# DEPARTMENT OF MATHEMATICAL AND COMPUTATIONAL SCIENCES UNIVERSITY OF TORONTO MISSISSAUGA

# MAT344H5F LEC0101 Introduction to Combinatorics Course Outline - Fall 2019

**Class Location & Time** Tue, 03:00 PM - 05:00 PM IB 235

Thu, 05:00 PM - 06:00 PM IB 235

**Instructor** Arul Shankar

Office Location
Office Hours

E-mail Address arul.shnkr@gmail.com

Course Web Site Quercus will be used to post announcements, assignments, and grades

**Teaching Assistant** Mehmet Durlanik

E-mail Address durlanik@math.toronto.edu

# **Course Description**

Basic counting principles, generating functions, permutations with restrictions. Fundamentals of graph theory with algorithms; applications (including network flows). [36L,12T]

Prerequisite: MAT102H5, MAT223H5/MAT240H5

Exclusion: MAT344H1, MATC44H3 (SCI)

Distribution Requirement: SCI

Students who lack a pre/co-requisite can be removed at any time unless they have received an explicit waiver from the department. The waiver form can be downloaded from here.

#### **Textbooks and Other Materials**

Miklos Bona, A Walk Through Combinatorics, 4th Ed., World Scientific, 2017.

# **Assessment and Deadlines**

Type	Description	<b>Due Date</b>	Weight
Term Test	In-Class Test on Oct 22	2019-10-22	25%
Assignment	5 Assignments	On-going	25%
Final Exam		TBA	50%
		Total	100%

### More Details for Assessment and Deadlines

#### Missed Work

If a student misses the test for a valid, documented reason, the corresponding portion of their mark will be incorporated into their final exam mark.

That is, if a student is excused from the Test, their final mark would be calculated with the Final Exam worth 75%.

All five assignments will be weighted equally. However, only the top four scores will count towards your final score.

#### **Test Info**

There will be one 100 minute term test. It will be written during class time (i.e. starting at ~9:10pm) in the usual lecture room on February 27.

There will not be a make-up test.

# **Assignment Info**

There will be five hand-in assignments, due in your registered tutorial on the following dates:

- Sep 18
- Oct 2
- Oct 23
- Nov 06
- Nov 20

Late assignments will not be accepted under any circumstances. If an assignment is missed for a valid documented reason, the score of that assignment will be taken from the averaged scores of the other assignments.

Assignments will be posted at least one week before they are due.

Students' assignments should either be very neatly handwritten, or typed.

### **Penalties for Lateness**

Late assignments will not be accepted.

There are no make-up tests or assignments.

# **Procedures and Rules**

# **Missed Term Work**

If you have a legitimate reason (e.g. illness, other impairment, etc.) for being unable to attend class or complete some other aspect of the course work then you need to submit documentation to the instructor as soon as possible, and no later than two weeks after the course work was due. If this is a recurring situation for whatever reason, you should speak to the instructor about it as soon as possible.

• In all cases of illness etc, you must use theofficial UTM medical certificate. The certificate must specify the exact period during which you were unable to carry out your academic work.

# **Missed Final Exam**

Students who cannot write a final examination due to illness or other serious causes must file an<u>online petition</u> within 72 hours of the missed examination. Original supporting documentation must also be submitted to the Office of the Registrar within 72 hours of the missed exam. Late petitions will NOT be considered. If illness is cited as the reason for a deferred exam request, a U of T Verification of Student Illness or Injury Form must show that you were examined and diagnosed at the time of illness and on the date of the exam, or by the day after at the latest. Students must also record their absence on ACORN on the day of the missed exam or by the day after at the latest. Upon approval of a deferred exam request, a non-refundable fee of \$70 is required for each examination approved.

# **Academic Integrity**

Honesty and fairness are fundamental to the University of Toronto's mission. Plagiarism is a form of academic fraud and is treated very seriously. The work that you submit must be your own and cannot contain anyone elses work or ideas without proper attribution. You are expected to read the handout How not to plagiarize (<a href="http://www.writing.utoronto.ca/advice/using-sources/how-not-to-plagiarize">http://www.writing.utoronto.ca/advice/using-sources/how-not-to-plagiarize</a>) and to be familiar with the Code of behaviour on academic matters, which is linked from the UTM calendar under the link Codes and policies.

# **Groupwork and Plagiarism**

Students are encouraged to work on assignments in groups.

When working on an assignment though, students are required to follow thesethree simple rules:

- 1. If you work in a group, then on each copy of the assignment you hand in record the other students you worked with and which questions you worked on together.
- 2. Even if you work in a group, or have help from a tutor, you must write-up your own answer to each question. (Copying or submitting someone else's work, letting someone copy or submit your work, writing a solution for another student, or having another student write a solution for you are all cases of Academic Dishonesty.)
- 3. Students should cite any and all sources they use in their work. (This includes using Wikipedia, or alternate textbooks, etc.)

#### **Final Exam Information**

Duration: 3 hours Aids Permitted: None

### **Additional Information**

# Course Syllabus

We will aim to cover many (but not all) of the topics from Parts I, II and III in the textbook. We will cover Chapters 1, 3, 4, and 5 in the first half of the class. Chapters 9, 10, 11, and 12 in the second half. The term test will consist of the first half of the course.

# **Learning Outcomes**

# Upon successful completion of this course, students should be able to:

- Apply a variety of strategies to solve combinatorial problems.
- Formulate rigorous proofs of results that arise in the context of Graph Theory and Combinatorics, including results related to:
  - Connectedness, colouring, and planarity of graphs
  - Existence and non-existence of various types of paths in graphs
  - Trees
  - Generating functions and recurrence relations
  - Binomial identities
  - Permutations
- Analyze novel definitions and concepts about graphs and combinatorial objects, for instance by:
  - Creating examples and counterexamples.
  - Relating them to familiar definitions and concepts.
  - Formulating and verifying hypotheses about them.
- Write solutions to problems and proofs of theorems that are coherent, organized and well-supported.

## **Course Website**

The MAT344 Quercus page will be used for making announcements, uploading course materials and assignments, and for recording your marks in the Grade Centre.

Last Date to drop course from Academic Record and GPA is November 7, 2019.