

MATH-UA.0120-004: Discrete Mathematics

Fall 2020

Instructor	Michel Pain	Lecture	MW 3:30–5:20pm
Email	michel.pain@nyu.edu	Classroom	CIWW 312
Office	CIWW 619	Office hours	Thursday at 9–11am on Zoom, or by appointment

Course Goals

This course is a one-semester introduction to discrete mathematics with an emphasis on the understanding, composition and critiquing of mathematical proofs. At the semester's conclusion, the successful student will be able to:

- write clear mathematical statements using standard notation and terminology.
- understand and execute a variety of proof techniques (direct, contradiction, combinatorial, inductive, etc.).
- show fluency in the language of basic set theory and Boolean logic.
- understand the basic theorems and their implications in a variety of fields including: function theory, discrete probability theory, number theory and graph theory.

Prerequisites (one of the following): SAT math score of 670, ACT/ACTE math score of 30, AB/BC score of 3, A/AS level maths score of C/B, IB HL/SL score of 5/6, MATH-UA 009 Algebra & Calculus grade of C, or placement exam.

Textbook

The textbook for the course is *Mathematics A Discrete Introduction*, by Edward R. Scheinerman (3rd edition). Readings associated to each lecture are indicated on the calendar; you are encouraged to read these before coming to class.

This course is participating in the Follett Access program. This is an NYU Bookstore initiative that will deliver the textbook to you **digitally** at the lowest possible price. You will receive an email the week before classes giving you the link to access the material. The cost of the book is \$28.25, which will be added as a book charge to your bursar bill, this is a savings of \$221.75 over the new hardcopy price. If you decide not to use this digital edition you can opt-out of the program. The deadline for opting out is September 17th. The link to opt out of the program is: <https://includedcp.follett.com/2015>

Communication

Main announcements concerning the class will be made through NYU Classes. In addition to this, we will use the platform **Campuswire** for class-related communication. You will be able to post messages publicly so that everyone can see or to send direct messages to the instructor. If you have questions about the homework, or a general question about the lecture material, please post this publicly. This way everyone in the class will benefit from the answer as it is likely that several people have a similar question. If you see a question for which you know or have an idea about the answer, please do post to respond. The instructor will monitor the posts frequently and indicate whether they are correct. Even if they aren't, it's ok! It's much better to have an incorrect idea and find out soon, than to keep thinking the incorrect idea and make mistakes on the test.

Assessments

Your course score will be determined as the following weighted average:

Exams	40%	Problem Sets	10%	Quizzes	10%	Project	10%
Participation	10%	Peer review	10%	Portfolio	10%		

This score will be converted to a letter grade with the values below as cutoffs. These cutoffs might be adjusted at the end of the semester (the so-called curve), but only in the downward direction (to make letter grades higher).

A	A−	B+	B	B−	C+	C	D	F
[100, 93]	(93, 90]	(90, 87]	(87, 83]	(83, 80]	(80, 75]	(75, 65]	(65, 50]	(50, 0]

Exams (40%)

There will be four exams. The first three will be taken in class and last one hour. The final exam will be taken after the end of classes. For students in time zones where the class meeting takes place during the night, another session will be scheduled. During the exam, you will not be allowed to consult resources other than the textbook and class notes.

Exam 1	October 5	Chapters 1–2
Exam 2	October 26	Chapters 1–4
Exam 3	November 16	Chapters 1–6
Exam 4	TBD	Chapters 1–7 and 9

There will be no accommodation for missed exams, except in the cases of illness, observance of religious holidays and school-sanctioned events (such as athletics). In the case of observance of religious holidays or school-sanctioned events, you must make arrangements to make up missed work **at least one week in advance**. In the case of illness, the instructor should be warned **before** the exam starts and you must present a detailed letter from a physician/health care provider. Students with disabilities can make arrangements at the Moses Center.

Problem Sets or HW (10%)

Problem sets will be due on selected Fridays after each chapter studied, at 11pm via **Gradescope**. Your answers should be written with LaTeX. Grading of homework will be based on clarity and correctness of mathematical arguments: you should detail the steps of your reasoning and cite theorems and definitions used. In fairness to graders and other students in the course, late homework will not be accepted (no exceptions). One problem set score will be dropped from your course grade. Students are encouraged to work together, but submitted assignments must be written individually in your own words. Submitting two very similar sets of solutions is a violation of academic integrity and will be disciplined by the university. The best way to ensure this does not happen is to write your solutions separately.

Quizzes (10%)

Quizzes will be available on **Gradescope**, 24 hours before Mondays class start time. Students can select any 20 minute interval of convenience during this window to complete the quiz. Your response should be written individually without consulting resources other than the textbook and class notes. There will be no makeup quizzes (no exceptions). Two quiz scores will be dropped from your course grade.

Project (10%)

For the project, student groups will summarize and present history, definitions, theorem, examples and proof technique of a discrete math topic. Various topics will be proposed at the end of October. The summary paper should be 4-5 pages in length and submitted in PDF LaTeX on **Gradescope**. The presentation should be no more than 5 minutes long, consist of slides prepared using the Beamer package in LaTeX, video recorded, uploaded to **NYU Classes/Media Gallery** for access to the instructor and classmates. The summary paper and presentation are due on Friday, December 11.

Participation (10%)

Students are expected to attend all class meetings. Students in time zones where the class meeting takes place during the night are expected to watch the recording of the class in the 24 hours after class time. Active participation is encouraged to enrich class discussions and deepen understanding of course topics. Students may participate by answering/asking questions during class and on Campuswire, presenting solutions in class, responding to surveys/polls, etc.

Peer review (10%)

Students will **submit** their responses to selected in-class exercises on **NYU Classes/Assignments** for peer review after class meetings on Monday. Answers are due on Tuesday at 3:30pm. Your response should be written individually without consulting resources other than the textbook and class notes. Students have to **review** two responses on NYU Classes/Assignments by 3:30pm on Wednesday. Two peer review scores will be dropped from your course grade.

Portfolio (10%)

Students will maintain a portfolio to document their growth and learning in the course. The portfolio will include samples of your proof writing and reflective writing pieces. Each part of your portfolio must be submitted in PDF LaTeX on **Gradescope** on selected Fridays before 11pm.

Honor Code

We value integrity and do not tolerate academic dishonesty. You are expected to uphold academic integrity as specified by the university and the College of Arts and Sciences (<https://cas.nyu.edu/content/nyu-as/cas/academic-integrity.html>).

Other Course Policies

Your safety and success in the course is important to me. For security purposes, students must join class meetings on NYU Classes/Zoom. All in-person meetings must meet current physical distancing and face covering guidelines. Students are expected to contribute to a positive learning community: arrive on time to class, turn cameras on during class time, participate meaningfully in class and learn from one another. I am available during office hours to discuss course material and by appointment to address personal matters. Peer tutoring is available to all students by the Math Department and University Learning Center. Students with disabilities should contact the Moses Center to make arrangements for academic accommodations as soon as practicable. If you are in a situation that is adversely impacting your coursework, contact me and your academic advisor immediately so we can make a plan to move forward.

MATH-UA.0120-004: Discrete Mathematics, Fall 2020, Tentative Calendar				
Week	Day	Date	Schneiderman	Topics
1	M	8/31	Chap 1: 1-3	Introduction, definitions
	W	9/2		Labor Day
2	M	9/7	Chap 1: 4-5	Statement and proofs
	W	9/9		Counterexamples, Boolean algebra
3	M	9/14	Chap 1: 6-7 Chap 2: 8-9	Lists, factorials
	W	9/16		
4	M	9/21	Chap 2: 10 Chap 2: 11-12	Sets I
	W	9/23		Quantifiers, sets II
5	M	9/28	Chap 2: 13 Chap 3: 14-15	Combinatorial proof
	W	9/30		Equivalence relations
6	M	10/5	Chap 3: 16-17	Exam 1
	W	10/7		Partitions, binomial coefficients
7	M	10/12	Chap 4: 20 Chap 4: 21-22	Contradiction
	W	10/14		Induction
8	M	10/19	Chap 4: 22-23 Chap 4: 23	Strong induction and recurrence relations
	W	10/21		More recurrence relations
9	M	10/26	Chap 5: 24	Exam 2
	W	10/28		Functions
10	M	11/2	Chap 5: 25-26 Chap 6: 30-31	Pigeonhole and composition
	W	11/4		Sample Space, Events
11	M	11/9	Chap 6: 32 Chap 6: 33-34	Conditional Probability, Independence
	W	11/11		Random Variables, Expectation
12	M	11/16	Chap 7: 35	Exam 3
	W	11/18		Divisibility
13	M	11/23	Chap 7: 36 Chap 7: 39	Greatest Common Divisor
	W	11/25		Factoring
14	M	11/30	Chap 8: 47,48 Chap 8: 49	Graphs, subgraphs
	W	12/2		Connection
15	M	12/7	Chap 8: 50 Chap 8: 51	Trees
	W	12/9		Eulerian Graphs
		TBD		Exam 4