
CS 2130

Computer Systems and Organization I

Course description

This course introduces students to the foundational concepts of computer systems and organization, bridging the gap between hardware design and high-level programming languages.

Topics span the computer architecture abstraction hierarchy from data storage at the silicon level, through logic gates, registers, and general-purpose processors, to the execution of C and assembly code. The first part of the course builds this hierarchy from the ground up: Boolean algebra and binary arithmetic, bitwise operations and floating-point representation, digital logic components such as adders, clocks, and registers, and how these pieces combine into a working computer built around the fetch-decode-execute cycle and its instruction set architecture (ISA). From there, the course moves into how humans actually program these machines, first by writing machine code and simple assembly directly, then x86-64 assembly, covering addressing modes, endianness, the stack, and how compilation translates higher-level code down to instructions the processor can run. The final part of the course focuses on C programming: syntax and control flow, pointers and memory management with malloc and free, string handling and standard library conventions, input/output, and how programs interact with the operating system through system calls.

Students will gain hands-on experience in writing low-level programs in C and x86-64 assembly, understanding how data is represented and manipulated in memory, and applying basic command-line development tools. Weekly labs reinforce each topic with practical exercises, from using the command line and a hex editor to building circuit simulators, debugging assembly, and tracking down memory errors in C.

The course also addresses ethical, legal, and security considerations relevant to computer systems, including topics such as patents and copyright in computing, and how software vulnerabilities such as buffer overruns are discovered and responsibly reported. By the end of the semester, students will possess the knowledge, skills, and critical perspective necessary to analyze, design, and reason about computing systems at multiple layers of abstraction.

At the end of it, you will be able to:

- Read and write C and (to a lesser extent) assembly
- Understand how C becomes assembly and how assembly is run by a computer
- Describe how both simple and complicated data is stored and manipulated in memory
- Design and reason about basic digital logic circuits and how they combine into a processor
- Discuss legal, ethical, and security issues related to these topics
- Use basic command-line development tools

Grade scale and breakdown

- **Lab work (70%):** Hands-on laboratory sessions form the core of the course assessment. Labs will involve practical exercises in computer systems, C programming, and assembly, with grading based on completion, accuracy, and demonstrated understanding.
- **First Midterm exam (15%):** This exam will cover the material you worked on since the beginning of the course until the week before the exam. Only topics covered during course will be asked. The format of the exam will be composed by one or several of each of the following types of exercises: multiple choice questions, definitions, concept questions, numerical calculations, problems. More information will be given during the last week of class before the Midterm Exam.
- **Final exam (15%):** This exam will cover the first and the second part of the course. Only topics covered during course will be asked. The format of the exam will be composed by one or several of each of the following types of exercises: multiple choice questions, definitions, concept questions, numerical calculations, problems. More information will be given during the last week of class before the Final Exam.

Grades will be awarded according to the UVA grading scale:

A 10-9 (90-100%)	B+ 7,9-7 (70-79%)	C 5,4-5 (50-54%)	F 4,9-0 (Below 50%)
A- 8,9-8 (80-89%)	B 6,9-6 (60-69%)		
	B- 5,9-5,5 (55-59%)		

Materials

All course materials, including lecture slides, lab instructions, and supplementary readings, will be available on the course UVA in Valencia platform. In certain cases, external articles or online resources may be provided to complement the course content. No textbook purchase is required, as all essential materials will be accessible through the course website.

Course planning and calendar

Date	Contents
07/09/2026	Course introduction, Boolean Algebra, Binary Arithmetic
10/09/2026	LAB 1: SSH Bash and the Command Line
14/09/2026	Bitwise-Operations, Floating Point Numbers
17/09/2026	LAB 2: Hex editor
21/09/2026	Adders, Clocks, Circuits and Code
24/09/2026	LAB 3: Circuits
28/09/2026	Building a Computer, Fetch, Decode Execute Instruction Set Architecture, Toy Instruction Set Architecture
01/10/2026	LAB 4: Simulator
05/10/2026	Toy Instruction Set Architecture, More Variables, Arrays, and More
08/10/2026	LAB 5: Programming in binary
12/10/2026	Día de la Hispanidad
15/10/2026	Fall Break
19/10/2026	Stacks and Functions, Backdoors
22/10/2026	Endianness, Assembly, x86-64 Assembly
26/10/2026	(MIDTERM EXAMS) *
29/10/2026	(MIDTERM EXAMS) *
02/11/2026	LAB 6: git, programming in assembly
05/11/2026	Assembly, Patents, Copyright, C and Compilation, C introduction
09/11/2026	LAB 7: Debugger
12/11/2026	C introduction
16/11/2026	LAB 8: char*
19/11/2026	C, Memory, malloc, free
23/11/2026	LAB 9: File-based
26/11/2026	C, Memory, string.h, C std library conventions
30/11/2026	LAB 10: Memory Errors
03/12/2026	C: stdio.h, varargs, unistd.h, Vulnerabilities, buffer overrun, reporting exploits, finale
07/12/2026	Puente (No class)
10/12/2026	Revision
14/12/2026	(FINAL EXAMS) *

* Specific dates for midterm and final exams will be finalized by the University later this term to ensure a balanced schedule across all courses.

Important information

1) Use of Spanish at the Center

The use of Spanish at the Center is strongly encouraged. Remember that you have come to Spain to learn Spanish and immerse yourself in its culture, and there is no better way to do so than by using Spanish on as many occasions as possible.

2) Class Attendance and Tardiness

2.1) Attendance and punctuality are essential for the successful completion of the course. Consequently, unexcused absences and lateness will negatively affect the final grade.

2.2) Only one unexcused absence is permitted. Please bear this in mind when planning trips or outings.

2.3) Arriving more than 5 minutes late to class will count as half an absence (1/2). It is the student's responsibility to notify the instructor of an absence before the class begins.

2.4) Arriving more than 30 minutes late to class will be considered an absence.

2.5) Four (4) unexcused absences will result in the student not receiving credit for the course.

2.6) Only documented absences will be considered excused: a religious holiday, a family emergency, or a medical appointment. Medical absences must be supported by a doctor's note and submitted at reception on the day the student returns to class after the incident has ended.

3) Academic Integrity

3.1) The exchange of information is not only permitted but is also a way of enriching the knowledge acquired during the course. However, all work submitted for each course must be individual and original in every respect. Any sources and direct quotations used must be properly cited.

3.2) Remember that the use of artificial intelligence to complete assignments or examinations is strictly prohibited unless an instructor expressly states otherwise. Such use constitutes a lack of authenticity, and may amount to direct plagiarism, in addition to undermining the development of critical thinking and writing skills, which are among the primary goals of this program. Failure to comply with this rule will result in a grade of "F" for the course.

3.3) Any work that has received credit for one course will NOT be accepted for credit in another course. There will be NO exceptions to this rule. Reusing such work will result in immediate failure of the second course. If assignments for two different courses are related in any way and the student has questions about whether the second project is permissible, the matter must be discussed with all instructors involved. This will prevent any possible unintentional violation of this rule.

3.4) As with punctuality, assignments must be submitted on time. Any late submission will result in a reduction of the grade for that assignment.

3.5) Failure to comply with the provisions set out above will result in the loss of the corresponding course credits for the course in which these rules have been violated.

3.6) If you have a documented special need that requires academic accommodations (SDAC), it must be certified by your home institution. Please contact the Head of Studies in Valencia, Mari'a Andre's (maria.andres@uvavalencia.org).

4) Activities, Workshops, and Lectures

Throughout the course, various activities, workshops, and lectures are organized. Participation may be voluntary or mandatory if the instructor considers the activity relevant to the course.

5) Classroom Conduct

5.1) It is very important that all students arrive to class on time, prepared, and with the materials needed for the day. During class, students must treat one another and the instructor with respect, demonstrate a positive attitude, and help create a participatory and collaborative environment that supports effective learning. Any violation of these expectations will have direct consequences.

5.2) Electronic devices (laptop, mobile phone, smartwatch) may be used in class only for course-related purposes. If a student uses such technology for personal reasons during class, the student may be penalized with an unexcused absence.

5.3) The use of computer or electronic technology during examinations is prohibited unless the instructor determines otherwise in accordance with the examination format.

6) Course Content

On occasion, and always within the context of the course, certain "sensitive" topics may be addressed both inside and outside the classroom. Therefore, if a student feels offended by such content in a particular class, the student may leave the class, and doing so will not have any negative effect whatsoever on the final grade. Faculty members will always be open to communication and dialogue in order to promote better intercultural understanding.

7) Final Clarification

The instructor may modify or add activities and/or change the dates indicated according to the learning needs of the group. Effective learning requires not only careful planning, but also a certain degree of flexibility.