

Syllabus for Discrete Structures

Spring 2024, Howard University

Course & Section #: Math 181 - 02
Class time: Mon-Wed-Fri, 3:10-4:00pm
Classroom: Douglass Hall - #113/114
Website: <http://www.samuelhopkins.com/classes/181.html>

Instructor: Sam Hopkins
Email: sam.hopkins@howard.edu
Office: Annex III (Graduate School) - #220
Office Hours: Wed 2-3pm (or by appointment)

Course content: In Discrete Structures, we will consider the basics of mathematical logic, set theory, and discrete mathematics (combinatorics and/or graph theory), and will learn to construct and write rigorous mathematical proofs.

Prerequisites: Math 157 (Calculus II)

Textbook: *Discrete Mathematics*, 8th edition, by R. Johnsonbaugh.

Grading: 40% Homeworks • Each of two Midterms 20% • Final 20%

Homework problems will be assigned each Wednesday and due the next Wednesday, except for midterm weeks. There will be 12 total homeworks and your lowest 2 scores will be dropped (so 10 of the 12 will count). Barring exceptional circumstances, you must **turn in** your homeworks **during class** on Wednesdays.

There will be two in-class **midterms** in the semester. They will take place on Wednesdays and be announced 1-2 weeks in advance.

The **final** will happen after the end of classes, during finals week.

This is a proof-based class, so it is important that you write **explanations** for your answers. Full credit will only be given for convincing arguments.

Collaboration on homework assignments is permitted, as long as each person writes their own solutions and writes with whom they collaborated. The use of calculators (beyond "simple arithmetic") or other tools from the Internet, is not permitted. You may use your own notes and the textbook on the homework assignments, but the in-class tests are closed-book. Do not use your phone during class and especially not during tests.

Assignments and grades will be posted to the Canvas page. I may consider other factors, like class participation, when determining final letter grades, especially in borderline cases.

Detailed outline: We will try to cover material from Chapters 1, 2, 3, and 6 of the textbook. We may cover more if we have time. The topics we will discuss include:

Chapter 1: Sets and Logic

- 1.1 Sets
- 1.2 Propositions
- 1.3 Conditional Propositions and Logical Equivalences
- 1.4 Arguments and Rules of Inference
- 1.5 Quantifiers
- 1.6 Nested Quantifiers

Chapter 2: Proofs

- 2.1 Mathematical Systems, Direct Proofs, and Counterexamples
- 2.2 More Methods of Proof
- 2.4 Mathematical Induction
- 2.5 Strong Form of Induction and the Well-Ordering Principle

Chapter 3: Functions, Sequences, and Relations

- 3.1 Functions
- 3.2 Sequences and Strings
- 3.3 Relations
- 3.4 Equivalence Relations

Chapter 6: Counting Methods and the Pigeonhole Principle

- 6.1 Basic Principles
- 6.2 Permutations and Combinations
- 6.3 Generalized Permutations and Combinations
- 6.7 Binomial Coefficients and Combinatorial Identities
- 6.8 The Pigeonhole Principle

Reproduced below this line are various department- and school-wide policy statements.

Academic Code of Student Conduct (*please see Howard University handbook*): No copying, unauthorized use of calculators, books, or other materials, or changing of answers or other academic dishonesty will be tolerated. Cheating will not be tolerated. Anyone caught cheating will receive an F for the course and may be expelled from the university.

Grievance Procedure: If you have any problems with the policies or rules of this course, discuss your concerns with your instructor. If you are still unable to come to a satisfactory arrangement, you may contact (depending on your status) the Director of Undergraduate Studies, Dr. Jill McGowan, jmcgowan@howard.edu, or the Director of Graduate Studies, Dr. Henok Mawi, henok.mawi@howard.edu, and then, finally, the Chair of the Department, Dr. Bourama Toni, bourama.toni@howard.edu.

Americans with Disabilities Act: Howard University is committed to providing an educational environment that is accessible to all students. In accordance with this policy, students in need of accommodations due to a disability should contact the Office of Student Services (202-238-2420, oss.disabilityservices@howard.edu) for verification and determination of reasonable accommodations as soon as possible after admission and at the beginning of each semester as needed.

Statement on Sex and Gender-Based Discrimination, Harassment and Violence: Howard University's Policy Prohibiting Sex and Gender-Based Discrimination, Sexual Misconduct and Retaliation (aka, the Title IX Policy) prohibits discrimination, harassment, and violence based on sex, gender, gender expression, gender identity, sexual orientation, pregnancy, or marital status. With the exception of certain employees designated as confidential, note that all Howard University employees – including all faculty members – are required to report any information they receive regarding known or suspected prohibited conduct under the Title IX Policy to the Title IX Office (TitleIX@howard.edu or 202-806-2550), regardless of how they learn of it. For confidential support and assistance, you may contact the Interpersonal Violence Prevention Program (202-836-1401) or the University Counseling Service (202-806-7540). To learn more about your rights, resources, and options for reporting and/or seeking confidential support services (including additional confidential resources, both on and off campus), visit <https://howard.edu/title-ix>.