

Philosophy 370: Symbolic Logic
Syllabus version #1
August 27, 2017

Description

The goal of this course is to provide students with a basic understanding of the proof theory and semantics of classical propositional and first-order logic; we prove fundamental metatheoretic results, including equivalences between different proof-theoretic systems, soundness, and completeness. By the end of the term, students should have a good understanding of these results, as well as the techniques involved in establishing them and in constructing proofs about formal systems more generally. Although the subject of symbolic logic was developed by mathematicians and philosophers for their own special purposes (which we will discuss), logical concepts and techniques have found applications in a variety of disciplines including computer science, economics, law, linguistics, and psychology; students in any of these subjects can benefit from the ideas studied in this course.

Time and place

Monday and Wednesday from 2:00pm till 3:15pm in JMZ 0103.

Office, phones, hours, etc.

Office: Skinner Building, Rm. 1101. Office phone: I don't use my office phone. Personal cell phone: 301-408-8963. You are welcome to call my cell, but please keep it between 9:00am and 8:00pm. If I don't pick up, leave a clear message and I'll call you back. Email: horty@umiacs.umd.edu. Note: I'm not good at answering complicated questions by email, and prefer to meet in person or talk on the phone for that, but email is fine for quick administrative things, and for setting up appointments. Office hours: I'll let you know my exact office hours once they've sorted themselves out, but right now it looks like they will be the periods right after each class.

Course web page

<http://www.umiacs.umd.edu/users/horty/courses/2017-370>

Course work, grades

There will be weekly homework exercises, which you must do and turn in, and which I will look at to get a sense of where you are, but grade only for completion. We will then discuss the exercises in class. There will be a one point deduction from your final grade for each missed homework after the third.

There will be four exams, after syllabus topics 2, 3, 4, and 6. Some of the exams may have take-home components, mixed with in-class components. In general, my exam philosophy is

that I want to give you a chance to demonstrate your understanding, rather than trick you or give you brain-teasers to solve—so I try to keep the exams as straightforward as possible. Each exam will be worth roughly 25% of your final grade, though I may adjust the weighting if that turns out to be in your benefit, and I will curve if I think the raw grades are skewed too low.

Materials

The course will draw on parts of the following texts, which will be made available during the term:

- Graham Priest. *An Introduction to Non-Classical Logic (second edition)*. Cambridge University Press (2008).
- Richmond Thomason. *Symbolic Logic: An Introduction*, Macmillan Company (1970).
- Richard Zach et al. *Sets, Logic, Computation: An Open Logic Text*. The Open Logic Project (2016).

Policies

The course is subject to the various policies found here:

<http://www.ugst.umd.edu/courserelatedpolicies.html>

In addition, there is the further e-free policy: no laptops, phones, or other mobile devices can be used during class, unless you have a particular need to use a device of some sort for note-taking. If you are curious about the reasons for this policy, I can refer you to studies showing that classroom use of mobile devices interferes with learning.

Topics

1. Review of elementary logic
 - (a) Fitch-style natural deduction
 - (b) Tableaux systems
2. Elementary set theory
 - (a) Sets, relations, functions
 - (b) Size of sets
 - (c) Induction
3. Propositional logic: Syntactic metatheory
 - (a) Hilbert-style formulations
 - (b) Syntactic metatheorems
 - (c) Equivalence of formulations

4. Propositional logic: Semantics, soundness, completeness
 - (a) Semantics for classical propositional logic
 - (b) Interdefinability, functional completeness
 - (c) Soundness and completeness for Tableaux systems
 - (d) Soundness and completeness for Hilbert systems

5. First-order logic: Syntactic metatheory
 - (a) Hilbert-style formulations
 - (b) Syntactic metatheorems
 - (c) Equivalence of formulations
 - (d) Adding identity

6. First-order logic: Semantics, soundness, completeness
 - (a) Semantics for classical propositional logic
 - (b) Soundness and completeness for Tableaux systems
 - (c) Soundness and completeness for Hilbert systems
 - (d) Adding identity
 - (e) Compactness, Lowenheim-Skolem theorem
 - (f) Interpolation, Beth definability

7. Some nonclassical logics (if there is time)
 - (a) Some modal logics
 - (b) Intuitionistic logic