

PHIL P-11101: Introduction to Logic

Logic is justly considered the basis of all other sciences, even if only for the reason that in every argument we employ concepts taken from the field of logic, and that every correct inference proceeds in accordance with its laws.

Alfred Tarski

1. About this course

Throughout our lives we are bombarded by persuasive arguments aimed at shaping our actions, feelings and beliefs. How should we decide which arguments to trust? Sometimes this is a straightforwardly factual matter of verifying key premises. But we are often confronted by arguments from true premises to opposite conclusions. We cannot easily settle such matters by gathering further facts; we need to study the goodness of reasoning itself. What beyond the truth of its premises makes an argument good, or worth trusting?

Logic answers this question by studying the *structure* of reasoning and asking *what kind of structure must an argument have in order to establish the truth of its conclusion, given the premises?* By clearly representing the structure of an argument we can assess its strength. We also guard ourselves against misdirection, conflation, insinuation, and other misuses of persuasive language by clearly setting out which expressions contribute to an argument's logical structure, and which expressions function in other ways. Much of this can be done formally, with the same precision, clarity and certainty as any textbook in mathematics.

In this course, you will learn to:

- (1) Construct and clearly express logically valid arguments.
- (2) Analyze and critically evaluate the structure and logical force of arguments.
- (3) Explain and motivate principles of logical reasoning.
- (4) Apply these skills to novel contexts ranging from academic research to everyday life.

We'll take a discovery-oriented approach, collaboratively developing key logical concepts, principles and modeling frameworks by reflection on readings, puzzles, and examples of reasoning. We'll build confidence with logical techniques by applying them to situations from everyday life.

2. Text

The text for this course is Hurley's *A concise introduction to logic: 12th edition*. Hard copies are best, since you can mark them up and bring them to class without distraction. But the ebook is fine if that's your thing, just note that laptops are not allowed in class so you may not have access to the textbook during course hours. Additional resources and readings listed on the course schedule are available on the course site.

3. Course structure

3.1 Course meetings

Course meetings will involve a lively mixture of student-guided lecture and group work. When possible, you'll be guided through group activities which will help you to discover and explain relevant logical concepts. When more formal lecture is required, you'll be asked to take an active role in supplying examples of defined concepts, working through problems as a class, motivating key distinctions, and developing formalisms and solution methods. Please come prepared to roll up your sleeves and actively participate in all aspects of the course. Your learning and enjoyment will be directly proportional to your own engagement.

3.2 Daily events

We'll take a 10-15 minute break in the middle of each course meeting, and finish each day with a minute debrief to check in with how you're doing in the course. I'll also hold daily office hours (Emerson 316, hours TBD).

3.3 Homework

Homework will consist of a healthy mixture of reading, logic problems, presentations, and exercises meant to help you apply your knowledge. Homework assignments will be posted on the course website and passed out in class. Please do bear in mind if you're working ahead that homework assignments may change to accommodate the pace of the course. Extensions will be granted only in rare circumstances, due to the pace of the course.

3.4 Final project

The culmination of your efforts in this course will be a final project in which you apply your skills of logical analysis to analyze and assess the logical structure of a contemporary newspaper editorial. Working in groups of no more than four students, you will choose a recent editorial article and select the most appropriate tools for formal logical analysis learned in this course to clearly set out, as best you can, the structure of the relevant argument. On the final day of class, each group will present their analyzed argument and assess the logical validity and soundness of the argument as well as its relation to the printed text. You will receive peer and instructor feedback on your presentation. We'll reconvene as a class to assess what these examples can teach us about the use and misuse of logical language in persuasive argument; the extent of extra-logical influence on argumentation; and the success or failure of logical formalisms in capturing aspects of written argument.

4. Course policies

4.1 Academic integrity

Students are expected to familiarize themselves with and adhere to the Summer School's policy on academic integrity, which can be found in the student handbook or online (<https://studenthandbook.summer.harvard.edu/academic-integrity>). This policy outlines our stance on plagiarism, collaboration, duplicate assignments, and distribution of course materials. Because of the content of this course, it is especially important to ensure appropriate collaboration. Collaboration is *heartily encouraged* on all assignments in this course. However, please bear in mind that collaboration requires active participation in group work and should lead to conceptual mastery of all material contained in written solutions. Specifically, make sure that you can work through the problems yourself and ensure that any answers you submit for evaluation are the result of your own efforts. Please *list collaborators* at the top of each submitted assignment. In addition, please cite any books, articles, websites, lectures, etc that have helped you with your work using appropriate citation practices.

4.2 Accessibility statement

Harvard is committed to promoting an inclusive learning environment allowing each student an equal opportunity to learn. If you require any special arrangements, please don't hesitate to reach out. By university policy, requests for accommodation should be made through Accessibility Services (<https://www.summer.harvard.edu/resources-policies/accessibility-services>). Instructors are not permitted to arrange accommodations directly with students.

4.3 Laptop policy

Laptops are not required for this course and should not be used during course time, in the interest of promoting a distraction-free environment for all students. I'm willing to negotiate on e-readers if you're using the ebook. Some homework assignments may require computer access outside of class.

4.4 Homework

Unless otherwise specified, there is no need to submit homework assignments before class time. Please bring completed assignments to lecture, and come prepared to ask questions about any material which was especially difficult or interesting. I'm happy to accept handwritten or typed submissions using any reasonable format (so for example LaTeX is ideal for technical writing but MS Word might not be). Sometimes you will be asked on the course schedule to submit assignments ahead of time. In this case, please upload submissions to the course site by midnight on the day they are assigned.

4.5 Grading

Grading for this course is pass-fail. Daily homework assignments will be weighted equally alongside the final project. I'll return comments on all homework assignments during the next course meeting, and am happy to meet with you to provide feedback on your progress. You'll also receive a written evaluation of your progress at the end of the course. My goal is for all of you to pass the course, so I hope you'll view the evaluation process as an opportunity for feedback and learning as much as formal correction. Students averaging close to the minimum passing grade (65%) are strongly encouraged to meet with me to discuss strategies for passing the course.

5. Tentative schedule

Homework will be posted on the Canvas site.

Monday, July 8th	
Unit	Topics
1. Introduction to logic	Welcome and syllabus Why study logic? What logic is and isn't Statements and arguments Deduction versus induction Validity and soundness
Reading for tomorrow:	Hurley §§1.1-1.2, 1.4
Tuesday, July 9th	
Unit	Topics
1. Introduction to logic	Validity and soundness Testing for validity
2. Syllogistic logic	Categorical propositions Categorical paraphrase
Reading for tomorrow:	Hurley §§1.5, 4.1, 4.3 (Optional: Skim §4.2)
Wednesday, July 10th	
Unit	Topics
2. Syllogistic logic	Venn diagrams Categorical syllogism Validity Sorites Limitations of categorical logic
Reading for tomorrow:	Hurley §§5.2, 5.5, 5.7 (Optional: Skim §4.7)

Thursday, July 11th

Unit	Topics
3. Propositional logic	Language and formation rules Truth-functionality Truth tables
Reading for tomorrow:	Hurley §§6.1-6.2

Friday, July 12th

Unit	Topics
3. Propositional logic	More truth-tables Propositional paraphrase
Reading for tomorrow:	Hurley §§6.3-6.4

Monday, July 15th

Unit	Topics
3. Propositional logic	Classification and comparison Testing for validity Introduction to natural deduction
Reading for tomorrow:	Hurley §7.1

Tuesday, July 16th

Unit	Topics
3. Propositional logic	More natural deduction Soundness and completeness Limitations of propositional logic
Reading for tomorrow:	Hurley §7.2

Wednesday, July 17th

Unit	Topics
4. Predicate logic	Language and formation rules Subsumption of syllogistic logic Paraphrase
Reading for tomorrow:	Hurley §8.1

Thursday, July 18th

Unit	Topics
4. Predicate logic	More paraphrase Testing for validity
Reading for tomorrow:	Hurley §8.5

Friday, July 19th

Unit	Topics
5. Logic in the world	Final project presentations Applications What's next?
