Foundations of Computer Science (FOCS), Spring 2025

CSCI 2200, RPI

Mondays and Thursdays, 8:00am–9:50am, Darrin 308

The required techniques of effective reasoning are pretty formal,
but as long as programming is done by people that don't master them,
the software crisis will remain with us and will be considered an incurable disease.
— Edsger Dijkstra

As a computer scientist, your goal is to choose, design, and/or implement efficient algorithms that accomplish the goals for which they are designed. The aim of this course is to give you the tools necessary to establish *certainty* about your algorithms: that they do what they claim to. To that end, this course introduces the fundamental mathematics used in computer science for the purpose of ensuring such certainty: *discrete mathematics* and the *theory of computation*.

Discrete Mathematics:	proofs, sums and recurrences, graphs, counting and probability
Theory of Computation:	what is computing? what is computable?
	how can it be done (models of computing)? how fast can we do it (P vs NP)?

Instructors

Dan DiTursi (`ditursi` at rpi.edu)	Office Hours: Tue 9:30am-12pm ET and Thurs 2pm-4:30pm ET, AE 123A
Alex Gittens (`gittea` at rpi.edu)	Office Hours: Monday and Thursday 10am-11am ET, Lally 316

TAs

Mei Huang (`huangm10` at rpi.edu)	Office Hours: Monday 12pm-2pm ET, AE 127
Junseob Kim (`kimj43` at rpi.edu)	Office Hours: Thursday 2pm-4pm ET, AE 127
Lilian Ngweta (`ngwetl` at rpi.edu)	Office Hours: Friday 2-4pm ET, AE 127
Eric Scheer (`scheee2` at rpi.edu)	Office Hours: Tuesday 10am-12pm ET, AE 127
Xingjian Zhao (`zhaox8` at rpi.edu)	Office Hours: Monday 2pm-4pm ET, AE 127

Websites We are using Piazza to manage course discussions: `https://piazza.com/rpi/spring2025/csci2200/home`. The course website is `https://www.cs.rpi.edu/~gittea/old-site/teaching/spring2025/focs.html`

Text The textbook for the course is *Discrete Mathematics and Computing* by Magdon-Ismail. We *require* and all gradeables expect that you read and worked through the indicated portions of the text along with attending the lectures. One does not substitute for the other.

Prereqs CSCI 1200 (Data Struct.) + MATH 1010 (Calc I). Math 1020 (Calc II) is **strongly** recommended.

Learning Outcomes Upon successful completion of this course, each student:

- ✓ can define discrete mathematical objects and mathematical proofs using logic,
- ✓ can apply mathematical tools such as induction and recursion,
- ✓ can recall key definitions relating to discrete mathematical objects,
- ✓ can formulate combinatorial arguments,
- ✓ can define and compute the probability of an event,
- ✓ can develop formal models of computation and reason about computability within those models, and
- ✓ can recall key facts regarding finite automata and Turing machines.

Grading

Final	Exams (3)	Homeworks (13)
27%	**51%**	**22%**

Threshold	95%	90%	85%	80%	75%	70%	65%	60%	55%	50%	<50%
Grade	A	A-	B+	B	B-	C+	C	C-	D+	D	F

The lowest two homework grades will be dropped. The exams are non-cumulative and the final is cumulative. There are no makeup quizzes, homeworks, or exams except as required by institute policy. Special circumstances will be handled case-by-case, if the student presents an institute letter requesting it and if the instructors deem the request reasonable. Students should direct regrade requests towards their grading TAs. EWS warnings will be sent out twice during the course of the semester to help students assess their standing in the course.

Academic Integrity Student-teacher relationships are built on trust. For example, students must trust that teachers have made appropriate decisions about the structure and content of the courses they teach, and teachers must trust that the assignments that students turn in are their own. Acts that violate this trust undermine the educational process. The Rensselaer Handbook of Student Rights and Responsibilities and The Graduate Student Supplement define various forms of Academic Dishonesty and you should make yourself familiar with these. In this class, all assignments that are turned in for a grade must represent the student's own work. In cases where help was received, or teamwork was allowed, a notation on the assignment should indicate your collaboration.
Violations of academic integrity may also be reported to the appropriate Dean (Dean of Students for undergraduate students or the Dean of Graduate Education for graduate students, respectively).
If you have any question concerning this policy before submitting an assignment, please ask for clarification. In addition, you can visit the following site for more information on our Academic Integrity Policy: Students Rights, Responsibilities, and Judicial Affairs.

Collaboration and Academic Honesty All assignments that are turned in for a grade must represent the student's own work. In particular:

- **NO** discussion on exams. Discussion is allowed on homework but submitted work must be your own.
- **YOU ARE RESPONSIBLE FOR ENSURING THAT YOUR HOMEWORKS ARE NOT COPIED**.
- Copying from **anywhere** other than the class notes or your notes is **NOT** allowed.
- AI models, including Large Language Models such as ChatGPT, are not to be used for any form of assistance on the assignments in this course.
- You must write and understand all solutions yourself.

In cases of academic dishonesty, the minimum penalty is a course grade of F, and other institute-mandated protocols may be invoked.