Introduction to Deductive Logic

Online PHIL 2310/COGST 2310

Description

This course is an introduction to formal deductive logic. At its core, formal logic aims to answer the following question: *what follows from what?* We will focus on formalizing arguments, recognizing common argument forms, and systematically testing the logical validity of an argument. The course will cover the syntax, semantics, and proof theory for truth-functional and first-order logic. Topics include symbolization, truth tables, natural deduction proofs, quantification, and model construction.

Instructors

Instructor:	Arc Kocurek
Email:	awk78@cornell.edu
Office Hours:	F 10–11am (or by appointment)
TA:	Ritabrata Ray
Email:	rr686@cornell.edu
Section (DIS 201):	Th 2:40–3:30pm, Phillips Hall 101
Office Hours:	F 4–5pm (or by appointment)
TA:	Shao-Pu Kang
Email:	sk2888@cornell.edu
Section (DIS 202):	W 7:30–8:20pm, Zoom
Office Hours:	W 8:30–9:30pm (or by appointment)

Lectures

Lectures will be prerecorded and posted on Canvas. You can access videos in either the "Pages" tab or the "Media Gallery" tab. Modules will also directly link to the relevant lecture videos.

Textbook

The textbook we will use is called **forall x: Cornell**. It is free and can be downloaded on Canvas under the "Files" tab.

Grades

Problem Sets	50%	(5% each; 12 total; 2 drop)
Review Exercises	20%	(2% each; 12 total; 2 drop)
Midterm Problem Set	15%	(take-home)
Final Problem Set	15%	(take-home)

Assignments

Problem Sets

There are weekly problem sets (12 in total, 2 drop). These generally cover the material from the previous week's lectures.

- Each problem set is worth 5% of your total grade. Your lowest two problem set grades will be dropped. No makeups will be permitted.
- Problem sets are due on **Sunday night**. (The assignment officially closes at 8am on Monday.) No late problem sets will be accepted after that point, as the solutions will be posted shortly afterwards.
- All problems sets must be uploaded as a PDF to Canvas. You may use whatever format works best for writing your solutions (handwritten on paper, written on a note-taking app like Notability, typed in Word or LaTeX, etc.).
- You may resubmit your solutions as many times as you want up until the assignment closes. Only the last file uploaded will be graded.
- You are permitted (indeed, encouraged!) to work in groups on problem sets, so long as (1) your solutions are your own work and not the result of just copying others' work, and (2) you write the names of those you worked with on the problem set.

Review Exercises

There are weekly "review exercises" (12 in total, 2 drop). These comes at the end of the week. The goal of these is to check that you understand the material covered in lectures and to correct any misunderstandings you may have.

- Each review exercise is worth 2% of your total grade. Your lowest two review exercise grades will be dropped. No makeups will be permitted.
- Review exercises are due on **Friday night at midnight**. No late review exercises will be accepted after that point.
- All review exercises are completed online through Canvas. You have an unlimited number of attempts. Your grade will be the highest of your attempts.
- You are to work on these exercises *by yourself*. Do not use the book or any notes you have. The point of these is to make sure *you* understand the material.

Midterm and Final

There are two take-home "exams". These are basically longer cumulative problem sets. All the same rules governing problem sets apply to these. In particular, you are permitted to work in groups under the same conditions as for problem sets.

Engagement

The course has several resources for you to get help on the course material, problem sets, etc. These forms of engagement are entirely optional and solely there are a resource for you.

- **Weekly Sections.** These are lead by the TA once a week. The main purpose of these is to get additional practice with the course material. If your section is online, you can find the Zoom link on the "Zoom" tab.
- **Office Hours.** Each week, I set aside time for office hours so that you can ask me questions directly. You can access the Zoom link on the "Zoom" tab. (It's the same link each week.) If you wish to schedule a separate appointment with me, send me an email to arrange a time.
- **Ed Discussion.** This is an online discussion forum for asking questions from staff and peers (similar to Piazza). If you have a question, I would strongly recommend posting it to Ed Discussion before emailing me or your TA about it; it's likely others will have a similar question! In addition, you may want to use Ed Discussion to find study groups.

  There are only three rules when posting to Ed Discussion:

  1. Be polite.
  2. Don't just ask for the answer to a problem on a problem set.

     Bad question: "What is the answer to question 2 on the problem set?"
     Good question: "Does anyone have suggestions for how to approach question 2?"
  3. Don't just give away the answer to a problem on a problem set.

     Bad answer: "The answer is T,F,T,T."
     Good answer: "Slide 12 discusses the following strategy for making truth tables:. . . "

Policies

Extension Policies

In general, I cannot grant exceptions for problem sets. Solutions are posted immediately after so that other students may prepare for future problem sets. Exceptions will only be made in extreme circumstances (e.g., family or medical emergency) and may require documentation.

Academic Integrity

We strictly adhere to the University Policy on Academic Integrity, as outlined in the Code of Academic Integrity (http://cuinfo.cornell.edu/aic.cfm). It is your responsibility to familiarize yourself with the Code and what constitutes a violation of it. All work submitted must be the student's own, and all sources must be properly cited. Any violation of this policy will be reported immediately. Violations will, at the very least, result in an F on the assignment, but may also to lead to an F in the class, suspension, or even expulsion.

Schedule

PS = Problem Set

Truth-Functional Logic

Date		Topic	Assignment	Reading
Week 1	02/09	Arguments and Validity		ch. 1–2
	02/11	Logical Concepts	PS 1 due 02/14	ch. 3–5
Week 2	02/16	Symbolization		ch. 6–7.3
	02/18	Sentences of TFL	PS 2 due 02/21	ch. 8
Week 3	02/23	Truth Tables		ch. 9.1–9.2, ch. 10
	02/25	Conditionals	PS 3 due 02/28	ch. 7.4–7.6, 9.3–9.4
Week 4	03/02	Entailment		ch. 11
	03/04	Laws of Logic	PS 4 due 03/07	ch. 12
Week 5	03/09	∼∼Wellness Day∼∼		
	03/11	Metatheory	PS 5 due 03/14	ch. 13
Week 6	03/16	Natural Deduction Proofs		ch. 14–15.3
	03/18	Subproofs	PS 6 due 03/21	ch. 15.4–15.7, 16.1–16.3
Week 7	03/23	Negation Rules		ch. 15.8, 16.4–16.6
	03/25	Derived Rules	PS 7 due 03/28	ch. 17–18

First-Order Logic

Date		Topic	Assignment	Reading
Week 8	03/30	Nonclassical Logics		
	04/01	Terms and Predicates	Midterm due 04/04	ch. 20.1–20.4, 22.1–22.2
Week 9	04/06	Interpretations		ch. 26–27.2
	04/08	Quantifiers	PS 8 due 04/11	ch. 20.5, 23
Week 10	04/13	Symbolization		ch. 20.6, 21
	04/15	Multiple Generality	PS 9 due 04/18	ch. 22.3–22.4
Week 11	04/20	Counting		ch. 24
	04/22	Definite Descriptions	PS 10 due 04/28	ch. 25
Week 12	04/27	Truth in FOL		ch. 27.3–28
	04/29	First-Order Laws	PS 11 due 05/02	ch. 29
Week 13	05/04	Easy Quantifier Rules		ch. 30.1–30.3, 32–33
	05/06	Hard Quantifier Rules	PS 12 due 05/09	ch. 30.4–31
Week 14	05/11	Second-Order Logic		ch. 19, 34
	05/13	Modal Logic	Final due 05/19	