

University of Toronto Scarborough
COURSE INFORMATION
MATC01 – Groups and Symmetry

Course homepage:

<http://www.math.toronto.edu/lgoldmak/C01F13/>

Instructor: Leo Goldmakher (I prefer to be called by my first name)

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Office hours: Mondays 11–12, Fridays 2:30–4:30; additional office hours by appointment.

Lectures: Mondays 9–10 (in HW 215) & Fridays 11–1 (in HW 216)

Textbook: None required. There are several books on course reserve at the library; they won't be useful at the beginning of the course, but could be helpful later on in the term.

Syllabus: Group theory is a subfield of abstract algebra, an area with applications to geometry, number theory, cryptography, chemistry, physics, and really any field in which symmetries arise. The aim of this course is to introduce students to some of the basic ideas and results of group theory, with emphasis on examples.

We will start with geometry, ultimately classifying all possible rigid motions and wallpaper patterns. Then we will move on to number theory, discussing the structure of the set of integers and modular arithmetic. After this, we will explore the behavior of polynomials and their roots. The rest of the term will be devoted to the one theory to rule them all: group theory. In addition to classical results on groups (Cayley's theorem, Euler's theorem, Lagrange's theorem, Cauchy's theorem, the isomorphism theorems) we will discuss some more advanced parts of the theory, such as the Sylow theorems, Jordan-Hölder decomposition, and the structure theorem for finite abelian groups. Throughout, we will discover and explore many examples of groups.

Marking scheme:

Your mark will be calculated based on two components:

1. Problem sets – 45%

This course will have weekly problem sets. These will require substantial effort at the beginning, but will get easier as you acquire familiarity with groups. **I will assume that you are comfortable with proofs – both coming up with and writing them.** If you're not sure, please contact me as soon as possible, so that we can get you up to speed.

Problem sets are to be turned in within the first five minutes of lecture on the due date; late assignments will not be accepted under any circumstances. However, your lowest score will be dropped before calculating the contribution to your final mark.

2. Final exam – 55%

To do well on the final exam, it is essential that you understand all the material from the problem sets. Although I encourage you to talk to each other about the problem sets, copying someone's solutions will not help you understand the material. (It's also considered cheating and subject to serious penalties; see next page.) **If you do not struggle with a problem on your own for a significant amount of time, you will never fully understand its solution.** In other words, cheating on homework guarantees that you'll do worse on the exam.

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COMPUTER POLICY

Computers and phones are not to be used at any time in the lecture room, as this is distracting both for you and for your fellow students. If you have something you need to do urgently on your computer or phone, quietly take it outside the classroom and do it there; I will never be offended by this, so long as you do not disrupt the class.

TEAM WORK AND PLAGIARISM:

The problem sets in this course will be challenging, and I encourage you to work together on them. However, each student must work out and write up their final solutions individually and independently. Moreover, please **write up your problems sets in physical isolation from any other student**.

Although the internet is a great resource, I urge you to use it wisely. In particular, I ask you not to search for the problems appearing on the assignments. **Looking up definitions is OK, looking up (or asking about) problems is not.**

When using ideas which are not your own, please indicate your source. You will *not* be penalized for collaborating with another student unless:

- (1) your work is identical to that appearing elsewhere (again, write up HW in isolation!); or
- (2) you explicitly use an idea without attributing the source.

Both (1) and (2) may have serious consequences. See

<http://www.writing.utoronto.ca/advice/using-sources/how-not-to-plagiarize>

for further information.

The academic regulations of the University are outlined in the Code of Behavior on Academic Matters which can be found at

<http://www.governingcouncil.utoronto.ca/policies/behaveac.htm>

MISSED FINAL EXAM:

It is not possible to pass the course without taking the final exam. In the case of a documented emergency, the final exam may be deferred. The deferred exam will most likely be an oral exam.