

Course Syllabus: Math 2000 A & B
Mathematical Concepts
Department of Mathematics and Computer Science
University of Lethbridge, Spring 2015

Course instructor: Sean Fitzpatrick **Email address:** sean.fitzpatrick@uleth.ca
Office: UHall C540 **Course website:** via moodle.uleth.ca
Office hours: MWF 10:30 - 11:30 am and 1:00 - 2:00 pm
Lectures: Section A – TR 12:15 - 1:30 pm in C756
Section B – TR 3:05 - 4:20 pm in AH176

Tutorial instructor: Sean Legge **Email address:** legge@cs.uleth.ca
Office: UHall C518
Office Hours:
Tutorials: Wednesday, 1:00 pm (Tut 01), 2:00 pm (Tut 02), 3:00 pm (Tut 03) in D631

Course Description

This course can be viewed as a “math as a second language” course. It introduces basic concepts such as logic, set theory, and techniques of proof that form the foundation of mathematics. The course acts as a bridge between computational courses like calculus, and later theoretical courses, like analysis and number theory.

Course Objectives

The main goal in this course is to develop the ability to learn to write proofs and form mathematical arguments. The primary focus will be on learning to produce writing that is clear and concise, and easily understood by the rest of your classmates. Even if you are not planning to continue to higher-level mathematics courses, this course should prepare you for any situation where clear technical writing or convincing arguments are needed.

Required Textbook:

Mathematical Reasoning – Writing and Proof, Version 2.0, by Ted Sundstrom. The book is available online for free at <https://sites.google.com/site/mathematicalreasoning3ed/>. Please see the course Moodle page for details on how to obtain a hard copy. There is also a YouTube channel with recorded lectures for the textbook, at <https://www.youtube.com/playlist?list=PL2419488168AE7001>.

Note: It’s useful to keep in mind that the topics discussed in this course are common topics central to most mathematics, which means that finding additional resources is not difficult. If you find that you need additional material beyond what’s in the textbook, and don’t want to head all the way to the library, Google and Wikipedia will be your friends in this course.

Evaluation

Your grade will be determined according to the following table (see below for explanations of each component):

Component	Quizzes	Assignments	Midterm	Final
Weight	20	10	25	45

Quizzes:

Quizzes will be held **in tutorial** every week except for the week of the midterm. The quiz questions will be chosen by the tutorial instructor from a list of suggested homework questions you will be assigned every week. There will be a total of 11 quizzes. No make-up quizzes will be given; however, you will be able to drop your lowest grade (which may include a missed quiz).

Assignments:

There will be two written assignments, each worth 5%. These will involve written responses, in paragraph form, to several problems. The assignments will be graded according to the quality and clarity of the writing, and not just on the correctness of the solutions.

Midterm:

There will be one in-class midterm, to be written on Thursday, October 29th.

Final exam:

There will be a standard three-hour final exam. Note that final exams are scheduled by the Registrar's Office. **Please see their website for the time and place of the exam.** The exam will be weighted more heavily towards the material from the last month of classes; however, it will be cumulative in the sense that the concepts and techniques (e.g. methods of proof) covered earlier in the course are necessary to solve any of the problems encountered later in the course.

Letter grade conversions:

The percentage grades earned in this class will be converted to letter grades according to the following table:

Letter grade:	A ⁺	A	A ⁻	B ⁺	B	B ⁻	C ⁺	C	C ⁻	D ⁺	D	F
Minimum % required:	95	85	80	77	73	70	67	63	60	55	50	0

Course policies

Participation:

Class participation is encouraged, but not required. We will have a class discussion forum at piazza.com available through Moodle for online participation. Piazza is a Q & A forum that supports mathematical notation and allows you to post anonymously, in case you're worried about posting a bad question or wrong answer.

Notes:

1. The best way to learn how to write mathematics (and proofs, in particular) is to discuss the material with other students (or me). The online forum is a good place to get quick feedback on whether your attempt at a proof is a good one. (A good proof has to be logically sound, and written clearly enough that others can follow your logic.)
2. We will be encouraging group work in both lectures and tutorials. To get the most out of group discussions, it's important to stay on top of the suggested homework. It's difficult to have a useful discussion about a problem that you haven't previously attempted.

Communication:

Communication between students and myself can take place in several ways:

- Announcements on Moodle. Any updates and reminders will be posted on Moodle and emailed to your ULeth email address.
- In person, during office hours. (Recommended, especially if you are having trouble with a concept.)
- Online discussion forum, via Piazza.com (see above).
- Email. You are welcome to email me with questions about the course, and I will do my best to answer as soon as I can. I do, however, have a few email etiquette rules:
 - Include the course number in your subject heading, and your full name in the message text. Since I teach several classes at once, this will help to ensure a prompt reply. (For example, if your email consists only of “Yo prof, when's the test?” I won't be able to give you an answer since my courses have tests at different times.)
 - Questions about how to solve a particular homework problem should be directed to the discussion forum rather than email: the discussion forum can properly display math symbols, and it's usually the case that several students will have the same question.
 - Questions that can be answered by reading this syllabus (e.g. “When's the test?”) will usually not be answered in a timely fashion, and the replies will generally be grumpy/sarcastic in nature.

Warning: I have set times *during the day* when I respond to emails and questions on Piazza. Do not count on getting a timely answer from me in the evening.

Homework:

Our textbook is designed for active learning: every section begins with a “preview activity” and includes additional exercises and “concept checks”. When reading the textbook you should have a pencil and paper handy to work through problems as they occur. After reading a section in the textbook, you should watch the corresponding screencasts on the textbook YouTube channel. I’ll maintain a weekly list of topics on Moodle to keep you advised of which sections to read, and which exercises to work on. The questions on the weekly quizzes will be based on the exercises at the end of each textbook section.

Lecture:

Lectures will be a combination of individual and group problem solving, and review of the material covered in the textbook and screencasts. I will give a lecture for part of each class and address any questions that you have, but classes will be most effective for those students who arrive having done the assigned reading and homework.

Tutorials:

You will be assigned to one of three tutorial sections that meets once every Wednesday. Your tutorial instructor is Sean Legge. In each tutorial you will be given time to work in groups on the assigned homework problems, before writing an individual quiz. (Note that the quiz question(s) will be selected from the assigned homework.)

Special arrangements:

If you are a student who has registered for accommodations with the Accommodated Learning Centre, please ensure that I am informed of the necessary arrangements as soon as possible, and please feel free to meet with me if there are any adjustments I can make to improve your learning experience.

Academic honesty:

Students are expected to be familiar with, and abide by, the rules laid out in the Academic Calendar regarding academic honesty, cheating, etc. and the penalties assessed for disregarding those rules.

Tentative course schedule

Date	Topic	Assigned Reading
September 9 th	No tutorial	
September 10 th	Introduction	Chapter 1
September 15 th	Symbolic logic	§2.1
September 16 th	Tutorial/Quiz 1	Chapter 1
September 17 th	Logical equivalence	§2.2
September 22 nd	Predicates and quantifiers	§2.3, 2.4
September 23 rd	Tutorial/Quiz 2	§§2.1, 2.2
September 24 th	Proving conditional statements	§§3.1, 3.2
September 29 th	Proof by contradiction	§3.3
September 30 th	Tutorial/Quiz 3	§§2.3, 2.4, 3.1
October 1 st	Proof by cases	§3.4
October 6 th	Congruence	§3.5
October 7 th	Tutorial/Quiz 4	§§3.2 - 3.4
October 8 th	Proof by induction	§4.1
October 13 th	Other methods of induction	§4.2
October 14 th	Tutorial/Quiz 5	§3.5
October 15 th	Recursion	§4.3
October 20 th	Sets and set relationships	§§5.1, 5.2
October 21 st	Tutorial/Quiz 6	Ch. 4
October 22 nd	Set operations	§5.3, 5.4
October 27 th	Indexed families of sets	§5.5
October 28 th	Midterm Review	Ch. 1-5
October 29 th	Midterm	Ch. 1-5
November 3 rd	Introduction to functions	§§6.1, 6.2
November 4 th	Tutorial/Quiz 7	§5.5
November 5 th	Properties of functions	§6.3
November 10 th	Composition of function	§6.4
November 11 th	Remembrance Day	No tutorial
November 12 th	Inverses of functions	§6.5
November 17 th	Functions acting on sets	§6.6
November 18 th	Tutorial/Quiz 8	§§6.1-6.4
November 19 th	Relations	§7.1
November 24 th	Equivalence Relations	§7.2
November 25 th	Tutorial/Quiz 9	§§6.5, 6.6
November 26 th	Equivalence classes	§7.3
December 1 st	Modular arithmetic	§7.4
December 2 nd	Tutorial/Quiz 10	§§7.1-7.3
December 3 rd	Cardinality of finite sets	§9.1
December 8 th	Countable sets	§9.2
December 9 th	Tutorial/Quiz 11	§§7.4, 9.1
December 10 th	Uncountable sets	§9.3