



**UNIVERSITY OF CALGARY**  
FACULTY OF ARTS  
Department of Philosophy

## **PHIL 279 Lec 01**

### **Logic I**

Summer 2023

Monday, Wednesday, 13:00-15:45, Science B 105

## **COURSE OUTLINE**

**Instructor Name:** Sophia Kimiagari

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**Office:** Social Sciences 1227

**Office Hours:** Friday 13:00-14:00, in-person or via Zoom

## **COURSE INFORMATION**

The course will introduce you to the semantics and proof-theory of Truth-Functional logic (TFL) and first-order logic (FOL). We will learn how to “speak” the language of FOL, study the method of truth tables, become proficient in giving formal proofs, and learn how to construct first-order interpretations. These methods provide us with precise ways to make sense of argument validity. The goal is to have you become comfortable with formal methods, and to use them to clarify and make precise logical relationships that are hard to understand or express otherwise. We will also look at some results and notions which are important for the applications of formal logic, such as the expressive power of truth-functional and first-order logic, as well as some important theorems relating semantics and proof theory (soundness, completeness). We will touch on applications of logic to philosophy, mathematics, and computer science.

The kinds of things you will learn are mainly of three sorts: (1) symbolize sentences of English in a formal language, (2) give counterexamples (truth tables, interpretations) that show various things, (3) give formal proofs. Much of this will be completely new and not something that’s like anything you’ve done before. It will not feel like what you might think of as philosophy. There will be lots of symbols. This is a course in formal logic, not a course on how to think or how to avoid fallacies. There are similarities to some things in discrete mathematics, but this formal logic is applied to more than mathematics.

## **PREREQUISITE(S)**

None

## **COURSE OBJECTIVES/LEARNING OUTCOMES**

By the end of the course, you should be able to :

1. work with the formal languages of truth-functional and first-order logic, with the ability to formalize natural language sentences in a formal language.
2. use truth tables to evaluate sentences and arguments in truth-functional logic.
3. understand the basic semantic concepts such as validity, entailment and logical equivalence, when they apply and how they can be used.
4. construct correct derivations in a natural deduction system for truth-functional and first-order logic, with and without identity.
5. use a proof system to determine whether or not a sentence is a logical truth, whether an argument is valid, and whether two formal sentences are equivalent.
6. construct interpretations that make first-order sentences true or false and use them to show that arguments are invalid.

7. appreciate some basic metatheoretic results, such as truth-functional completeness, and soundness and completeness of a natural deduction system for truth-functional logic.
8. be able to articulate clear questions, explain logical concepts, and guide others through logical problems.

### **REQUIRED/RECOMMENDED TEXTBOOKS, READINGS AND MATERIALS**

The textbook is: *P.D. Magnus, et. al., forall x: Calgary. An Introduction to Formal Logic (Fall 2021 edition)*. [forallx.openlogicproject.org](http://forallx.openlogicproject.org). It is free and available on D2L in PDF, as well as in Carnap. It comes in two formats, and many of the exercises in it have solutions in the accompanying solutions manual. You may also purchase a paper copy if you like. Each lecture in the Content section on D2L will tell you which chapters of the book that section covers. The book is more of an accompaniment than a primary source. The lectures will cover all the material you need, but you can find more detailed information on certain topics and also additional practice questions in the textbook.

### **HOW TO CONTACT AND ASK QUESTIONS**

1. There are different modules in D2L's Discussion Board for you to ask your questions. Your question about the course content (logical concepts, course outline, etc.) may already have been answered on the course discussion board (or in this outline). Check these first. If you can't find the answer to your question, consider posting your question on the discussion board. I will monitor the discussion boards and attend to questions regularly.
2. If your inquiry is specific to your personal situation or for some reason you couldn't find the answer you are looking for, feel free to send me an email ([mansooreh.kimiagari@ucalgary.ca](mailto:mansooreh.kimiagari@ucalgary.ca)). Please write "Phil 279" in the subject line of your emails.
3. I will do my best to reply within one business day. Consider reminding me if I didn't get back to you in 2 full business days.
4. You're highly encouraged to attend the lectures, but attendance is not mandatory. If you do attend, you'll have a chance to ask your questions first-hand and get an answer on spot. You will also see examples and exercises and discuss things with me and your peers; this is very useful for getting prepared for the weekly assignments.
5. Office hours are on Fridays from 1:00 to 2:00 pm. I will be in my office during this time (Social Sciences 1227) and keep zoom on. You can either connect via zoom or come to my office if you happen to be on campus.
6. Feel free to call me "Sophia".

### **COURSE ASSESSMENT AND EVALUATION**

**There will be no registrar-scheduled final exam.**

The aim of this course is for you to become proficient in the learning objectives listed below. Your success in this will be assessed by the number of activities (problem sets, quizzes, and challenge problems) you complete successfully. There are a total of 12 activities of each kind, two of each kind per week each aimed at a particular learning outcome. Each activity has a minimum level of performance that counts as "complete (✓)." Completing an activity roughly corresponds to earning at least a B on that activity. Problem sets and quizzes have a higher level of performance that earns you a "complete+ (✓+)." Completing a quiz or problem set at this level roughly corresponds to an A.

Instead of earning point scores on each, and then determining your final grade based on some frankly arbitrary system of weights, averages, and cutoffs, your final grade will be determined on the basis of how many activities you complete. This means, more or less, that your final grade is determined by how many of the learning objectives you show proficiency in by the end of term.

**Problem sets:** You have to score 80% on a problem set for it to count as complete. If you score 95%, you earn a "complete+." (You can check your answers before submitting, them so no retakes.)

**Quizzes:** A quiz counts as complete if you score at least 80% on it, and complete+ if you score 95%. (You have four attempts at each quiz, and although the questions you get each time are randomized, they are of equivalent difficulty, so no retakes.)

**Challenge problems:** Each week there will be challenge problems to complete. Challenge problems will be timed (usually 30-60 minutes), but they will be available to complete for several weeks. (You will be able to check your answers before submitting them, but since they are timed, you are permitted retakes.) Yes, that is a higher bar to clear than usual in all of the activities, but proficiency requires demonstrating that kind of result. Remember, you have more than one attempt to clear the bar in many cases. You also get immediate feedback on all of your activities, so you will know right away whether you have completed it.

On the quizzes you will not see which questions you got wrong: part of the learning experience is figuring that out. On the carnap.io activities, you can check that your answers are correct before submitting them.

Overall, you can take your time and learn from your mistakes.

### Final grades

Your final grade is a record of how many learning objectives you have achieved, based on how many activities (problem sets, quizzes, challenge problems) you have completed. This mapping of performance on activities to letter grades is more complicated than a points system with percentage cutoffs, but it captures more accurately how much you've shown to have learned in the course.

The following table lists how many activities of each type you have to complete in order to earn a given grade. "Total" is the overall minimal number of activities you must complete for that grade range. For A-range grades, you must also earn complete+ marks on a sufficient number of activities. You earn the highest grade you qualify for on the basis of the number of  $\checkmark$ 's and  $\checkmark+$ 's you have earned in each category, and the total number you have earned.

Grades	PS	Q	CP	Total
A+	12 $\checkmark+$	12 $\checkmark+$	12 $\checkmark$	36
A	12 $\checkmark$ /10 $\checkmark+$	12 $\checkmark$ /10 $\checkmark+$	12 $\checkmark$	36
A-	11 $\checkmark$ /8 $\checkmark+$	11 $\checkmark$ /8 $\checkmark+$	11 $\checkmark$	33
B+	10 $\checkmark$	10 $\checkmark$	10 $\checkmark$	32
B	10 $\checkmark$	10 $\checkmark$	10 $\checkmark$	30
B-	8 $\checkmark$	8 $\checkmark$	8 $\checkmark$	28
C+	8 $\checkmark$	8 $\checkmark$	8 $\checkmark$	26
C	8 $\checkmark$	8 $\checkmark$	8 $\checkmark$	24
C-	6 $\checkmark$	6 $\checkmark$	6 $\checkmark$	22
D+	6 $\checkmark$	6 $\checkmark$	6 $\checkmark$	20
D	6 $\checkmark$	6 $\checkmark$	6 $\checkmark$	18

For instance, to earn a B-, you must complete 8 of each activity (that's 24 total) but overall must complete at least 28 activities (so e.g., an additional two problem sets and two quizzes, or two problem sets, a quiz, and a challenge problem). For an A, you must complete all activities, and for 10 problem sets and 10 quizzes you must receive a  $\checkmark+$ . (An A+ requires 12  $\checkmark+$  on problem sets and quizzes, and an A- requires 11 problem sets and quizzes completed, of which 8 must be  $\checkmark+$ .)

Note that the number of activities alone does not guarantee a higher grade. E.g., if you have completed all 12 problem sets and 12 challenge problems, but only 8 quizzes, this earns you only a B-, not a B+

even though you have 32 activities completed in total. Also, ✓+ only play a role in earning A-range grades. So 8 ✓+ on problem sets, 8 ✓+ on quizzes, and 8 ✓ on challenge problems is still just a C.

### **Partial credit, retakes, tokens**

Grades in this class are based on how many learning objectives you show proficiency in. Proficiency is an all-or-nothing affair: for instance, you have either completed a truth table correctly or you did not. You can think of a learning objective as a hurdle you have to clear; either you clear it or you don't. Your overall performance is determined by how many hurdles you clear throughout the course, and how high those hurdles are. For that reason, there will be no partial credit. You won't get half the marks for jumping half as high as necessary.

Every student gets tokens to spend during the term. You may only spend two tokens per week. Once you redeem a token you will have two weeks to complete the challenge problem you redeemed it on, unless two weeks' time is past the final due date of the course.

To redeem a token, i.e., request an alternative challenge problem, quiz attempt etc, send an email to me. Note that re-takes of assessments may have different questions than the originals. Your best attempt will be the one kept.

## **IMPORTANT DEPARTMENTAL, FACULTY AND UNIVERSITY INFORMATION**

### **Academic Accommodations**

It is the student's responsibility to request academic accommodations according to the University policies and procedures. The student accommodation policy can be found at [ucalgary.ca/legal-services/sites/default/files/teams/1/Policies-Student-Accommodation-Policy.pdf](https://ucalgary.ca/legal-services/sites/default/files/teams/1/Policies-Student-Accommodation-Policy.pdf).

Students needing an Accommodation because of a disability or medical condition should communicate this need to Student Accessibility Services in accordance with the Procedure for Accommodations for Students with Disabilities: [ucalgary.ca/legal-services/sites/default/files/teams/1/Policies-Accommodation-for-Students-with-Disabilities-Procedure.pdf](https://ucalgary.ca/legal-services/sites/default/files/teams/1/Policies-Accommodation-for-Students-with-Disabilities-Procedure.pdf). Students needing an Accommodation in relation to their coursework or to fulfil requirements for a graduate degree, based on a protected ground other than disability, should communicate this need, preferably in writing, to their instructor.

### **Absence or Missed Course Assessments**

Students who are absent from class assessments (tests, participation activities, or other assignments) should inform their instructors as soon as possible. If the reason provided for the absence is acceptable, instructors may decide that any arrangements made can take forms other than make-up tests or assignments. For example, the weight of a missed grade may be added to another assignment or test.

### **Student Support and Resources**

Full details and information about the following resources can be found at [ucalgary.ca/current-students/student-services](https://ucalgary.ca/current-students/student-services)

- Wellness and Mental Health Resources
- Student Success Centre
- Student Ombuds Office
- Student Union (SU) Information
- Graduate Students' Association (GSA) Information
- Emergency Evacuation/Assembly Points
- Safewalk

### **Academic Advising**

If you are a student in the Faculty of Arts, you can speak to an academic advisor in the Arts Students' Centre about course planning, course selection, registration, program progression and more. Visit the Faculty of Arts website at <https://arts.ucalgary.ca/current-students/undergraduate/academic-advising>

for contact details and information regarding common academic concerns.

For questions specific to the philosophy program, please visit [arts.ucalgary.ca/philosophy](https://arts.ucalgary.ca/philosophy). Further academic guidance is available by contacting Jeremy Fantl (Undergraduate Program Director [jfantl@ucalgary.ca](mailto:jfantl@ucalgary.ca)) or David Dick (Honours Advisor [dgdick@ucalgary.ca](mailto:dgdick@ucalgary.ca)).

### **Writing Assessment and Support**

The assessment of all written assignments—and, to a lesser extent, written exam responses—is based in part on writing skills. This includes correctness (grammar, punctuation, sentence structure, etc.), as well as general clarity and organization. Research papers must include a thorough and accurate citation of sources. Students are also encouraged to use Writing Support Services for assistance. For more information, and other services offered by the Student Success Centre, please visit [ucalgary.ca/student-services/student-success](https://ucalgary.ca/student-services/student-success).

### **Required Technology**

In order to successfully engage in their learning experiences at the University of Calgary, students taking online, remote, and blended courses are required to have reliable access to the following technology:

- A computer with a supported operating system, as well as the latest security, and malware updates;
- A current and updated web browser;
- Webcam (built-in or external);
- Microphone and speaker (built-in or external), or headset with microphone;
- Current antivirus and/or firewall software enabled;
- Broadband internet connection.

Most current laptops will have a built-in webcam, speaker and microphone.

### **Responsible Use of D2L**

Important information and communication about this course will be posted on D2L (Desire2Learn), UCalgary's online learning management system. Visit <https://ucalgary.service-now.com/it> for how-to information and technical assistance.

All users of D2L are bound by the guidelines on the responsible use of D2L posted here: <https://elearn.ucalgary.ca/commitment-to-the-responsible-use-of-d2l/>. The instructor may establish additional specific course policies for D2L, Zoom, and any other technologies used to support remote learning. Instructional materials, including audio or video recordings of lectures, may not be posted outside of the course D2L site. Students violating this policy are subject to discipline under the [University of Calgary's Non-Academic Misconduct policy](#).

### **Media Recording**

Please refer to the following statement on media recording of students: [https://elearn.ucalgary.ca/wp-content/uploads/2020/05/Media-Recording-in-Learning-Environments-OSP\\_FINAL.pdf](https://elearn.ucalgary.ca/wp-content/uploads/2020/05/Media-Recording-in-Learning-Environments-OSP_FINAL.pdf)

### **Academic Misconduct/Honesty**

Cheating or plagiarism on any assignment or examination is as an extremely serious academic offense, the penalty for which will be an F on the assignment or an F in the course, and possibly a disciplinary sanction such as probation, suspension, or expulsion. For information on academic misconduct and its consequences, please see the University of Calgary Calendar at [ucalgary.ca/pubs/calendar/current/k.html](https://ucalgary.ca/pubs/calendar/current/k.html).

Intellectual honesty requires that your work include adequate referencing to sources. Plagiarism occurs when you do not acknowledge or correctly reference your sources. If you have questions about referencing, please consult your instructor.

## **University Policies**

The Instructor Intellectual Property Policy is available at [ucalgary.ca/legal-services/sites/default/files/teams/1/Policies-Intellectual-Property-Policy.pdf](https://ucalgary.ca/legal-services/sites/default/files/teams/1/Policies-Intellectual-Property-Policy.pdf)

The University of Calgary is under the jurisdiction of the provincial Freedom of Information and Protection of Privacy (FOIP) Act, as outlined at <https://www.ucalgary.ca/legal-services/access-information-privacy>. The instructor (or TA) must return graded assignments *directly* to the student UNLESS written permission to do otherwise has been provided.

All students are required to read the University of Calgary policy on Acceptable Use of Material Protected by Copyright (<https://www.ucalgary.ca/legal-services/sites/default/files/teams/1/Policies-Acceptable-Use-of-Material-Protected-by-Copyright-Policy.pdf>) and requirements of the copyright act (<https://laws-lois.justice.gc.ca/eng/acts/C-42/index.html>).