

Course ID and 6-digit Number:	MATH 570-401/LGIC 310-401/PHIL 410-401
Course Name:	Introduction to Logic & Computability
Instructor:	Henry Towsner (pronouns: he/him/his)
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Course Description and Level:	This course is an introduction to mathematical logic, including the notion of first-order logic and culminating in three central proofs: the Completeness Theorem, the Compactness Theorem, and the First Incompleteness Theorem. While this material does not depend on much specific knowledge from other math courses; it assumes a substantial familiarity with abstract, proof-based mathematics. Students should have taken a year of algebra (i.e. through Math 371 or Math 503), or have a comparable experience working with mathematical proofs.
Required Course Text:	Leary and Kristiansen, <i>A Friendly Introduction to Mathematical Logic</i> , available at https://textbooks.opensuny.org/a-friendly-introduction-to-mathematical-logic/

Course Work

The typical work each week consists of:

- Reading the assigned parts of the text and watching the videos. I generally recommend reading the text casually, then watching the videos, and then rereading the text more carefully, but you should find an approach that works for you.
- Identifying parts that are confusing, complicated, or incomplete, and asking questions (on Zoom or in Piazza).
- Doing the weekly homework assignment.

Make sure to start the homeworks early. The problems generally span a range of difficulties, from relatively straightforward problems that just apply definitions to problems that will require using the ideas from proofs we've seen in novel ways.

We'll have recorded Zoom meetings on Tuesdays and Thursdays at the scheduled class time (3pm-4pm, EST), which we'll use to discuss examples, elaborate on the ideas in the book and the videos, and answer questions. This will be a lot more useful to everyone if you show up with good questions!

Prerequisites

This is a 500 level math course. The nominal prerequisite is Math 370/371, but we won't use much substantive content from those courses. (Though we'll use groups/rings/fields/vector fields as examples a lot, so recognizing those ideas will make things easier.)

But the real prerequisite is a sufficient level of what's often called "mathematical maturity". Logic is very abstract, even compared to other topics in mathematics. We'll see a lot of tricky definitions and proofs, so you should already have a significant amount of experience with the way mathematicians approach them.

For instance, you should be prepared to look at a definition of an abstract idea and make it concrete by looking at some specific cases where it applies. You should be prepared to read proofs multiple times looking for different kinds of ideas—the step-by-step justification, the big intuition for why it works, for ideas you can use in proofs you write.

You should also be prepared for the fact that we have to start the course by writing down our definitions very carefully, and doing things that may seem obvious in a very precise way. There is, I promise, a payoff at the end (the Incompleteness Theorems), and I'll try to highlight the most interesting parts of that early development, but you'll need to work with me to see why the early, technical part is interesting and worthwhile.

Doing Well in This Course

This is an unusual semester, and we're all scrambling to figure out how to get the most out of this situation.

One of the most important things you can be doing to help yourself do well in this course is putting some thought into how you learn best. In particular, I think you'll benefit from:

- Be thoughtful about how you approach the course. When should you read the textbook and videos? How many times? How will you take notes while reading and watching? When do you start thinking about the pre-class problems?
- Be thoughtful about how to use technology to help you. For instance, when (or if) we meet synchronously, try to arrange things so you're not likely to be distracted. I won't ask you to turn on video if you don't want to, but make sure not to get pulled away to other activities during those times.
- Push yourself to participate. Ask questions on Piazza when you get stuck. *Answer* questions on Piazza. Communicate with me, on Piazza or by e-mail or on Zoom. It's going to be easy to feel isolated this semester; Zoom is no substitute for being in a room together. Help all of us fight that by participating in making this class a collective experience.

The most important things you can do to help me help you are:

- Let me know what we're doing that isn't working, or what we're not doing that would help you! This is new to me too, and we're experimenting. I want you to have a rewarding semester in this course, and it'll be hard to do that without input from you.
- Let me know when things go wrong. I have to set about ten million things to get everything right on Canvas; sometimes I'll forget things. If something isn't working, or doesn't seem to make sense, let me know.