



PHIL 320 001 – LOGIC: METATHEORY & COMPUTABILITY

Winter Term 2: Jan. 5 – Apr. 10, 2026, Credits: 3

Tue Thu 11am – 12:30pm, LIFE Building, Room 2212

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Office hours: by appointment

Course Description:

The two major topics of this course are computability theory and basic metalogic. The first part of the course (chapters 1-8 of the textbook) elaborates what it means for a function to be *computable* employing three different approaches to computability: Turing machines, abacus machines and recursive functions. These chapters demonstrate that all three definitions of a computable function are equivalent: any function that counts as computable on one of the definitions also counts as computable on the other two as well. This equivalence result provides some support for *Church's Thesis* (the claim that all effectively computable functions are recursive functions).

The second part of the course (chapters 9-14) develops some of the main ideas of intermediate (meta)logic. For this part, we assume a solid grasp of classical first-order predicate logic: one should understand truth-functional connectives and quantifiers; one should be able to symbolize English sentences in a formal language; and one should know how to construct proofs in first-order predicate logic. However, rather than doing proofs within a given system of predicate logic, our principal goal is to prove important facts *about* our system of predicate logic itself.

It includes the study of:

- *Syntax*: the language and formation rules for formulas of predicate logic; and
- *Semantics*: the definition of valid (logically true) formulas in terms of *interpretations*.
- *Model Theory*: the notion of interpretations and models for sets of sentences and prove some important facts about models.
- *Proof theory*: the definition of valid formulas in terms of *deductions*.
- *The soundness and completeness* theorems (chapters 13-14).

Textbook: G.S. Boolos, J.P. Burgess and R.C. Jeffrey, *Computability and Logic*, 5th edition (Cambridge, 2007). Available in bookstore. (Note: Used copies of 4th edition are almost identical and are fine for the course, but not 3rd edition or earlier.)

Prerequisites: PHIL 220 or equivalent background in symbolic logic. You should feel comfortable with a mathematical style of lecturing and a mathematical style of problem-solving. **Important:** The concepts and problems in Phil 320 are significantly harder than in Phil 220. We move at a fast pace. The lectures cannot cover every detail or work through as many examples as one might wish to do. You must be able to learn the material **independently** through reading and solving problems, using the lecture notes as a basis. I suggest that you read the material before it is covered in the lectures, and then return to the text for a more thorough examination afterwards. You may need multiple readings to grasp these ideas.

Course Website: www.canvas.ubc.ca → PHIL 320 001 2025W2

Evaluation:

Three Online Discussion Activities	15%
Three In-Class Tests	45%
Final Exam	40%

- **Discussion Activities:** We'll have three online small group discussion activities. Prior to that every student will be assigned to one of several small groups (10 or so students), within which he or she will be expected to take part in all these group discussions. The more detailed instructions on the group discussions will be given shortly prior to the first discussion activity. All (equally weighted) discussion activities are worth 15% of your final grade.
- **Tests:** There will be three in-class sit-down paper-based written tests. Each individual test weighs 15% of your final grade in this course.
- **Final Exam:** There will be a regular, 2.5-hour long, paper-based sit-down cumulative final exam during the examination period weighing 40% of your final grade in this course.

Doing the textbook exercises and participation in online discussions are the key ingredients to the success in this course. **I highly recommend doing all the assigned problems (starred and unstarred) and actively participate in the online discussions** as the real test problem may closely resemble them, both in format and content. All starred problems have answers at the back of the book.

Class Format:

The general format of the class is a mixture of in-class lectures, in-class discussions, online small group discussions, in-class tests, review of assignments, and final exam. The lectures will invite participation from the students, but their main goal is to introduce and illustrate concepts.

Course Objectives:

At the end of this course, you should be able to:

- Read and write in first-order languages
- Translate non-quantified and quantified English sentences into first-order languages
- Construct truth-tables and determine logical properties of, and relations between, sentences
- Provide informal proofs for given conclusions
- Provide formal proofs for given conclusion in a system of natural deduction
- State general metalogical properties of our systems of natural deduction.

Academic Concessions, Missed Assignments, and Grade Changes:

According to the newly revised University Academic Concession policy taking effect on Sep. 1, 2019, students must contact me, the instructor, via email as soon as you are aware you may need an in-term concession. I will adjudicate your first request. You need to include a Student Self-Declaration form, found on the Arts Advising website at

<https://www.arts.ubc.ca/wp-content/uploads/sites/24/2019/10/Student-Self-Declaration-Form-1.6-Arts.pdf>

Please note that, according to the new policy, for all consecutive concessions (second, third, etc.), you must make your request directly to your appropriate Faculty Advising Office. The official guidelines of what types of academic concessions are available to you and what procedures you need to follow to request them can be found at the following page:

<https://www.arts.ubc.ca/degree-planning/academic-performance/academic-concession/>

As a rule, there'll be no make-ups for the graded activities because the answer keys for many assignments are typically revealed to the class after the assignment deadline. If you do have a University-valid excuse for missing them (see above about Academic Concession), I will transfer the weight of what you have missed to the weight of your final exam.

If you wish to have a grade reconsidered, write a brief note stating your reason. Typically, the note will outline what you take to be the requirements of a good answer and point out where you believe you met these requirements.

Learning Analytics:

Learning analytics includes the collection and analysis of data about learners to improve teaching and learning. This course will be using the Canvas Learning Management System and a UBC approved online remote invigilating tool (LockDown Browser and Zoom or similar), which may record your webcam, your computer screen, or other actions during the exam session and share that information with your instructor. The recorded information meets British Columbia's Freedom of Information and Protection of Privacy Act.

Overall, in this course, I may use analytics data to

- View overall class progress
- Track your progress in order to provide you with personalized feedback
- Review statistics on course content being accessed to support improvements in the course
- Track participation in discussion activity forums and in the course in general
- Assess your participation in the course.

University Policies:

- **UBC General Policies:**

UBC provides resources to support student learning and to maintain healthy lifestyles but recognizes that sometimes crises arise and so there are additional resources to access including those for survivors of sexual violence. UBC values respect for the person and ideas of all members of the academic community. Harassment and discrimination are not tolerated nor is suppression of academic freedom. UBC provides appropriate accommodation for students with disabilities and for religious observances. UBC values academic honesty and students are expected to acknowledge the ideas generated by others and to uphold the highest academic standards in all of their actions. Details of the policies and how to access support are available on the UBC Senate website at <https://senate.ubc.ca/vancouver/policies-resources-support-student-success/>

- **UBC Plagiarism Policy:**

Plagiarism, which is intellectual theft, occurs where an individual submits or presents the oral or written work of another person as his or her own. Scholarship quite properly rests upon examining and referring to the thoughts and writings of others. However, when another person's words (i.e. phrases, sentences, or paragraphs), ideas, or entire works are used, the author must be acknowledged in the text, in footnotes, in endnotes, or in another accepted form of academic citation. Where direct quotations are made, they must be clearly delineated (for example, within quotation marks or separately indented). Failure to provide proper attribution is plagiarism because it represents someone else's work as one's own. Plagiarism should not occur in submitted drafts or final

works. A student who seeks assistance from a tutor or other scholastic aids must ensure that the work submitted is the student's own. Students are responsible for ensuring that any work submitted does not constitute plagiarism. Students who are in any doubt as to what constitutes plagiarism should consult their instructor before handing in any assignments. A link about Academic misconduct is as follows:

<https://academicintegrity.ubc.ca/regulation-process/academic-misconduct/>

- **Students with special needs:**

Students who require accommodations in this course due to a disability affecting mobility, vision, hearing, learning, or mental or physical health are advised to discuss their needs with the Disability Resource Centre at Brock Hall, Room 1203, 1874 East Mall or visit their website at

<https://you.ubc.ca/ubc-life/campus-community/students-disabilities>

Copyright:

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