MAST 217
Introduction to Mathematical Thinking
Fall 2020

Preface: **Due to exceptional circumstances, this course will be taught, and all assessments will be done completely ONLINE.**

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Class Schedule: Tuesday-Thursday, 13:15-14:30.

Office Hours: TBA.

Course Objectives: This course is meant primarily for students who intend to pursue some concentration in mathematics or statistics at the university level.

University-level mathematics courses tend to be somewhat theoretical, and they require the use of a particular language and style that is not familiar to many students. In our experience, students often find it difficult to know what the "rules of the game" are: why all these proofs? What is it that one is expected to know about proofs? How much emphasis should you put on the "how to do things" rather than on the "why something is true"?

MAST 217: Introduction to Mathematical Thinking, aims to address the above questions and to lay a foundation which will help you in all of the mathematics courses which you take at university. We hope to let you in on some of the "tools of the trade" of the mathematician. The topics that we will be discussing include: how proofs work, different styles of proof, the difference between mathematical and everyday language and logic, the roles of examples and counter-examples, the transition from the finite to the infinite, and different techniques of problem solving. MAST 217 is not designed to teach you a lot of new mathematical content (although there will be some new material in the course that you will be responsible for). Most of the mathematics that will be used to illustrate the above topics will be based on familiar material regarding the number systems you already know (e.g. the real numbers), geometry, and functions, and this material will be re-discussed in class to the extent that it is needed.

Text:

MAST 217 lecture notes by J. Hillel, W. Byers, H. Proppe and A. Sierpinska, "*Introduction to Mathematical Thinking. Course Notes and Problems*", which can be purchased at the Concordia Book Store.
The print and digital versions of the textbook will be available at:
https://www.bkstr.com/concordiastore/home

The following text is strongly recommended:
Chartrand, G., Polimeni, A. and Zhang, P., "*Mathematical Proofs: A transition to Advanced Mathematics*", 4th ed., Pearson.
Can be purchased from Pearson:
https://www.pearson.com/store/p/mathematical-proofs-a-transition-to-advanced-mathematics/P100000842388

Note: Students should order textbooks as early as possible, especially for print versions in case books are backordered or there are any shipping delays.

Grading:

The following grading scheme will be used:

- 10 homework assignments: 25%
- Contribution to forum discussion: 10%
- One midterm test in approximately the 7th week of classes: 20%
- Final examination: 45%

(Note: There is no "100% final option" in this course. It is necessary to do the assignments and to take the mid-term test).

If the grading scheme for this course includes graded assignments, a reasonable and representative subset of each assignment may be graded. Students will not be told in advance which subset of the assigned problems will be marked and should therefore attempt all assigned problems.

Class organization:

Lectures, individual and small-group work during classes. It is expected that **students actively participate** during the class: by presenting their work, leading discussions, etc. Students are expected to conduct discussions on the Moodle forum.

Office hours are organized in the form of a class tutorial.

List of topics:

Basic tools of mathematical argumentation:

- The language of mathematics
- The logical structure of mathematical statements
- Direct proofs and proofs by contrapositive
- Proofs by contradiction
- Proofs by Mathematical Induction

These tools will be practiced in various mathematical contexts:

- Numbers: natural, rational and real.
- Functions.
- Sets and their cardinality; countable and uncountable sets.

Academic Integrity and the Academic Code of Conduct

This course is governed by Concordia University's policies on Academic Integrity and the Academic Code of Conduct as set forth in the Undergraduate Calendar and the Graduate Calendar. Students are expected to familiarize themselves with these policies and conduct themselves accordingly. "Concordia University has several resources available to students to better understand and uphold academic integrity. Concordia's website on academic integrity can be found at the following address, which also includes links to each Faculty and the School of Graduate Studies: concordia.ca/students/academic-integrity." *[Undergraduate Calendar, Sec 17.10.2].*

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Disclaimer: In the event of extraordinary circumstances beyond the University's control, the content and/or evaluation scheme in the course is subject to change.