

Syllabus for (Graduate) Combinatorics II

Spring 2024, Howard University

Course #: Math 274
Class time: Mon-Wed, 12:10-1:30pm
Douglass Hall - #207
Website: <http://www.samuelhopkins.com/classes/274.html>

Instructor: Sam Hopkins
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Office: Annex III (Graduate School) - #220
Office Hours: By appointment

Course content: We will continue to study the enumeration of discrete structures, with a new focus on connections to algebra (a.k.a. symmetries!).

Prerequisites: Calculus, linear algebra, undergraduate algebra (groups, rings, fields)
It's helpful to have taken the 1st semester of grad combinatorics, but is not strictly necessary.

Textbook: B. Sagan, Combinatorics: the Art of Counting.

Grading: There will be 3 homework assignments for the semester.

The grading of the assignments will depend on both the quality and quantity of homework turned in. Beyond that, I expect you to show up to class and be engaged. Collaboration on the homework is encouraged, as long as each person understands the solutions, writes them up in their own words, and indicates with whom they collaborated.

Detailed outline: Roughly speaking we will try to cover the following:

- Group actions on combinatorial sets:
 - group actions, orbits, stabilizers, etc.,
 - Burnside's Lemma,
 - Pólya-Redfield enumeration
- Symmetric functions:
 - the ring of symmetric functions and its bases,
 - Schur functions and semistandard Young tableaux,
 - the Lindström-Gessel-Viennot lemma and the Jacobi-Trudi formula,
 - reverse plane partitions and the Hillman-Grassl correspondence,
 - standard Young tableaux and the hook length formula,
 - the Robinson-Schensted-Knuth correspondence,
 - increasing and decreasing subsequences,
 - the representation theory of the symmetric group

But if there are any topics you are especially interested in, please let me know! I am happy to tailor this course to the interests of the students.

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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.

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