or points awarded one week after your grade is posted. "re-grades" may result in a higher, equal, or lower score.
  - There are no "re-grades" after the semester is over.
  - Do not ask multiple members of the course staff for "re-grades"
- If you are currently wait listed, you must submit your homework on time. That is the gamble! If you do not have blackboard access, you will submit by e-mail or other course mechanism.
- There are no extra credit assignments. I reserve the right to add points to assignments that do go above and beyond however.
- I reserve the right to modify the grading scale in your favor if you show exemplary proficiency in any of the categories. I will never modify the scale to lower a students grade.
- In class work cannot be made up at a later date unless otherwise arranged with the instructor well in advance.
  - Course work completed after the date cannot be graded, as solutions will have been discussed (this includes if taking this course for an Incomplete).

- Once again, "in-class" work must be completed in-class unless there is a documented emergency or you have prearranged with the instructor a make-up well in advance.
- No Facebook, no cell phones. Not only does it distract you, it distracts others! (Divide your tuition by lecture hours and perhaps you will be more motivated as well!)
- **Everyone** needs to come see me in office hours (or by appointment) at least one time during the semester to introduce yourself. The purpose is so that you:
  - Know where my office is.
  - Get used to coming to office hours.
  - Let me know how I can help you achieve your goals.

Please do not redistribute or host any materials without e-mailing me first. I generally am happy to share the latest .pdf or slide presentation with those who ask. Thank you for your time!