

# CIT 592 Mathematical Foundations of Computer Science

Spring 2022

## Instructor

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## Course Description

The mathematics of computer science is built almost entirely on discrete math, especially on topics like combinatorics and graph theory. The current hot topics of big data and machine learning rely heavily on a good grasp of probability, and even general-purpose algorithms are now making clever use of randomness. In turn, in order to understand how combinatorics, probability, and graph theory are used, the student needs to become familiar with a certain amount of mathematical terminology and notation, as well as acquire the ability to construct some mathematical proofs. CIT 592 is designed to give you a strong fundamental knowledge of all these concepts.

## Course Learning Objectives

- Decypher and manipulate **mathematical notation** for sets, functions, operations, and relations, as applied to discrete modeling of computational problems.
- Construct informal but rigorous mathematical **proofs**.
- Apply combinatorics techniques to **counting** problems that arise in computation.
- Build **discrete probabilistic models** for random processes and behaviors that arise in computation.
- Apply **graph theory** to modeling problems that can be solved with computational methods.

## Course Prerequisites

There are no prerequisites for this class. No prior programming background is expected.

## Course Textbook

There is no required textbook for this course. Two textbooks that can be referred to for extra reading are “Mathematics: A Discrete Introduction” by Edward A. Scheinerman and “Discrete Mathematics for Computer Science” by David Liben-Nowell.

Detailed lecture notes are available along with each lecture video, as well as additional content presented as self-paced examples for you to work through.

## Grading & Assessment

You must attempt all graded assignments to pass the course. If you have any questions or concerns about grading or progress in the course, please reach out to the instructor.

This course will use a variety of assessments to determine whether learners understand and can apply the key concepts and skills that the course teaches. This includes:

Type	%	Description
Practice Quizzes	3%	There are fourteen practice quizzes, one for each module, providing an opportunity to review the concepts you will need for the homework.
Homework Assignments	28%	There are fourteen graded individual assignments (or “Homeworks”), each covering one module.
Timed Assignment 1	23%	There are three timed assignments and they will use live online proctoring. The timed assignments are not cumulative. Timed Assignment 1 covers Modules 1-6, Timed Assignment 2 covers Module 7-10, and Timed Assignment 3 covers Modules 11-14. There is no separate final exam.
Timed Assignment 2	23%	
Timed Assignment 3	23%	

Each graded assessment will use Gradescope for submission, and will require your submissions to be formatted using LaTeX. Information on using LaTeX is provided in Week 1. You will need to open the assignment through the external tool link in Coursera to get the grade to pass back correctly.

In 592 the class average in the first two offerings was between A- and A. Students who work hard are very likely to pass this course. Students who are at risk of failing the

course will be contacted by the course staff. Please see overall program requirements here

[\[https://www.coursera.org/learn/penn-mcit-onboarding/supplement/IBx1c/program-requirements\]](https://www.coursera.org/learn/penn-mcit-onboarding/supplement/IBx1c/program-requirements).

**Please read the instructions for each assignment very carefully to make sure you know what to submit to receive credit!**

### **Late Policy/Extensions**

There is no policy for submitting an assignment late, therefore no late work is accepted. Extensions may be approved for special circumstances (ie. medical reasons) on a case by case basis. For extraordinarily extenuating circumstances, please fill out the extension request form located under the Course Resources page in Coursera. Please fill out this form for any and all extension requests you wish to submit. These extension requests must be submitted at least 24 hours before the assignment deadline. **If your request is granted, you will see updated deadlines reflected in Coursera and Gradescope by Mondays at 5 pm ET.** You will need to fill out this form for each assignment you wish to have an extension for.

### **Regrade Requests**

Regrade requests are handled on a case-by-case basis and are accepted only for up to 1 week after the grades are released. Requests must be created through the facility that Gradescope provides for this.

Regrade requests may take up to a week to process at the discretion of the faculty. When submitting a regrade request, please explain (in detail) why you feel the grading is incorrect.

Moreover, please be aware that a regrade request may result in a lowering of the score and not necessarily in an increase of the score or no change to the score.

### **Other Course Activities**

The following activities are not mandatory, but will greatly support your success on the graded assignments.

## Discussion Forum

Discussion forums (on Piazza) are designed to give you optional extra practice with the material, and to see examples of how your classmates are thinking and working.

## Recitation

Recitations are weekly live sessions with your TAs designed around one or several problems/activities that are supposed to take about an hour to complete. TAs will answer questions as you work through the problem or answer questions that you have submitted in advance of the session. If you are not able to attend any of the scheduled recitation times, you can review a recording of the session, posted the day after.

## Additional Segments

The professor may add additional optional segments to support the class as needed.

## Creating an Inclusive Environment

All members of the course community – the instructor, TAs, and students – are expected to work together to create a supportive, inclusive environment that welcomes all students, regardless of their race, ethnicity, gender identity, sexuality, religious beliefs, physical or mental health status, or socioeconomic status. Diversity, inclusion, and belonging are all core values of the MCIT Online program, the instruction staff, and this course. **All participants in this course deserve to and should expect to be treated with respect by other members of the community.**

Discussion boards, messaging channels, recitations, office hours, and group working time should be spaces where everyone feels welcome and safe. In order to facilitate a welcoming environment, students of this course are expected to:

- Exercise consideration and respect in their speech and actions
- Attempt collaboration and consideration, including listening to opposing perspectives and authentically and respectfully raising concerns, before conflict
- Refrain from demeaning, discriminatory, or harassing behavior and speech

All members of the course community are expected to be familiar with and abide by the University's guidelines on general conduct and sexual harassment:

- University Code of Conduct:  
<https://catalog.upenn.edu/pennbook/code-of-student-conduct/>
- University Sexual Harassment Policy:  
<http://www.upenn.edu/affirm-action/introsh.html>

Students should also be familiar with other University guidelines regarding personal conduct:

- Conduct & Personal Responsibility guidelines in Pennbook:  
<https://catalog.upenn.edu/pennbook/#policiesbytopictext>
- University Principles of Responsible Conduct:  
[http://www.upenn.edu/audit/oacp\\_principles.htm](http://www.upenn.edu/audit/oacp_principles.htm)

If you are a victim of, witness, or are otherwise affected by unacceptable behavior:

- In cases of sexual harassment or assault, please consult DPS Special Services (<https://www.publicsafety.upenn.edu/about/special-services/sensitive-crimes/> at 215-573-3333; this is a confidential resource.
- To report other bias incidents, contact the Penn Office of Diversity:  
<https://diversity.upenn.edu/diversity-at-penn/bias-motivated-incident-report>
- For other violations of the code of student conduct, the Office of Student Conduct has an incident reporting form at <https://www.osc.upenn.edu/referral-form>

If you are unsure which office to contact, please contact the instructor or any Penn Engineering Online Learning staff member.

## Getting and Giving Help

### TA and Faculty Support

TAs will hold office hours weekly where they will open a que in PennLab's OHQ.io system [Coursera - OHQ.io Resource](#).

Your professor will hold weekly live Open Office Hours (OOH) where questions are asked and answered in a group setting. If you are not able to attend any of the scheduled OOH times, you can review a recording of the session, posted the day after. In addition, the professor will be available for a limited number of private meetings per week, depending on the needs of the class.

### Collaboration Guidelines and Academic Integrity Issues

Discussion forums, recitations, and open office hours *are* collaborative —please take advantage of those times to work with your colleagues. For general communication with your colleagues, use your Slack channels or Slack direct messages.

Forming study groups to understand the material is also a good idea, as long as you stay on the conceptual level and are not collaborating on the graded assignments directly. Direct collaboration on the homework solutions constitutes cheating. When in doubt, always ask the instructor or TA first, to avoid any potential collaboration that can lead to academic dishonesty.

Posting our homework questions on online help/tutoring websites constitutes cheating. Searching online for solutions to our homework questions constitutes cheating even if you were not the one who posted the questions. Please be warned that online help/tutoring websites cooperate with our University in order to end this kind of cheating. The timed exam questions are also confidential. Sharing them with others, whether students in the same class or not, constitutes cheating.

In proctored exams you are allowed to submit your answers only while the proctor is present. Attempting to do so outside of the proctored time constitutes cheating and Gradescope collaborates with us to identify such attempts.

*Cheating* will be dealt with severely, including failure in the course and referral to the Penn Office of Student Conduct who can apply penalties such as suspension or expulsion.

You can further read Penn's [Code of Academic Integrity](#) page on this subject matter, as well as the SEAS Graduate Student guidelines on the code of ethics.

**Please note that searching for solutions or code online is a violation of academic integrity. Sharing solutions or code with another student (unless working on a group project or other collaborative assignment) is also a violation of academic integrity. This includes posting solutions and code publicly online, even after you've completed the course. If you discover publicly viewable solutions for the assignments of this course, please let the course staff know immediately.**

## **Access to Materials and Content Before and After Graduation**

If you would like to retain copies of your submitted assignments, you must download them from Gradescope, Coursera, Codio, and any other platforms that you submit to during the semester in which you are taking that course.

Your SEAS account will be permanently deleted in the fall following your graduation. Once your SEAS account is deleted, we will be unable to re-grant you access to the MCIT Online Program materials and course content. Therefore, if you would like to retain the content from each course after you graduate from the program, you must download the content locally to your computer during the semester that you are in the course.

## Spring 2022 Course Schedule and Important Dates

Dates are subject to change. Please check Piazza for announcements regarding schedule changes.

Assignment	Deadline
Quiz: Module 1 Practice Quiz	Jan.17
Staff Graded Assignment: Module 1 Assignment	Jan.17
Quiz: Module 2 Practice Quiz	Jan.24
Staff Graded Assignment: Module 2 Assignment	Jan.24
Quiz: Module 3 Practice Quiz	Jan.31
Staff Graded Assignment: Module 3 Assignment	Jan.31
Quiz: Module 4 Practice Quiz	Feb.7
Staff Graded Assignment: Module 4 Assignment	Feb.7
Quiz: Module 5 Practice Quiz	Feb.14
Staff Graded Assignment: Module 5 Assignment	Feb.14
Quiz: Module 6 Practice Quiz	Feb.21
Staff Graded Assignment: Module 6 Assignment	Feb.21
Staff Graded Assignment: Timed Assignment 1: Counting, Proofs, Terminology & Notation	Feb. 24-27
Quiz: Module 7 Practice Quiz	Mar.2
Staff Graded Assignment: Module 7 Assignment	Mar.2
Quiz: Module 8 Practice Quiz	Mar.14
Staff Graded Assignment: Module 8 Assignment	Mar.14
Quiz: Module 9 Practice Quiz	Mar.21
Staff Graded Assignment: Module 9 Assignment	Mar.21
Quiz: Module 10 Practice Quiz	Mar.28
Staff Graded Assignment: Module 10 Assignment	Mar.28
Staff Graded Assignment: Timed Assignment 2: Probability	Mar. 31-Apr. 3
Quiz: Module 11 Practice Quiz	Apr.6

Staff Graded Assignment: Module 11 Assignment	Apr.6
Quiz: Module 12 Practice Quiz	Apr.11
Staff Graded Assignment: Module 12 Assignment	Apr.11
Quiz: Module 13 Practice Quiz	Apr.18
Staff Graded Assignment: Module 13 Assignment	Apr.18
Quiz: Module 14 Practice Quiz	Apr.25
Staff Graded Assignment: Module 14 Assignment	Apr.25
Staff Graded Assignment: Timed Assignment 3: Graph Theory	Apr. 28-May 1