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CS341L: Introduction to Computer Architecture and Organization
Fall 2024 - Syllabus[1]

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Instructor:

Soraya Abad Mota   email: soraya@unm.edu (add CS341 to subject for a timely response)
Office: Farris Engineering Center 2040. Phone: 277-3052
Office hours:

> **virtual:**   Wednesday 8:30-10:30 am
> (via zoom only, link on canvas)
>
> **in person**
> **and virtual:**   Thursday 3:30-5:30 pm
> additional office hours may be provided upon request

Class meets for
Lectures:

> Monday-Wednesday 5:00 - 6:15 pm,
> Science and Mathematics Learning Center (SMLC) 102

Labs:

> Tuesday 10:00 - 10:50 am, Centennial B146
> Friday 11:00 - 11:50 am, Centennial B146

1   Course Description

This course provides a: "Survey of various levels of computer architecture and design: microprogramming and processor architecture, advanced assembly language programming, operating system concepts and input/output via the operating system." (from the UNM catalog).

The course is an introduction to Computer Systems, a 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 increase student's understanding of C, programming in C, and program performance through programming assignments.

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[1]Parts of this syllabus were borrowed from Prof. Bridges' syllabus for the fall 2016 semester and have been evolving. Maybe today they don't have much left from that, but I still acknowledge him.

The class covers a wide range of introductory topics in modern computer organization and computer systems, including but not limited to those in the list below.

- Basic computer hardware components

- Computer representation of complex data and control structures (e.g. floating point numbers, structures, strings, and functions)

- Basic x86 assembly language concepts

- Machine level representation of programs

- Basic processor architecture

- Basic performance optimization

- Basic memory system architecture (e.g. caching and virtual memory hardware)

- Running programs on a system

- Basic operating systems concepts and goals (processes, system level I/O, concurrency)

Because of the wide range of topics that will be covered, students will be expected to read ahead in the textbook (cited below), so that the class can move along at the necessary pace. In a separate document we provide a tentative calendar with a distribution of the topics on the lecture days. The calendar is not final and it is subject to changes along the semester.

At the end of the term, the student should be able to:

- Use the acquired foundational background in key computer systems topics, to reason about and discuss/understand new systems. Examples of these topics are: mapping higher-level languages to assembly language, data and control structures, program performance, role of programming language and OS tools such as linkers, loaders, libraries, and kernels in executing real programs.

- Demonstrate experience in writing, debugging, and analyzing C and assembly programs.

1.1   Textbook and material (mandatory)

- "Computer Systems: A Programmer's Perspective" Randal Bryant and David O'Hallaron. 3rd edition. Pearson 2016. The text is offered through the inclusive access program of the UNM Bookstore in electronic form.

- Deck of 3 x 5 index cards, will be used on every lecture for *muddy points*, in-class exercises, and reflections.

2 Prerequisites and 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 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 Assessments

Attendance to lectures and lab sessions is compulsory. Grades will be determined through the following types of evaluations.

Midterm exam:	**20%**	Wednesday, **October 9, 2024** (Week 8)
Final Exam:	**25%**	Date and time is fixed by UNM during finals week
Flexible assignments:	**20%**	These could be homeworks, surveys, attendance, participation in the active learning activities through the index cards, etc. (therefore the name flexible). Portions or all of this 20% may be distributed among the other assignments at the instructor's discretion.
Projects:	**35%**	Three large projects to practice the main topics. Identified as P1, P2, and P3 in the calendar at the end.

In the Spring 2024 semester we used funds provided by the School of Engineering to improve the lab component of this class by producing a set of videos; during the fall 2024 semester we will continue this project and add more videos. We encourage students to watch these videos and give us feedback. If you find videos on your own, please submit the links to me or the TA so that we can incorporate them if they are sound and useful. To guide us and evaluate the results properly, we will be passing surveys. These surveys are worth a few points for completion to guarantee that every student responds on time. The surveys are part of the flexible assignments.

Grading: The final grade will be calculated by weighing each *assignment* (test, homework, project, etc.) score obtained by the student, according to the percentages described above.

The conversion process (from number to letter) is left to the discretion of the instructor; students should not compute their letter grade according to their own or other faculty's conversion scale.

Given the number of students, the distribution of numerical grades may be approximately normal. I will look at the average and the standard deviation when assigning the final letter grades. Our conversion strategy is very flexible, it uses the main statistical indicators, as a guide to establish the boundaries between the letter grades, and in all cases will be more favorable to

the student than a rigid table that decides the letter grade with a fixed predetermined range. To assuage your concerns about the meaning of the numbers in letter grades, usually 60 and up is a C, below 60 is a D, 40 and below is an F.

4 UNM Canvas platform

For all announcements and submissions we will use UNM Canvas available with your Net ID at Canvas.unm.edu. When you register for this class your UNM id is automatically included in the course platform list and this will allow you access to all the course materials. There will be no other formal website for this class. Students should be up to date with the announcements and material published in this platform. Communication with the instructor and the teaching assistants will be done via email with the protocol specified below in section 5. For technical questions and comments the use of the discussion board in Canvas is highly encouraged.

5 Course and UNM Policies

This section contains the most important policies students are expected to comply with ad it also provides the most important resources available to you.

5.1 Specific Course Policies

1. Communication with instructor and TA will always be respectful. The instructor requires that you use the email address soraya@unm.edu only with the string **CS341** in the subject line, and an appropriate subject phrase, otherwise your message will not get a timely response. If you forget the CS341 in the subject your message might go unanswered.

2. Project Assignments will be handed out and collected using UNM Canvas. Neither email nor other means should be used for your submissions. If you are unable to submit assignments on Canvas due to technical difficulties, please email the submission on time to the instructor and the TA, and submit it through Canvas once the technical difficulties are resolved.

3. 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 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.

4. No make-up or extra credit assignments or tests will be given. The due dates for assignments have been determined and announced in this syllabus and the calendar since the first week of classes. If you must miss the midterm, your grade for the final exam counts for both exams, i.e. your final exam will be worth 45% of the final grade.

5. Requests for regrades of assignments must be made within two weeks from when the score for the assignment is posted. Assignments will not be regraded after that point.

6. Assignments and tests for which a regrade is sought will be regraded in their entirety. Therefore the new grade could be lower or higher than the original grade (before regrading).

7. 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.

8. 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. This policy might be modified depending on what UNM decides for this semester.

5.2   Academic Honesty

Academic Integrity is a key skill that you will need in any future profession. You are each capable of meeting my expectations for this course. If you are concerned about how well you are doing in this course, please come speak with me instead of considering academic misconduct. Academic dishonesty is used as defined in the UNM Pathfinder and includes plagiarism, using inappropriate resources in exams and quizzes and copying among others (`https://pathfinder.unm.edu/campus-policies/academic-dishonesty.html`). Please let me know if you need guidance about what constitutes plagiarism or a lack of academic integrity. Each instance will be reported to the Dean of Students and may become a part of your permanent record. In addition, it will result in consequences from a zero on the assignment up to failure of the course, and potentially more serious consequences. [2]

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. Any conversation or sharing of information that moves beyond simple verbal discussion and begins discussing or sharing specifics of source code or mathematical operations, 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. Abad-Mota prior to sharing it.

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[2]Thanks to Prof. Sushilla Knottenbelt for the positive presentation of the difficult topic contained in this paragraph.

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. Chegg, StackOverflow) or generative AI tools (e.g. ChatGPT) 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. The description of the assignments is subject to copyright.

If you do use ideas or anything that is not your original work, you **must cite the source** by writing down the complete reference to that source in your submission, failure to do this will be considered plagiarism. See section 5.8 for an expansion of this topic.

5.3   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.

5.4   Accommodations

UNM is committed to providing equitable access to learning opportunities for students with documented disabilities. As your instructor, it is my objective to facilitate an inclusive classroom setting, in which students have full access and opportunity to participate. To engage in a confidential conversation about the process for requesting reasonable accommodations for this class and/or program, please contact Accessibility Resource Center (`https://arc.unm.edu/`) at arc-srvs@unm.edu or by phone at 505-277-3506.

5.5   Title IX:

The University of New Mexico and its faculty are committed to supporting our students and providing an environment that is free of bias, discrimination, and harassment. The University's programs and activities, including the classroom, should always provide a space of mutual respect, kindness, and support without fear of harassment, violence, or discrimination. Discrimination on the basis of sex includes discrimination on the basis of assigned sex at birth, sex characteristics, pregnancy and pregnancy related conditions, sexual orientation and gender identity. If you have encountered any form of discrimination on the basis of sex, including sexual harassment, sexual assault, stalking, domestic or dating violence, we encourage you to report this to the University. You can access the confidential resources available on campus at the LoboRESPECT Advocacy Center (`https://loborespect.unm.edu`), the Women's Resource Center (`https://women.unm.edu`), and the LGBTQ Resource Center (`https://lgbtqrc.unm.edu`). If you speak with an instructor (including a TA or a GA) regarding an incident connected to discrimination on the basis of sex, they must notify UNM's Title IX Coordinator that you shared an experience relating to Title IX, even

if you ask the instructor not to disclose it. The Title IX Coordinator is available to assist you in understanding your options and in connecting you with all possible resources on and off campus. For more information on the campus policy regarding sexual misconduct and reporting, please see `https://policy.unm.edu/university-policies/2000/2740.html`and CEEO's website.

If you are pregnant or experiencing a pregnancy-related condition, you may contact UNM's Office of Compliance, Ethics, and Equal Opportunity at ceeo@unm.edu. The CEEO staff will provide you with access to available resources and supportive measures and assist you in understanding your rights.

5.6 Credit-hour statement

This is a three credit-hour course. Class meets for two 75-minute sessions of direct instruction for fifteen weeks during the Fall 2024 semester. Please plan for a minimum of six hours of out-of-class work (or homework, study, assignment completion, and class preparation) each week. Student Support: Resources to support study skills and time management are available through Student Learning Assistance (`https://ctl.unm.edu/undergraduate-students/index.html`) at the Center for Teaching and Learning in Zimmerman Library or online.

Support: Resources to support study skills and time management are available through Student Learning Support at the Center for Teaching and Learning. For undergraduate support: `https://ctl.unm.edu/undergraduate-students/index.html`. Similar resources are available in the CTL for graduate students.

5.7 Wellness

If you do need to stay home due to illness or are experiencing a wellness challenge, please take advantage of the resources below. You can communicate with me at soraya@unm.edu; I can work with you to provide alternatives for course participation and completion. Let me, an advisor, or another UNM staff member know that you need support so that we can connect you to the right resources. UNM is a mask friendly, but not a mask required, community. If you are experiencing COVID-19 symptoms, please do not come to class.
Support:. Student Health and Counseling (SHAC) at `http://shac.unm.edu` or (505) 277-3136. If you are having active respiratory symptoms (e.g., fever, cough, sore throat, etc.) AND need testing for COVID-19; OR If you recently tested positive and may need oral treatment, call SHAC. TimelyCare (`https://timelycare.unm.edu`): Free 24/7 virtual care services (medical, emotional support, health coaching, self-care, basic needs support).
LoboRESPECT Advocacy Center (`https://loborespect.unm.edu`) (505) 277-2911 can offer help with contacting faculty and managing challenges that impact your UNM experience.

5.8 Responsible Learning and Academic Honesty

Cheating and plagiarism (academic dishonesty) are often driven by lack of time, desperation, or lack of knowledge about how to identify a source. Communicate with me and ask for help, even at the last minute, rather than risking your academic career by committing academic dishonesty. Academic dishonesty involves presenting material as your own that has been generated on a website, in a publication, by an artificial intelligence algorithm (AI), by another person, or by otherwise breaking the rules of an assignment or exam. It is a Student Code of Conduct (`https://pathfinder.unm.edu/code-of-conduct.html`) violation that can lead to a disciplinary procedure. When you use a resource (such as an AI, article, a friend's (or tutor) work, or a website) in work submitted for this class, document how you used it and distinguish between your original work and the material taken from the resource.

Off-campus paper writing services, problem-checkers and services, websites, and AIs can produce incorrect or misleading results. Learning the course material depends on completing and submitting your own work. UNM preserves and protects the integrity of the academic community through multiple policies including policies on student grievances (Faculty Handbook D175 and D176), academic dishonesty (FH D100), and respectful campus (FH CO9). These are in the Student Pathfinder (https://pathfinder.unm.edu) and the Faculty Handbook (https://handbook.unm.edu).

Support: Many students have found that time management workshops or work with peer tutors can help them meet their goals. These and are other resources are available through Student Learning Support at the Center for Teaching and Learning.

5.9 Respectful Conduct Expectations

I am committed to building with you a positive classroom environment in which everyone can learn. I reserve the right to intervene and enforce standards of respectful behavior when classroom conduct is inconsistent with University expectations and/or classroom community agreements. Interventions and enforcement may include, but are not limited to, required meetings to discuss classroom expectations, written notification of expectations, and/or removal from a class meeting. Removal from a class meeting will result in an unexcused absence. Seven (7) or more unexcused absences may result in permanent removal and a drop from the course (see attendance policy). The University of New Mexico ensures freedom of academic inquiry, free expression and open debate, and a respectful campus through adherence to the following policies: D75: Classroom Conduct (`https://handbook.unm.edu/d75/`), Student Code of Conduct (`https://pathfinder.unm.edu/code-of-conduct.html`), University Policy 2240 – Respectful Campus (`https://policy.unm.edu/university-policies/2000/2240.html`, University Policy 2210 – Campus Violence (`https://policy.unm.edu/university-policies/2000/2210.html`.

5.10   Citizenship and/or Immigration Status

All students are welcome in this class regardless of citizenship, residency, or immigration status. I will respect your privacy if you choose to disclose your status. As for all students in the class, family emergency-related absences are normally excused with reasonable notice to me. UNM as an institution has made a core commitment to the success of all our students, including members of our undocumented community. The Administration's welcome is found on our website: `http://undocumented.unm.edu/`.

5.11   Connecting to Campus and Finding Support

UNM has many resources and centers to help you thrive, including opportunities to get involved, mental health resources, academic support such as tutoring, resource centers for people like you, free food at Lobo Food Pantry, and jobs on campus. Your advisor, staff at the resource centers and Dean of Students, and I can help you find the right opportunities for you.

5.12   Land Acknowledgement

Founded in 1889, the University of New Mexico sits on the traditional homelands of the Pueblo of Sandia. The original peoples of New Mexico Pueblo, Navajo, and Apache since time immemorial, have deep connections to the land and have made significant contributions to the broader community statewide. We honor the land itself and those who remain stewards of this land throughout the generations and also acknowledge our committed relationship to Indigenous peoples. We gratefully recognize our history.