DEPARTMENT OF MATHEMATICAL AND COMPUTATIONAL SCIENCES
UNIVERSITY OF TORONTO MISSISSAUGA

MAT301H5F LEC0101
Groups and Symmetries
Course Outline - Fall 2019

Class Location & Time	Wed, 09:00 AM - 11:00 AM MN 2110
	Fri, 09:00 AM - 10:00 AM MN 2110
Instructor	Ali Mousavidehshikh
Office Location	DH3027
Office Hours	Wednesdays 11:10 AM - 12 PM and Fridays 10:10 AM - 12:00 PM
E-mail Address	ali.mousavidehshikh@utoronto.ca
Course Web Site	https://q.utoronto.ca
Teaching Assistant	David Cui
Office Hours	Mondays 11AM - 12 PM (in TA help room)
E-mail Address	dz.cui@mail.utoronto.ca
Teaching Assistant	Mark Lee
Office Hours	Tuesdays 1 PM - 2 PM (in TA help room)
E-mail Address	markkw.lee@mail.utoronto.ca
Teaching Assistant	Nikki Siggurdson
Office Hours	Mondays 2 PM - 3 PM (in TA help room)
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Course Description

Permutations and permutation groups. Linear groups. Abstract groups, homomorphisms, subgroups. Symmetry groups of regular polygons and platonic solids, wallpaper groups. Group actions, class formula. Cosets, Lagrange's theorem. Normal subgroups, quotient groups. Classification of finitely generated Abelian Groups. Emphasis on examples and calculations. [36L, 12T]

Prerequisite: MAT102H5, MAT202H5/MAT224H5/MAT240H5
Exclusion: MAT301H1, MATC01H3 (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

Groups and Symmetries, Second Edition, by Ali Mousavidehshikh. It is available at the UTM bookstore. We will follow this book very closely.

Assessment and Deadlines

Type	Description	Due Date	Weight
Class Participation	Students work in groups and write a quiz in groups (attendance is mandatory)	On-going	10%
Assignment	5 Assignments	On-going	10%
Term Test	Test 1	2019-10-09	20%
Term Test	Test 2	2019-11-13	20%
Final Exam	Exam	TBA	40%
		Total	100%

More Details for Assessment and Deadlines

Working on problem sets is an essential part of learning the material. Problem sets will be posted on the course website (usually a week before they are due). They are due at the **beginning** of your tutorial. It is your responsibility to download and print them in order to complete them by the due date. **Late problem sets will not be accepted**, unless there are exceptional circumstances, such as severe illness over a long period of time. In such cases a doctor's note or other documentation must be provided. Under no circumstance shall a problem set be accepted after other students have received their marked problem sets or solutions to the problem set have been posted.

Class Participation: Each week you will be assigned reading material from the book via quercus (see table below). The following week, in Tuesday lectures you will work on work sheets in your group (these questions are not marked and are posted on Quercus), and in Thursday lectures I will answer any questions you have regarding the assigned reading (for 30 minutes), after which you will be given a multiple choice quiz (4-5 questions) based on this material, which you will complete as a group (these quizzes will be worth 10 percent of your mark). I will pick the groups in week 1. The best 8 out of 10 quizzes count. Quizzes start first week of classes (see table below).

Quizzes on test weeks: These quizzes will be marked out of 4, and the marks will be added to the test mark from that week (so you can think of them as bonus marks that you are able to get). These quizzes are also done in groups.

Attendance: In every tutorial and lecture attendance will be taken. If a students misses 7 or more tutorials or lectures combined (for example missing 2 lectures and 5 tutorials), the 10 percent for the participation will be forfeited by that student and they will receive a mark of 0 out of 10 percent for participation no matter how well they did on their group quizzes. This is meant to make sure students attend class and contribute to the work done by their group.

Lectures: Each week the lectures are broken down as follows:

(1) 20-30 minutes of a mini lecture - I will go over the important material for the weeks reading material.

(2) 70-80 minutes - students will work in groups on a worksheet and present their solutions.

(3) 30 minutes - we will discuss the weeks reading material, you can ask questions and I will ask you guys questions to test you knowledge of the weeks reading material.

(4) 20 minutes - you will write a quiz in groups of 4-7.

Penalties for Lateness

Late work is not accepted.

Procedures and Rules

Missed Term Work

To request special consideration, bring supporting documentation to the instructor in person during office hours at least one week in advance.

In case of illness, bring a U of T medical certificate to the instructor within one week of the missed work. 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 online petition **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 (http://www.writing.utoronto.ca/advice/using-sources/how-not-to-plagiarize) 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.

Final Exam Information

Duration: 3 hours
Aids Permitted: None

Additional Information

Calculators: Calculators and other aids will **NOT** be allowed during the Tests or the Exam.

Tutorials: Tutorials will begin the week of September 9, 2019.

2019 Fall reading week: October 15, 2019 - October 18, 2019.

UTM is closed on October 14, 2019 (Thanksgiving).

Week/Dates	Sections	Topics	Additional Information
1- September 6		Talk about the syllabus and procedures in the class	**No tutorials**
2- Sep 9 - Sep 13	Sections 1.1 - 1.5	Preliminaries/**class discussion/quiz**	**Tutorials begin**
3- Sep 16 - Sep 20	Sections 2.1 - 2.4	Groups/**class discussion/quiz**	**Assignment 1 due in tutorial**
4- Sep 23 - Sep 27	Sections 3.1 - 3.4	Generators, relations, and cyclic groups/**class discussion/quiz**	
5- Sep 30 - Oct 4	Sections 4.1 - 4.3	Dihedral, Symmetric, and Alternating groups/**class discussion/quiz**	**Assignment 2 due in tutorial**
6- Oct 7 - Oct 11	Sections 1.1 - 4.3	**Test 1/quiz**	**Test 1, Oct 9, 2019**
7- Oct 21 - Oct 25	Sections 5.1 - 5.2	Homomorphisms and Isomorphisms/**class discussion/quiz**	
8- Oct 28 - Nov 1	Sections 5.3 - 5.4	Automorphisms, Inner automorphisms, Cayley's Theorem/**class discusssion/quiz**	**Assignment 3 due in Tutorial**
9- Nov 4 - Nov 8	Sections 6.1 - 6.2	Cosets, Lagrange's Theorem/**class discussion/quiz**	**Assignment 4 due in Tutorial**
10- Nov 11 - Nov 15	Sections 5.1 - 6.2	**Test 2/quiz**	**Test 2, Nov 13, 2019**
11- Nov 18 - Nov 22	Sections 7.1 - 7.3	Normal subgroups and factor (quotient) groups, Isomorphism Theorems/**class discussion/quiz**	
12- Nov 25 - Nov 29	Section 8.1 - 8.2	External and Internal direct products/**class discussion/quiz**	**Assignment 5 due in tutorial**

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