CS 341L: Introduction to Computer Architecture and Organization

Department of Computer Science
University of New Mexico

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1 Course Description

CS341, Introduction to Computer Systems, is an sophomore/junior level class in computer hardware and software systems, particularly the essential interfaces and interactions between the hardware, assembly language, programming systems, and operating systems. It is also designed to dramatically increase student's understanding of C, C programming, and program performance through programming assignments. The class covers a wide range of introductory topics in modern computer organization and computer systems, including but not limited to:

- Basic computer hardware components
- Computer representation of complex data and control structures (e.g., floating-point numbers, structures, and strings, and functions)
- Basic x86 assembly language concepts
- Mapping of high-level language concepts to assembly language
- Procedure calling conventions and stack-frame layout
- Basic processor architecture
- Program performance optimization
- Basic memory system architecture (e.g., caching and virtual memory hardware) linking)
- Basic operating system goals

Because of the wide range of topics that will be covered, students will be expected to read ahead in the text, *Computer Systems: A Programmer's Perspective, 3rd Edition (CS:APP2e)*, by Bryant and O'Halloran, so that the class can move along at the necessary pace.

2 Prerequisites/Expected Background

CS241L and ECE 238L, or equivalent classes, are the prerequisites for this course. In particular, knowledge of C/C++ programming in the UNIX environment, basic computer data structures (arrays, structures, and linked data structures), integer data representation, binary data operations (bitwise AND, OR, NOT, and two's complement arithmetic), and basic math (e.g. percentages) is required. Prerequisites courses may be waived with instructor permission, but students will be expected to know and will be held responsible for the material in these classes.

3 Course Format

This class is taught as both an in-person/ITV class and as a hybrid online class with online lectures and in-person labs. Students in the online class will have access to the taped in-person lectures, and may attend the attend in-person classroom lectures at the regularly scheduled time to ask questions if they wish to do so.

Laboratory assignments and notes will also be made available online for students unable to attend lab sessions. Note, however, that while lab materials and assignments will be available online, students are strongly encouraged to attend lab sections to receive additional help from the course TA and instructor on lab and programming assignments.

Materials, discussions, assignments, and other course content will all be made regularly available through UNM Learn. As a result, students should be familiar with using Learn to download and upload content, submit materials, contact the instructor, and ask and answer questions. In addition, Learn web conferencing tools are also available for online students to hold live discussions with the course instructor and TA.

4 Assignments and Grading

Grades will be determined through three exams (two midterms and a final), lab assignments to help students develop systems programming skills, a series of programming assignments primarily in C but frequently with an assembly language component, and several written homework assignments.

Overall grades are broken down as follows:

- Written Homeworks (approximately 3): 15%
- Lab Assignments (approximately 5): 15%
- Programming Assignments (approximately 4): 30%
- 2 Midterm Exams: 20% (10% each, may be replaced with final exam grade)
- Final Exam: 20%

Final grades will be assigned on a 10-point scale (90.0-100 = A, 80.0-89.9 = B, etc.). I reserve the right to further lower the cutoffs for these grades as necessary, though I will not raise these requirements.

5 General Course Policies

- Assignments will be handed out and collected using UNM Learn; assignments should *only* be submitted through learn, not email or other means. If you are unable to submit assignments on Learn due to technical difficulties, please email me the submission on time and we will coordinate later submission through Learn once the technical difficulties are resolved.

- Students are responsible for turning in assignments on time. Unexcused late assignments will only be accepted by prior arrangement with the instructor *before the due date/time*, with significant penalties determined by this instructor. Late assignments will be accepted without penalty *only* in the case of *documented* extraordinary circumstances that make prior arrangement impossible. If you know that you will be unable to make a turn-in date either due to circumstances outside of your control (e.g. illness, death in the family, etc.), please make arrangements with me either in person, by email, or by phone as soon as possible for an extension.
- No make-up or extra credit assignments or tests will be given. In general, the dates of the exams and the due dates for assignments will be announced well in advance. If you must miss a midterm, your final exam grade will count for that midterm grade as well.
- Requests for regrades of assignments must be made within two weeks from when the assignment is returned. Assignments will not be regraded after that point.
- Assignments and tests for which a regrade is sought will be regraded *in their entirety*.
- This course falls under all UNM policies for last day to drop courses, as described at `http://www.unm.edu/studentinfo.html` and in the UNM Course Catalog. Please see the UNM academic calendar for course dates, the last day to drop courses without penalty, and for financial disenrollment dates.
- Any requests to drop the class or change grade mode (e.g. audit, CR/NC) with instructor permission must be made on or before the last regular class/lab meeting. Such request made after this date will not be approved except in the case of documented, extraordinary circumstances.

6 Additional UNM Policies

6.1 Copyright Issues

All materials in this course fall under copyright laws and should not be downloaded, distributed, or used by students for any purpose outside this course.

6.2 Accessibility

The American with Disabilities Act (ADA) is a federal anti-discrimination statute that provides comprehensive civil rights protection for persons with disabilities. Among other things, this legislation requires that all students with disabilities be guaranteed a learning environment that provides for reasonable accommodations of their disabilities. If you have a disability requiring accommodation, please contact me immediately to make arrangements as well as Accessibility Services Office in 2021 Mesa Vista Hall at 277-3506 or http://as2.unm.edu/index.html. Information about your disability is confidential.

Blackboards Accessibility statement: `http://www.blackboard.com/accessibility.aspx`

6.3 Sexual Harassment and Misconduct

No form of discrimination, sexual harassment, or sexual misconduct will be tolerated in this class or at UNM in general. I strongly encourage you to report any problems you have in this regard to the appropriate person at UNM. As described below, I must report any such incidents of which I become aware to the university. UNM also has confidential counselors available through UNM Student Health and Counseling (SHAC), UNM Counseling and Referral Services (CARS), and UNM LoboRespect.

UNM faculty, Teaching Assistants, and Graduate Assistants are considered "responsible employees" by the Department of Education (see pg 15 - `http://www2.ed.gov/about/offices/list/ocr/docs/qa-201404-title-ix.pdf`). This designation requires that any report of gender discrimination which includes sexual harassment,

sexual misconduct and sexual violence made to a faculty member, TA, or GA must be reported to the Title IX Coordinator at the Office of Equal Opportunity (oeo.unm.edu).

Complete more information on the UNM policy regarding sexual misconduct, including reporting, counseling, and legal options, is available online: `https://policy.unm.edu/university-policies/2000/2740.html`

7 Academic Honesty

The university policy on academic honesty is contained in the *Pathfinder*; you should review this policy if you are unfamiliar with it. *Any* academic dishonesty will result in an automatic F for the entire semester and will be referred to the UNM Dean of Students for further disciplinary action as they deem appropriate. There will be no second chances or extra warnings.

As a general rule, any work you hand in for this class must be your own original work. Do not, under any circumstances, share source code, writings, or assignments with your classmates without my explicit prior approval. Students can, however, *verbally* discuss assigned readings, written and lab assignments, and programming assignments outside of class, or using online mechanisms (email, Piazza, etc) that are the general equivalent of verbal communication. For example, feel free to describe verbally over email generally how you attacked a particular problem in a programming assignment.

Any conversation or sharing of information that moves beyond simple verbal discussion and begins discussing or sharing specifics of source code or mathematical operations, however, is potentially a violation of academic honesty requirements. If you are unsure about whether or not you can share a particular piece of information, please consult with Prof. Bridges prior to sharing it.

As examples, the following, are clearly not acceptable and will be considered cheating: copying another person's code; co-developing code with someone else; mailing your code to another person; using the Internet (e.g. StackOverflow) to find a solution to the problem; making your files readable so another person can copy them; reading another person's files; using another person's listing (taken from the trash, for example); having another person write a portion of your code for you; receiving telepathic help on your work from the ghost 19th of a century Go master (Prof. Bridges says: "Hikaru Shindo is filthy cheater!").

8 Additional UNM Resources

CAPS Tutoring Services: `http://caps.unm.edu/programs/online-tutoring/` CAPS is a free-of-charge educational assistance program available to UNM students enrolled in classes. Online services include the Online Writing Lab, Chatting with or asking a question of a Tutor.

UNM Libraries: `http://library.unm.edu`

Student Health and Counseling (SHAC) Online Services: `http://online.unm.edu/help/learn/support/shac`