UMassAmherst

Fundamental Concepts of Mathematics, MATH 300.04
SYLLABUS FALL 2019
Luca Schaffler

LECTURE: TuTh 11:30-12:45 in LGRC A203.

OFFICE: LGRT 1335G **EMAIL:** lschaffler@umass.edu

CO-SEMINAR: W 4:00, 5:00, 6:00 in LGRT 1114 by Patrick Lei (plei@umass.edu).

COURSE MATERIAL: Available on Moodle.

TEXT: Ted Sundstrom; *Mathematical Reasoning: Writing and Proof*, Version 2.1. Available online at https://scholarworks.gvsu.edu/books/9/ (you can also order a paper copy). **Warning!** Use the copy in the link. There are previous versions of the book online, which do not match the latest (2.1).

OFFICE HOURS: M 2-3, Tu 4-5, W 2:30-3:30 in my office.

COURSE DESCRIPTION: Math 300 is an introduction to rigorous abstract mathematics. In lower-level classes like calculus, the emphasis is on applying formulas and theorems to specific problems. In this class, we will be more concerned with *why* the formulas and theorems are true. We will learn what a proof is, how to read, create, and present proofs, and how to tell a correct proof from an incorrect one. It is like learning a new language: we need to learn the grammar (logical deduction) and the vocabulary (sets, functions, and other basic structures), but it also helps to have something to say, so we will also study some beautiful mathematics along the way. Most of the actual mathematics we will study will concern the behavior of different classes of numbers: natural numbers, integers, rational numbers, real numbers, modular arithmetic, and (if time permits) the surprising things that happen when you count infinite sets.

TOPICS: Propositional logic, quantifiers. Methods of proof: direct proof, proof by contradiction, proof by induction. Elementary set theory. Functions: injections, surjections, bijections, inverse functions. Equivalence relations and equivalence classes. Elementary number theory: divisibility, congruence, greatest common divisor, Euclidean algorithm. Cardinality: finite sets, countable sets, uncountable sets.

PREREQUISITE: There is a prerequisite of Calculus II, MATH 132, with a grade of C or better.

ATTENDANCE POLICY: PROMPT, COMPLETE ATTENDANCE is expected at all classes. Please attend the ENTIRE class; this to preserve an effective learning environment for all students. Professional courtesy toward your instructor and your classmates is expected. You will be responsible for all the materials delivered in class and your final letter grade can be affected by it.

TEST DATES: There are two midterms and a final. The first midterm is on Thursday October 3 from 7:00 pm to 9:00 pm in LGRC A301. The second midterm is on Thursday November 7 from 7:00 pm to 9:00 pm in ELAB 303. The comprehensive final exam is scheduled for Friday December 13 from 1:00 pm to 3:00 pm in A203.

CALCULATORS AND FORMULA SHEETS POLICY: There is no required calculator for the course. You will NOT be allowed to use a calculator, formula sheets, class notes, etc. on exams.

GRADING: 30% of your grade comes from the homework and participation. 20% of your grade comes from each of the two midterms. The remaining 30% comes from the final exam. The grading scale is:

90 – 100 A, 85 – 90 A-, 80 – 85 B+, 75 – 80 B, 70 – 75 B-, 65 – 70 C+, 60 – 65 C, 56 – 60 C-, 53 – 56 D+, 50 – 53 D, 0 – 50 F. (For example, if your final score is 90, your grade will be A, not A-.)

HOMEWORK RULES AND GUIDELINES: Homework will be due on Thursday at the start of lecture, unless otherwise stated. Late homework will not be accepted, but I will drop your lowest homework grade.

When you get stuck on a problem (and you *will* get stuck from time to time), I encourage you to seek help from me, your classmates, or other students. Many times talking with someone else will help you see a new way to approach a problem which you hadn't seen before. I especially recommend that you work with your fellow students in groups. *But*, if you are stuck on a problem and seek help from someone else, **you should make sure that you can reconstruct the argument by yourself. Remember that during tests, you will have to rely on your own understanding of the material.**

Here are the rules for collaborating on homework problems:

I. You must list the names of all people with whom you discussed each specific problem.
II. You MUST write your solutions completely independently.

Part of what you will be learning in this class is how to communicate mathematics to other people, so your homework will be graded on understandability as well as correctness. Doing your homework will usually be (at least) a two-step process, where you first work out how to do it, and then rewrite your solution, getting rid of any false starts or unnecessary steps.

Copying solutions of the homework problems from online sources goes against the Academic Honesty Policy. Let me also inform you that the answers you could possibly find online are likely to be incorrect. If you are having troubles with the homework problems, get in touch with me or your TA.

Not acknowledging people you work with, or copying your classmates or external resources goes against the Academic Honesty Policy, and **at least will result in a zero score on the corresponding problems, and possibly on the whole assignment**.

MAKE-UPS: There is a list of officially allowed reasons for missing a midterm or the final in the academic regulations (https://www.umass.edu/registrar/sites/default/files/academicregs.pdf). Apart from these reasons, make-ups are not allowed. There are no make-ups for missed homework. If the date of one of our midterms conflicts with the midterm of one of your other classes, go to the Registrar's Office and ask for a statement of conflict, which will determine which exam has priority.

ELECTRONIC DEVICES POLICY: *You are expected to turn off your cell phone or set it to mute/silence BEFORE you enter class—every class*. Furthermore, if you use your cell phone *in any manner* during class (e.g. text messaging, games, etc.), you will be dismissed from class and will forfeit any points you might have earned in that class period. If you use your cell phone *in any manner* during a test, you have violated the academic honesty policy. (This policy also applies to LAPTOPS, iPODs, iPADs and all other electronic communication and/or data storage devices.)

REMARKS, NO CLASS MEETINGS AND OTHER DATES: Questions are encouraged at all times. Please contribute as a positive member of this learning community. See the Academic Calendar for holidays and important deadlines. (https://www.umass.edu/registrar/calendars/academic-calendar)

ACADEMIC HONESTY POLICY: All academic work must meet the standards contained in the Academic Honesty Policy (www.umass.edu/honesty/). Students are responsible for informing themselves about those standards before performing any academic work. This policy defends the academic integrity of all student work, and will be uniformly applied to all students in the class.

ACADEMIC ACCOMMODATION: If you have a documented (learning) disability, you should contact the Disability Services. (https://www.umass.edu/disability/)

DISCLAIMER: The course syllabus is a general plan for the course; deviations announced to the class by the instructor may be necessary. It is the responsibility of the student to seek clarification of the grading policy and/or course requirements and procedures from the instructor.