

# Combinatorial Enumeration

Winter 2022, MATH 5819W

[School of Mathematics and Statistics, Carleton University](#)

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**Lectures (online) :** Tuesday and Thursday 1:05 - 2:25pm.

**Office hours:** Tuesday and Thursday 10:30-11:30am, or by appointment.

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## General Information

- **Textbook:** "Analytic Combinatorics", by [P. Flajolet](#) and [R. Sedgewick](#), Cambridge University Press 2009.
- **Reference:** [Generatingfunctionology](#), [Herb Wilf](#)

This course will be delivered online using ZOOM in Brightspace. To access your courses in Brightspace go to

<https://brightspace.carleton.ca> Please use the *help link* there if you need further assistance.

**This class or portions of this class will be recorded by the instructor for educational purposes. These recordings will be shared only with students enrolled in the course. Your instructor will communicate how you can access the recordings.**

**Unauthorized student recording of classroom or other academic activities (including advising sessions or office hours) is prohibited. Unauthorized recording is unethical and may also be a violation of University policy. Students requesting the use of assistive technology as an accommodation should contact the **Paul Menton Centre**. Unauthorized use of classroom recordings – including distributing or posting them – is also prohibited. Under the University's **Copyright Policy**, faculty own the copyright to instructional materials – including those resources created specifically for the purposes of instruction, such as lectures slides, lecture notes, and presentations. Students cannot copy, reproduce, display, or distribute these materials or otherwise circulate these materials without the instructor's written permission. Students who engage in unauthorized recording, unauthorized use of a recording, or unauthorized distribution of instructional materials will be referred to the appropriate University office for follow-up.**

## A tentative schedule

Topics	Book chapter	approx. # of weeks
Enumeration examples, exact formulas, asymptotic formulas, recursions, ordinary and exponential generating functions, formal power series, the multi-section formula, Dirichlet generating functions, Möbius inversion formula.	Invitation, A1,A5.	1.5
Symbolic enumeration methods for unlabelled structures, ordinary generating functions, words, trees, integer compositions and partitions.	I	2
Symbolic enumeration methods for labelled structures, exponential generating functions, permutations, set partitions, labelled trees, some special constructions.	II	2.5
Test, in Tuesday's class		<b>Mar 01</b>
Combinatorial parameters and multivariate generating functions, use bivariate generating functions to compute average and variance.	III	2
Power series and singularities, Darboux's theorem, singularity analysis and transfer theorems, saddle point method and Hayman's theorem, Lagrange inversion formula.	VI.1-6, VII. 1-5 VIII. 1-5	2.5
Transfer matrix models, distributions of parameters of random structures.	V.6, IX.1-5	1.5
<b>Total</b>		<b>12.5</b>

## Evaluation

- Final Exam 60% (a 3-hour closed book examination).
- Assignments (2) 20%.
- Midterm test 20%. To be held on **Mar 01 (Tuesday)**.

Assignments will be posted on brightspace; in due time solutions will also be posted. In order to pass the comprehensive a final exam mark of 70% is required; see the graduate calendar for details.

**Plagiarism is a serious academic offence and may lead to a failure grade.**

**E-Proctoring: Please note that test and final examination in this course will use a remote proctoring service provided by Scheduling and Examination Services. You can find more information at <https://carleton.ca/ses/e-proctoring/>.**

The minimum computing requirements for this service are as follows:

Hardware: Desktop, or Laptop

OS: Windows 10, Mac OS 10.14, Linux Ubuntu 18.04

Internet Browser: Google Chrome, Mozilla Firefox, Apple Safari, or

Microsoft Edge

Internet Connection (High-Speed Internet Connection Recommended)

Webcam (HD resolution recommended)

Note: Tablets, Chromebooks and Smartphones are not supported at this time. Windows-based tablets are not supported at this time.

## Academic accommodation

You may need special arrangements to meet your academic obligations during the term. For an accommodation request the processes are as follows:

**Pregnancy obligation:** write to me with any requests for academic accommodation during the first two weeks of class, or as soon as possible after the need for accommodation is known to exist. For more details visit the Equity Services website: <http://www2.carleton.ca/equity/>

**Religious obligation:** write to me with any requests for academic accommodation during the first two weeks of class, or as soon as possible after the need for accommodation is known to exist. For more details visit the Equity Services website: <http://www2.carleton.ca/equity/>

**Academic Accommodations for Students with Disabilities:** The **Paul Menton Centre** for Students with Disabilities (PMC) provides services to students with Learning Disabilities (LD), psychiatric/mental health disabilities, Attention Deficit Hyperactivity Disorder (ADHD), Autism Spectrum Disorders (ASD), chronic medical conditions, and impairments in mobility, hearing, and vision. If you have a disability requiring academic accommodations in this course, please contact PMC at 613-520-6608 or [pmc@carleton.ca](mailto:pmc@carleton.ca) for a formal evaluation. If you are already registered with the PMC, contact your PMC coordinator to send me your **Letter of Accommodation** at the beginning of the term, and no later than two weeks before the first in-class scheduled test or exam requiring accommodation (*if applicable*). After requesting accommodation from PMC, meet with me to ensure accommodation arrangements are made. Please consult the PMC website for the deadline to request accommodations for the formally-scheduled exam (*if applicable*) at <http://www2.carleton.ca/pmc/new-and-current-students/dates-and-deadlines/>

You can visit the Equity Services website to view the policies and to obtain more detailed information on academic accommodation at <http://www2.carleton.ca/eq>