Mathematics 2200H – Mathematical Reasoning
Trent University, Fall 2025

Instructor

Stefan Bilaniuk (pronounced Стефан Біланюк)
office: ENW 337
hours: Mondays and Fridays 09:00-09:50, and Tuesdays and
Thursdays 12:00-12:50, in-person and simultaneously
on Zoom, or by appointment, or just drop by.
phone: 705 748-1011 x7474   *e-mail:* sbilaniuk@trentu.ca
home: 705 742-7862 [Do *not* call between 9 p.m. and 8 a.m. unless it's an emergency.]
web: http://euclid.trentu.ca/math/sb/

Dept. of Mathematics & Statistics

Colleen Berrigan
office: SC 327
hours: Weekdays 09:00-16:00
phone: 705 748-1011 x7715
e-mail: math@trentu.ca

Prerequisites: MATH 1350H and either MATH 1120H or 1121H.

Resources: While we don't have a textbook, there are some books worth taking a look at. *A Gentle Introduction to the Art of Mathematics*, Version 3.1, by Joseph Fields, lives up to its title and covers a number of the topics in this course from a different angle. It may be downloaded from https://giam.southernct.edu/GIAM/ , or locally from Blackboard and the MATH 2200H archive page. A non-free book that would make a great supplement to this course is *Proofs: A Long-Form Mathematics Textbook*, by Jay Cummings. It makes a very great effort to explain everything in detail. There will also be handouts distributed in class for various topics.

Meetings

Lectures: Tuesdays 10:00-11:50 and Thursdays 09:00-10:50, all in ENW 106.
Seminars: We will usually use one of the four hours of lecture time each week as a seminar. Which one, we'll sort out in class.

Marking Scheme

There will be at least eleven weekly assignments and a take-home final examination. Please consult the schedule below for due dates. The work will weigh as follows:

Best 10 assignments (6.5% each)	65%
Take-home final examination	35%

At least 25% of the course marks will be obtained by the final date (Tuesday, 4 November) to withdraw from Fall courses. Please note that assignments will be accepted after the due date entirely at the instructor's discretion. Students who miss more than one assignment for reasons beyond their control should contact the instructor as soon as possible.

This scheme may be modified for students in exceptional circumstances, such as a lengthy absence due to illness. Any such modification will require the agreement of both the student and the instructor.

Learning Outcomes

This course is an introduction to the basics of handling abstractions and doing mathematical proofs while acquiring familiarity with a number of basic concepts, drawn from logic, set theory, number theory, combinatorics, and analysis, which are used in many mathematical fields. Successful students finishing the course should be able to solve problems using the methods developed in the course, read and write mathematics effectively using appropriate notation, and formulate and communicate logically correct proofs.

Archive Page

MATH 2200H has an archive page with links to assignments, exams, and various handouts from previous iterations of the course at: http://euclid.trentu.ca/math/sb/2200H/ Material from the current iteration of the course will eventually be archived on this page as well.

Schedule

Please note that where the material covered is concerned this schedule is likely to be something of a polite fiction as no lesson plan survives contact with actual students unchanged. We will adjust the pace and possibly the order of some material as necessary.

Week 0. *(4-5 September) Classes begin Thursday, 4 September. The first class in MATH 2200H is the same day.*
Week 1. *8-12 September)* Problem-solving. Some basic set theory, functions, relations. Assignment #1 due on Friday, 12 September.
Week 2. *(15-19 September)* Connectives. Propositional logic and deductions. Assignment #2 due on Friday, 20 September.
Week 3. *(22-26 September)* Quantifiers. First-order logic and deductions. Assignment #3 due on Friday, 26 September.
Week 4. *(29 September – 3 October)* Axioms for set theory. Construction of the natural numbers. Assignment #4 due on Friday, 3 October.
Week 5. *(6-10 October)* Cardinality of sets, the Pidgeonhole Principle, countable and uncountable sets, the Schröder-Bernstein Theorem. Assignment #5 due on Friday, 10 October.
Week 6. *(13-17 October)* Mathematical induction, division and Euclidean algorithms. Assignment #6 due on Friday, 17 October. *University closed on Monday, 13 October, for Thanksgiving Day.*
Fall Reading Week. *(20-24 October)* Enjoy!
Week 7. *(27-31 October)* Divisibility, prime numbers, and modular arithmetic. Assignment #7 due on Friday, 31 October.
Week 8. *(3-7 November.)* Equivalence relations. Construction of the rational numbers. Assignment #8 due on Friday, 7 November. *The last date to withdraw from Fall courses is Tuesday, 4 November.*
Week 9. *(10-14 November)* Linear orders and well-orders. Extending the natural numbers to the ordinals. Assignment #9 due on Friday, 14 November.
Week 10. *(17-21 November)* Construction of the real numbers via schnitts (Dedekind cuts). Properties of the real numbers, infima and suprema. Assignment #10 due on Friday, 21 November.
Week 11. *(24-28 November)* Sequences of real numbers, convergence, the Monotone Convergence Theorem. Assignment #11 due and take-home final examination distributed on Friday, 28 November.
Week 12. *(1-3 December)* Catch-up and clean-up. *Wednesday, 3 December, is the last day of classes.*
Fall Examination Period. *(5-19 December)* Possible Assignment #12 due on Friday, 5 December. Take-home final examination due on Friday, 12 December.

Academic Integrity

Academic dishonesty, which includes plagiarism and cheating, is an extremely serious academic offence and carries penalties varying from failure on an assignment to expulsion from the University. Definitions, penalties, and procedures for dealing with plagiarism and cheating are set out in Trent Universitys Academic Integrity Policy. You have a responsibility to educate yourself – unfamiliarity with the policy is not an excuse. You are strongly encouraged to visit Trents Academic Integrity website to learn more: `www.trentu.ca/academicintegrity`

For clarity, the following guidelines will apply in MATH 2200H:

You are permitted and encouraged to work with others and ask anyone willing (especially the instructor!) for explanations, hints, and suggestions for the assignments, and to consult whatever sources you wish. However, **all work submitted for credit must be written up entirely by yourself, giving due credit to all the sources of help and information that you actually used.** There will be greater restrictions on the take-home final examination, which will be spelled out on the exam.

Access to Instruction

It is Trent University's intent to create an inclusive learning environment. If a student has a disability and documentation from a regulated health care practitioner and feels that they may need accommodations to succeed in a course, the student should contact the Student Accessibility Services Office (SAS) at the respective campus as soon as possible.

Last modified 2025-07-31.