

Carleton University
School of Mathematics and Statistics
Discrete Structures and Applications
Comp3805A/Math3825A/Math3855A, Winter 2020

Instructor: Dr. Steven Wang
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Day and time of course: Monday, Wednesday: 4:05 pm - 5:25 pm,
Southam Hall 318

Office hours: 3:00pm -4:00pm Monday, Wednesday, 4368HP

Textbook: “*Discrete Mathematics*” by Norman L. Biggs (Oxford Science Publications, 2nd edition).

Prerequisites: One of MATH2108 or MATH3101.

Course Objective: The purpose of this course is to introduce students to the methods and techniques of discrete mathematics and applications. We will study 4 major topics: Enumeration (elementary methods, inclusion and exclusion, and etc); Generating functions and applications (recurrence relations, partitions of positive integers, etc); Graph theory and algorithms (connectivity, planarity, Hamiltonian cycle and Eulerian walk, etc); Error-correcting codes.

Evaluation: Midterm (15%), Tutorials (5%), Assignments (20%), and Final Examination (60%).

Tutorials: Wednesday 17:35-18:25, Southam Hall 318. Tutorials begin on January 15, 2020. Tutorials are a very important part of this course. In each tutorial you will be given several questions to work on. You are grouped in a team of four or five students. You may have discussions with the TA and/or your study partners about the tutorial questions. At the end, each team submits one set of answer to the TA. Each member will have the same mark (0, or 2, or 4). TA’s name and office hour will be announced later.

Midterm Exam: The midterm exam (Feb. 26) worth 15 marks.

Assignments: Two assignments (10 marks each). Due dates: Feb. 12 and Mar. 18.

Final Examination: This is a three hour closed-book exam scheduled by the University and will take place sometime during the examination period.

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://carleton.ca/equity/accommodation/student_guide.htm

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://carleton.ca/equity/accommodation/student_guide.htm

Students with disabilities requiring academic accommodations: in this course must register with the Paul Menton Centre for Students with Disabilities (PMC) for a formal evaluation of disability-related needs. Documented disabilities could include but are not limited to mobility/physical impairments, specific Learning Disabilities (LD), psychiatric/psychological disabilities, sensory disabilities, Attention Deficit Hyperactivity Disorder (ADHD), and chronic medical conditions. Registered PMC students are required to contact the PMC, 613-520-6608, every term to ensure that I receive your Letter of Accommodation, no later than two weeks before the first assignment is due or the first in-class test/midterm requiring accommodations. If you only require accommodations for your formally scheduled exam(s) in this course, please submit your request for accommodations to PMC by the last official day to withdraw from classes in each term. For more details visit the PMC website: http://www.carleton.ca/pmc/students/acad_accom.htm

Tentative lecture schedule

| Week | Dates | Sections | Topics |
|------|-----------------|---------------------------|---|
| 1 | Jan. 6-10 | 6.2; 6.4; 10.1-10.2 | Introduction, Pigeonhole and addition principle. Counting sets of pairs; |
| 2 | Jan. 13-17 | 10.3 -10.6 | Euler's function; Functions, words and selections; ordered selections without repetitions; permutations |
| 3 | Jan. 20-24 | 11.1-11.4 | binomial numbers; unordered selections with repetitions; binomial theorem; |
| 4 | Jan. 27 -31 | 11.5-11.7; 12.1 - 12.2 | sieve principal; designs and t-designs; partitions of sets; |
| 5 | Feb. 3-7 | 12.3- 12. 4; 25.1 | Multinomial numbers; partitions of a positive integer; |
| 6 | Feb. 10-14 | 25.1 - 25.3 | power series and properties; Partial fractions; binomial theorem for negative exponents Assign # 1 due on Feb. 12 |
| 7 | Feb. 17-21 | | Winter break, no class |
| 8 | Feb. 24-28 | 25.4 - 25.6 | Generating functions; homogenous and non-homogenous linear recurrences; Midterm (Feb. 26) |
| 9 | Mar. 2-6 | 26.1-26.2 26.3-26.4; | partitions and diagrams; conjugate partitions; Partitions and generating functions; restricted partitions |
| 10 | Mar. 9-13 | 15.1-15.6 | Graphs; isomorphism; valency; paths and cycles; trees; vertex colouring; |
| 11 | Mar. 16-20 | Course notes; | Planar graphs; Euler's theorem; Assign # 2 due on Mar. 18 |
| 12 | Mar. 23-27 | 24.1 -24.2 | words, codes and errors; Linear codes |
| 13 | Mar. 30- Apr. 3 | 24.3 - 24.4 | construction and error correction; |
| 14 | Apr. 6-7 | 27.1-6 | symmetry and counting; course review |