

Phil 120: Symbolic Logic

Syllabus, Spring 2024

MWF 5–6:20pm

RWAC 0426

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1 COURSE DESCRIPTION

Logic is the science of *valid arguments*, providing the foundations for mathematics, computer science, artificial intelligence, linguistics, and analytic philosophy. Formal logic allows us to analyze the notions of proof, validity, and sound reasoning with more precision than natural language permits. We'll use an artificial language—the language of first-order predicate logic—to formulate precise understandings of logical consistency, entailment, and proof. We'll also make use of a system of inference rules for formulating arguments with the utmost possible rigor.

Prerequisites: Phil 10 or equivalent introduction to propositional/sentential/truth-functional logic.

2 TEXTBOOK AND RESOURCES

1. **forall x: An Introduction to Formal Logic (Calgary Remix 2023)**, by P.D. Magnus & Tim Button, with additions by J. Robert Loftis, remixed and revised by Aaron Thomas-Bolduc & Richard Zach
2. **Open Set Theory (OST)**, by Tim Button
 - o Both textbooks are **100% free** and open-source, courtesy of the Open Logic Project. (You all have to pay far too much for most textbooks!) Download the correct versions for this course on Canvas.
3. **Problem sets:** conducted on Carnap (website; no software downloads). Carnap is also free, open-source, and programmed by philosophers. Carnap also provides a proof-checker. **Please register a Carnap account ASAP, using your UCSD email address.** There is a sign-up link for this class on Canvas. If you can't yet access the Canvas site for this course, sign up on carnap.io and enroll in the course "UCSD Phil 120: Symbolic Logic (Spring 2024)".
4. **In-class polls/ungraded mini-quizzes:** conducted primarily on Class Question (a free alternative to iClicker). Sign up for an account and register for this class with class code **LTLHF**. There is a sign-up link on Canvas.

3 BREAKDOWN OF REQUIREMENTS

- o Weekly problem sets: 30% (3% × 10 psets)

- Midterm exams: 38% (19% × 2 midterms)
- Cumulative final exam (06/14, 7:00p-9:59pm): 32%

3.1 Exams

There will be two midterm exams and a final exam.

If you miss a midterm for medical reasons or for any other personal emergency, you must contact me before the exam to explain.¹ I trust that you'll act in accordance with the Honor Code. There will be a make-up exam session after each midterm, scheduled ad hoc on the basis of availability.

All exams are closed book, closed notes. Exams must be completed independently. Any form of communication with others during exams (including whispering, passing notes, etc.) counts as cheating. Consulting any resource outside of your own brain (including notes, your phone, the textbook, logic-related tattoos, etc.) counts as cheating. Looking at another student's exam for any reason (even to check the date or your TA's name) counts as cheating. Students caught cheating will face immediate academic integrity charges.

3.2 Problem sets

30% of your grade will be determined by weekly problem sets ("psets"). Psets will be conducted on Carnap (a website; no download needed), a free, open-access, open-source online resource created by philosophers. Please register an account with Carnap as soon as possible, **using your UCSD email address**.

- If you register a non-UCSD email account, you'll have to redo all your psets on your UCSD account, and they'll be counted as late.
- If you accidentally register for the wrong course on Carnap, you can change your enrollment; but this will not count as a legitimate reason for late psets. Similarly for if you complete the wrong psets.

Please read the "Carnap Instructions and Troubleshooting" page on our Canvas site.

Psets must be completed individually and without collaboration. Students who give or receive help on psets will be reported to the university for committing an academic integrity infraction.

Psets are **due every Monday at 5:00 pm**. Late exercises are worth 40%, unless excused. In order for late pset exercises to be excused, you must fill in the pset extension form on the course website and provide a *legitimate reason*, at least 6 hours before the problem set is due.² By default, if your reason is legitimate, this will generate a two-day extension.

Psets may be time-consuming and involve some technical, typographical, and logical challenges; give yourself ample time and **start your psets early** to avoid facing last-minute technical challenges. Feel free to contact your TA with questions.

¹ Barring extraordinary and documented circumstances: for example, medical emergency.

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3.3 Legitimate and illegitimate reasons for late assignments and missed exams

- *Legitimate reasons*: illness (including COVID symptoms) or other medical emergency; death of a family member; ...
- *Illegitimate reasons*: not knowing the content of the syllabus; conflicts with other courses or activities; missed alarms; ...

4 POLICIES

Email policy: our TA should be your first point of email contact for brief logistical questions. However, if you have questions that would take more than a few sentences to answer, please bring them to class or office hours. Doing logic over email is wildly inefficient and introduces misunderstandings.

Laptop/tablet/phone policy: use of laptops, tablets, and phones won't be permitted during class, except in special cases or when we use Class Question.³ Please don't hesitate to contact me by email or during office hours if you have specific reasons why you will need to use any of these devices.

Grading policies: There will be no opportunities for extra credit after the final exam or for individual students. Grades will not be rounded up.

5 ACADEMIC INTEGRITY

In order to pass this class, students must agree to the Honor Code, appended, by providing their signature at the Honor Code portion of the course website.

Please familiarize yourself with **university policies** on cheating, plagiarism, and academic integrity. *Cheating and plagiarism need not be knowing or intentional to be penalizable.* Any form of cheating or plagiarism will be reported immediately. Penalties for academic integrity infractions include **failing the exam, failing the course, suspension, and expulsion from the university.**

6 ACCOMMODATIONS

Students requesting accommodations for this course due to a disability must provide a current Authorization for Accommodation letter issued by the Office for Students with Disabilities, located in University Center 202 behind Center Hall. Students are required to present their AFA letters to faculty and to the OSD liaison in the department *at least a week in advance* of affected assignments so that accommodations may be arranged. Contact the OSD at: (858) 534-4382 (phone), osd@ucsd.edu (email), or disabilities.ucsd.edu (website).

³ Justification: Students who take notes on laptops show reduced comprehension, in short and medium-term examination, compared with students who take notes by hand. Undergraduates who use laptops in lecture spend 40% of their time using non-course-related software. Academic performance is inversely correlated with multitasking on laptops. Most importantly: being seated near someone using a screen to multitask impedes academic performance. See Mueller & Oppenheimer (2014), "The Pen Is Mightier Than the Keyboard: Advantages of Longhand Over Laptop Note Taking," *Psychological Science*; Kraushaar & Novak (2010), "Examining the Affects of Student Multitasking with Laptops during the Lecture," *Journal of Information Systems Education*; Sanaa, Weston, Cepedab (2013), "Laptop multitasking hinders classroom learning for both users and nearby peers," *Computers & Education*.

7 TENTATIVE SCHEDULE

This schedule is subject to change. You should complete these readings before lectures. Note: many days require rereading previously assigned chapters. You might be tempted not to bother. But the reason our readings are so short is because they are densely packed with material. You'll understand this material better, and internalize it better, if you read it, hear lectures about it, attempt some exercises, and then read it again.

Week 1 *Refresher: logical concepts, truth tables*

Mon Apr 1 Introduction
Wed Apr 3 forall x , Ch. 2–6, 9–12

Week 2 *Proofs in zeroth-order logic*

Mon Apr 8 forall x , Ch. 16–19
Wed Apr 10 reread

Week 3 *Proofs, cont.*

Mon Apr 15 forall x , Ch. 20–21
Wed Apr 17 reread

Week 4 *First-order concepts and symbolizations*

Mon Apr 22 **first midterm**
Wed Apr 24 forall x , Ch. 23–24

Week 5 *Advanced concepts in first-order logic*

Mon Apr 29 forall x , Ch. 25–29
Wed May 1 reread

Week 6 *Models for FOL*

Mon May 6 forall x , Ch. 30–35
Wed May 8 reread

Week 7 *Proofs in first-order logic*

Mon May 13 forall x , Ch. 36–38
Wed May 15 reread

Week 8 *FOL proofs, cont.*

Mon May 20 **second midterm**
Wed May 22 forall x , Ch. 39–40

Week 9 *Naïve set theory*

Mon May 27 **Memorial Day obsv.**
Wed May 29 *OST*, Ch. 1.1–1.2, 1.4–1.6, 2.1, 2.3

Week 10 *Metatheory*

Mon Jun 3 forall x , Ch. 20, 37
Wed Jun 5 reread
