

Course Syllabus: Math 2000A
Mathematical Concepts
Department of Mathematics and Computer Science
University of Lethbridge, Fall 2014

Course instructor: Sean Fitzpatrick **Email address:** sean.fitzpatrick@uleth.ca
Office: UHall C530 **Course website:** via moodle.uleth.ca
Office hours: M 3:30-4:30 pm, TR 2:00-3:00 pm, WF 10:30-11:30 am
Lectures: Tuesday & Thursday, 12:15-1:30 pm in UHall D634
Tutorial: Wednesday, 9:00 am (Tut 01), 10:00 am (Tut 02), 11:00 am (Tut 03) in W400
Tutorial instructor: Jeff Bleaney

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. We want to make the transition from *using* mathematics – for example, computing a derivative using established rules – and *doing* mathematics – establishing those rules in the first place, and explaining why they’re valid. You will learn the precise logical meaning of words like ‘and’, ‘or’, and ‘if’, and why a precise meaning is necessary. While we will be stressing the importance of proper syntax, 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:

Proofs and Concepts, by Dave Morris and Joy Morris. This is a textbook written by two of the professors in the Math and CS department here at the University of Lethbridge. An electronic version will be made available for free on Moodle in PDF format. If you would like a hard copy, the Bookstore produces them on demand.

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	Participation	Midterm	Final
Weight	25	5	25	45

Exceptions: If your final exam grade is better than your midterm grade, I will use the following weightings: Midterm – 10%; Final exam – 60%. As will be explained below, it should be easy to earn the 5% participation grade. However, if you feel that being required to discuss mathematics with other people would cause undue pain and suffering, you may substitute a short (5-6 page) essay for the participation requirement. If you wish to exercise this option, please inform me no later than **October 2nd**.

Quizzes:

Quizzes will be held in the last 20 minutes of every Thursday lecture, and will be based on problems assigned the week before. Your quiz grade will be based on the **best 10 out of 12** quiz grades. Since you get two drop two quizzes, **no makeup quizzes will be given.**

Participation:

Yes, I'm asking you to participate in a math class, but it's for your own good: the most effective method for mastering this material is to practice it with others. There will be two ways to earn participation points: in class or online, using the Piazza.com¹ discussion forum (available via Moodle). I will award one point for any contributions online² or in class³. To earn the full 5% for participation, you will need to earn 10 points during the semester.

Midterm:

There will one in-class midterm, written on **Thursday, the 16th of October**. The midterm will cover all material up to and including October 9th.

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

¹Why Piazza instead of one of the built-in forums on Moodle? One reason is that they have better support for entering math symbols and formulas. Another reason is that, for those of you who might be shy about posting a wrong answer or a silly question, Piazza will allow you to post **anonymously**. (I can still to identify you to award participation points.)

²To qualify for participation credit, someone – either myself or a classmate – will have to endorse your contribution by clicking on the ‘good question’ or ‘good answer’ button.

³If you've made an in-class contribution, make sure to mention this to me at the end of class, and provide your name.

Course policies

Communication:

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

- Announcements on Moodle. Any updates and reminders will be posted on Moodle. These announcements will be sent to your uleth.ca email address by default, so be sure to monitor that account. It is also highly recommended that you log into Moodle on a regular basis to keep up to date on the course.
- In person, during office hours. (Recommended, especially if you are having trouble with a concept.)
- Online discussion forum, via Piazza.com. (This can also be used to earn participation credit; see below for details.)
- 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.

Lecture:

The first 50 minutes of each lecture will be used to present course material. On Tuesdays we will use the remainder of the class to discuss problems and present solutions. Quizzes will be written on Thursdays. **Note:** To accommodate quizzes and discussion, the amount of time spent on traditional lecturing will be reduced. This means that not all content in the textbook will be addressed directly in class. However, **you are still responsible for all content in the textbook**. The text is designed to be suitable for self-study, and it is highly recommended that you read the relevant sections **before** they are discussed in class. You will be advised of any sections in the text that you are not responsible for.

Homework:

As mentioned above, I will assign a problem set each Thursday as a study guide for the quiz on the following Thursday. For best results you should also attempt all the homework problems in the textbook as you encounter them. Some students find it helpful to attempt the problems before encountering them in class. You are free to discuss solutions to all problems (assigned or not) on Piazza.

Tutorials:

You will be assigned to one of three tutorial sections that meets once every Wednesday. Your tutorial instructor is Jeff Bleaney. Please note that these are *mixed* tutorials: they consist of students from both lecture sections (A and B) of Math 2000. Because of this, we will be making an effort to synchronize the schedules for both sections so that the tutorial topics are relevant to students from both classes. Note, however, that although the two lecture sections have shared tutorials, they are **independent** classes, with their own priorities and evaluation schemes. In particular, you won't be able to earn participation credit in tutorial.

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

I will follow the schedule below as closely as possible, although we may at times find ourselves slightly ahead of or behind the planned schedule. Please use the schedule as a guide to plan your readings and exercises.

Date	Topic	Assigned Reading
Sept. 4 th	Course outline and introduction	Ch. 1 and Ch. 2 §A&B
Sept. 9 th	Logical deductions	Ch. 2 §C-G
Sept. 11 th	Two column proofs	Ch. 3 §A-C
Sept. 16 th	Other methods of proof	Ch. 3 §D-G
Sept. 18 th	Set theory	Ch. 4
Sept. 23 rd	Set operations	Ch. 5
Sept. 25 th	First-order logic	Ch. 6
Sept. 30 th	Rules for quantifiers	Ch. 7 §A
Oct. 2 nd	Proofs with quantifiers	Ch. 7 §B
Oct. 7 th	More on counterexamples	Ch. 7 §C&D
Oct. 9 th	Divisibility	Ch. 8 §A
Oct. 14 th	Congruence	Ch. 8 §B&C
Oct. 16 th	Midterm	Covers Ch. 1-7 and §8A
Oct. 21 st	Cartesian products, functions	Ch. 9 §A-C
Oct. 23 rd	One-to-one functions	Ch. 9 §D
Oct. 28 th	Onto functions and bijections	Ch. 9 §E&F
Oct. 30 th	Inverses	Ch. 9 §G
Nov. 4 th	Composition of functions	Ch. 9 §H
Nov. 6 th	Images and preimages	Ch. 9 §I
Nov. 11 th	Remembrance Day	No class
Nov. 13 th	Cardinality of finite sets	Ch. 10 §A-C
Nov. 18 th	Cardinality of infinite sets	Ch. 10 §D-E
Nov. 20 th	Uncountable sets	Ch. 10 §F
Nov. 25 th	Proof by induction	Ch. 11 §A& B
Nov. 27 th	More induction	Ch. 11 §C& D
Dec. 2 nd	Equivalence relations	Ch. 12 §A-C
Dec. 4 th	Modular arithmetic	Ch. 12 §D&E
Dec. 8 - 16: Fall exams		