

SYLLABUS

CS 720: LOGICAL FOUNDATIONS IN COMPUTER SCIENCE

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NO COURSES REQUIRED BY THE CS MAJOR, MINOR, OR CERTIFICATE MAY
BE TAKEN PASS/FAIL.

Course description. The course treats the logical foundations of computer science in a mathematically rigorous way but with emphasis on the applications of logic in computer science. Topics include the syntax and semantics of predicate logic, formal systems for predicate logic, many-sorted logic, and logic programming. Additional topics may include equational logic, algebraic specification, term rewriting, program verification, nonstandard logic, and databases. Students are expected to demonstrate an understanding of theoretical material and the ability to apply it.

Prerequisites. Math470 or equivalent and permission of the instructor.

Textbook. Software Foundations (Volume 1 and 2). Benjamin C. Pierce, *et al*¹.

Topics covered. Semantics of programming languages; Functional programming; Program equivalence; Operational semantics; Hoare Logic; Type systems.

Course work and grades

Final grade consists of:

¹<https://softwarefoundations.cis.upenn.edu/>

- Homework: 83%

HW1: 5%

HW2: 5%

HW3: 5%

HW4: 5%

HW5: 12%

HW6: 12%

HW7: 12%

HW8: 12%

HW9: 15%

- Presentations: 12.5%

- Participation: 4.5%

Notes:

- Your final grade will be a (possibly weighted) average of at most 9 homework assignments.
- If P is the final percentage of your homework and participation, then your course grade will be calculated as follows, where decimal points are discarded. For instance, a final grade of 69.99 yields a **C+**, **not** a **B-**.
 - To obtain a final grade of **D-**, or higher, you need to have **D-** points in all homework assignments. Otherwise, your final grade is capped at **F**.
 - To obtain a final grade of **C-**, or higher, you need to have **C-** in **all** assignments. Otherwise, your final grade is capped at **D+**.
- **There will be no exams.**

$95 \leq P$	A
$90 \leq P < 95$	A-
$85 \leq P < 90$	B+
$80 \leq P < 85$	B
$75 \leq P < 80$	B-
$70 \leq P < 75$	C+
$60 \leq P < 70$	C
$55 \leq P < 60$	C-
$50 \leq P < 55$	D+
$45 \leq P < 50$	D
$40 \leq P < 45$	D-
$P < 40$	F

Homework

- The final grade of each assignment is given by the *instructor*, regardless of what the grading software shows.
- **The instructor/TA can schedule an interview, outside of lecture hours, to test your knowledge of any homework assignment you submit;** points can be deducted as a result of the interview.
- Assignments may be deducted points for code style.
- **Each student can retake up to 3 homework assignments. Please note that attendance constraints how many retakes are available.**
- **Retakes are done during the exam season.**
- No late homework will be accepted. The reception of assignments is done automatically.
- You may **not** collaborate with anyone else on any homework. Each homework represents your own, individual work.
- It is *acceptable* to discuss the concept in general terms, but *unacceptable* to discuss specific solutions to any homework assignment.
- Homework assignments will be automatically scanned for plagiarism against the present year and all past years of this course.

Presentations

Each student will present one academic paper on verification or programming languages. The students may suggest which paper they would like to present.

Participation

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- More than 6 **justified** absences will result in deductions to the participation grade.
- Students with more than 6 **justified** absences will not be able to resubmit homework assignments during finals.

In case of a student not being able to attend a class, the student should contact the instructor as soon as possible. Students are responsible for knowing everything that is covered during class meetings, including announcements. If you must be absent from a class meeting, make arrangements with another student to find out what you missed.

Software requirements

Students are expected to have access to Rocq 9. Homework assignments consist of a Rocq script or a paper that will be submitted to Gradescope (unless stated otherwise).

Incomplete grade policy

We consider a **portion the required class work** to be *at most* 20% of the total work, as per the incomplete policy.² For instance, assuming this course has 8 homework assignments and all assignments have the same weight, then a portion of the required class work would be at most 1 homework assignment.

Here is an excerpt from the school's incomplete policy:

The grade incomplete (INC) is reported only where a portion of the assigned or required class work, or the final examination, has not been completed because of serious illness, extreme personal circumstances, or scholarly reasons at the request of the instructor. If your record is such that you would fail the course regardless of your missing work, you will fail.

Student Conduct

Education at UMass Boston is sustained by academic integrity. Academic integrity requires that all members of the campus community are honest, trustworthy, responsible, respectful, and fair in academic work at the university. As part of being educated here, students learn, exercise, increase, and uphold academic integrity. Academic integrity is essential within all classrooms, in the many spaces where academic work is carried out by all members of the UMass Boston community, and in our local and global communities where the value of this education fulfills its role as a public good. Students are expected to adhere to the Student Code of Conduct, including policies about academic integrity, delineated in the University of Massachusetts Boston Graduate Studies Bulletin, Undergraduate Catalog, and relevant program student handbook(s), linked at https://www.umb.edu/academics/academic_integrity.

Every solution submitted to our grading server is automatically compared against a solution database for plagiarism, which includes every solution from every student in past semesters.

AI tools

Unless instructed otherwise, AI is prohibited: In this class, all work submitted by students must be generated by the students themselves, whether working individually or in groups. Students should not have another person or entity

²https://www.umb.edu/registrar/academic_policies/incomplete_policy

do the writing of any portion of an assignment; this includes hiring a person or a company to write assignments and using AI tools like ChatGPT. All work submitted must contain citations for any material that has been quoted or referenced. If students are unsure about whether or not a source is appropriate to use in the assignment, they should contact the instructor.

Diversity, Equity, and Inclusion

This course is designed with the department's DEI commitment in mind, available at: <https://www.cs.umb.edu/dei>

Accommodations

This class seeks ways to become a working and evolving model of inclusion and universal design for all participants. Individuals with disabilities of any kind (including learning disabilities, ADHD, depression, health conditions), who require instructional, curricular, or test accommodations are responsible for make such needs known to the instructor as early as possible. Every effort will be made to accommodate students in a timely and confidential manner. Individuals who request accommodations must be registered with the Ross Center for Disability Services, which authorizes accommodations for students with disabilities. If applicable, students may obtain adaptation recommendations from the Ross Center for Disability Services,³ M-1-401, (617-287-7430). The student must present these recommendations and discuss them with each professor within a reasonable period, preferably by the end of Drop/Add period.

³<https://www.rosscenter.umb.edu>