

# Feminist and Trauma-Informed Approaches to Teaching Formal Philosophy—Supplementary Material

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# 1 University of Michigan

## 1.1 Introduction

This course was taught in Fall 2023 as an upper-division course but had no prerequisites. As the graduate student instructor (GSI) instead of the primary instructor, my discussion sections fulfilled a role analogous to the Logic Labs from UCI. Here, I include snippets from activities I ran in the discussion sections throughout the semester, roughly classified along the lines of the interventions we discuss in the main text. All the materials were printed out and distributed to the students except for the solutions to the problems. After the discussion sections, I uploaded a version of the file with my solutions to Canvas.

## 1.2 Sample activities

### 1.2.1 Encouraging agency in learning

- I ran the following activity on the first discussion section.

*Why learn logic?* (~5-10 minutes in small groups). In small groups, discuss how evaluating an argument's form (not its content!) might operate in your disciplines. Can you think of a cool example that could arise in your professional or personal life in which studying "what counts as a good reason for what, and why"<sup>1</sup> would be relevant?<sup>2</sup>

After your discussion, each group member will come up with a one-word answer to the question "What's the goal of doing logic?" Write the word on a slip of paper, and return it to me at the end of the section. It's okay to pick the same word as other group members. (I'll compile a list with your words, make a word cloud, and upload it to Canvas!) We'll then have ~10 minutes for a big-group discussion.

- I ran reflection activities like the following after taking an exam.

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<sup>1</sup>I'm borrowing this phrase from Graham Priest's *Logic: A Very Short Introduction*.

<sup>2</sup>Here's an example. Say that I'm a biologist. Then, knowing that all insects have six legs and that a spider doesn't have six legs, I know a spider is not an insect.

PHIL 303 Discussion sections – Agenda for week 5

Objectives	Connections to the course’s big picture
Engaging in “meta” reflections on how logic works inside and outside of the classroom and what it means to do logic.	We’ve gone through a bunch of definitions, methods, problems, and questions. Remember our initial motivation: building better arguments and spotting weaknesses in ours or those of others. Does what we’ve learned so far help achieve that goal? If so, how?

1. Let’s do a small check-in. Think about the following questions individually for a couple of minutes. Then, we’ll have a big group conversation, but no one is expected to share if they don’t want to! (~20 minutes).
  - How do you feel about the logic you’ve learned so far? Is it different from what you expected? If so, how?
  - What has felt particularly challenging? Is it a challenge you think you can overcome with sufficient practice, time, and support?
  - Is there something you’ve felt particularly at ease with? This distinction is vague, but do you feel more at home with the more “meta,” big picture, creative aspects of doing logic or with the concrete, nitty-gritty, and technical ones? Why do you think that is the case?
  - We have a wide range of background interests and preparation—as your instructor, that’s challenging but also fruitful since, for instance, people new to the material can pose useful questions that help those more familiar with the material to identify gaps in their understanding or think about it in new ways. How have you felt about collaborating with your peers in section, in the problem sets, etc.? How do you react when someone tackles a problem in a way different from the one you were going for?
2. “What’s the goal of doing logic?” redux. Think about our word cloud from our first day/Canvas! What would you say logic is about now? Have you found ways in which the concepts and methods we’ve learned operate in your daily lives, hobbies, disciplines, etc.? Independently of your answer, why do we care!? (~10 minutes in small groups, ~10 minutes in the big group).

- I ran the following activity in the last discussion section.

Wrap-up meta-questions: Identify one to three concepts, tools, or ideas you learned from this course and that you think you’ll take away from it. Why do you believe they are important? Take ~5 minutes to write them down somewhere, individually. Then, we’ll go around the room sharing them (~10 minutes).

### 1.2.2 Building intentional space for underrepresented voices and traditions

- Brainstorming time: The material conditional is weird! From the lectures (and problem set 3), we already know that everything follows from a contradiction. Here are a couple of other examples:
  - From activity 2, we saw that  $p \supset q$  implies  $(p \& r) \supset q$ . And yet, remembering that  $p$ ,  $q$ , and  $r$  can be whatever propositions we want, it seems weird to infer from “If the match is struck, it will light” that “if the match is dunked in coffee and struck, it will light.”<sup>3</sup>
  - Potentially less weird: look at problem (i) from activity 3! Is it intuitive that  $p \supset (q \supset r)$  is not equivalent to  $(p \supset q) \supset r$ ?

<sup>3</sup>For more on this example, see Bas C. van Fraassen’s (1980) “The Scientific Image” (pp. 114 ff.) and Hans Halvorson’s (2020) “How Logic Works” (pp. 37-39).

What do you make of these issues? What do you think is/are the cause/s of these problems? Do you have ideas about how to fix them? How do you know you're on the right track if you do? (~ 5-10 minutes to discuss in small groups; ~ 5-10 minutes to discuss in the big group).

- Brainstorming time: we've seen [in the lecture] some ways to extend propositional logic (FDE [First-Degree Entailment],  $G_3$  [Gödel 3-valued logic], Dialetheism). What other limitations have you noticed propositional logic has? What other bits of natural language do you think it'd be cool that we'd be able to express in a formal system? Think about these questions individually for a couple of minutes. Then, we'll have a big group conversation. (~10 minutes).
- Here are excerpts from the instructions for the activity I ran. I want to highlight how I played (i) with the pronouns and (ii) with my involvement in the activity to encourage collaboration and foster other of our principles.

We're going to work on some tough derivations through a jigsaw activity...I'll walk around answering questions. Then, all the students with the same number will form a new group...and explain their **progress**...(If you have found the solution, great! If not, no pressure! Go with what you've done, including the dead ends.)...Make sure to cover the explanations from all the representatives of the original groups! Then, we'll all discuss where people got stuck and **try** to solve them on the board for ~ 15 minutes...**people asked last week if there were many ways of making a derivation. To show you that that's the case and to encourage you to do more practice problems to gain familiarity with derivations, I'll be coming "unprepared," without a "script" of a solution I've thought about before. Maybe I'll get stuck, too! We'll work on them together** and see what tricks we get from one another.

## 2 University of California, Irvine

### 2.1 Introduction

This course was taught in Spring 2023 as a lower-division course with no prerequisites. Here, I include the syllabus for the course as well as other materials used throughout. The Carnap.io page for this course can be viewed [here](#).

### 2.2 Syllabus

# LPS 30: Introduction to Symbolic Logic

Instructor: Helen Meskhidze (she/her)

[helen.meskhidze@uci.edu](mailto:helen.meskhidze@uci.edu)

Meetings: MWF 3-3:50 PM, SSH 100

Office hours: MW 4-5PM, SST 703 or by appointment

TAs: [redacted]

## What's this course about?

The goal of this course is to provide you formal tools for evaluating arguments, to give you practice using these tools, and to help you understand the utility of these tools. We will learn how to translate sentences into symbolic logic and the rules of manipulating those sentences to see what they entail. By the end of this course, you will be able to employ the language of symbolic logic as well as understand its limitations.

This course fulfills the following general education requirements:

Vb. Formal reasoning: Courses in this category focus on aspects of formal reasoning including symbolic logic, mathematical modeling, and algorithmic reasoning.

This course is designed to be **active** and **student-centered**. Refining your logical analysis skills is like refining your skills in a foreign language or a computer language: you need a lot of practice! Therefore, to succeed in this course, I recommend thinking of your time in the course (and in discussion sections) as time to practice. Our course structure is meant to facilitate this. We'll have active lectures on Mondays and Wednesdays and Fridays we'll have "logic labs." We'll use the time to work through problems, especially those relevant to upcoming homework, with partners/in groups. We'll also use [Carnap.io](https://carnap.io) throughout the course to ensure you have opportunities to practice.

In addition to the main content, this course pays special attention to your development as a logician! We will do a lot of reflections throughout the course, some to track developments in your thought and some to relate the content we study in this course to your lives more broadly.

## Text for the course

Required text:

- *Schaum's Outline of Theory and Problems of Logic* by Nolt, Rohatyn, and Varzi (2nd Ed.).

Supplemental texts (excerpts will be posted on our course page):

- *The Art of Logic in an Illogical World* by Eugenia Cheng
- *for all x* by P. Magnus & T. Button (Open Education Resource available [here](#)).

By the end of this course, you will be able to:

1. articulate the strengths and limitations of formal systems
2. describe how formal tools can shape and develop our beliefs
3. translate arguments from English into well-formed formulas of symbolic logic
4. evaluate the semantic validity of arguments in sentential logic using truth tables
5. evaluate the deductive validity arguments in sentential logic using a Fitch-style natural deduction system
6. use map models, Venn diagrams, and arrow models to evaluate arguments in quantified logic
7. evaluate the deductive validity arguments in quantified logic using a Fitch-style natural deduction system
8. reflect on and appreciate your development as a logician and as an active, reflective learner

## What is the structure of this course?

The content for this course will be broken into 4 main + 2 short supplemental modules.

**Weekly:** Mondays and Wednesdays, I'll introduce some new concepts and you'll have plenty of opportunities to practice. For any new concepts introduced, I'll also have a pre-recorded, short video that you'll be able to reference after class. Fridays, we'll treat class time as a lab and work through problems in partners/with small groups. Each week, you will have a set of **practice problems** for the material introduced (8 total; due weekly; graded for completion; 2 lowest dropped). These will be due Wednesdays at midnight. On Fridays (before lecture), I will post the solutions for the practice problems. A brief reflection about the solutions will be due with the following week's problems.

**At the end of each module:** There will be one problem set due at the end of each main module (totaling 4). They will be due Fridays at midnight. These will be posted on Canvas and you'll need to write out everything (unlike Carnap). This means you'll need to be able to print & scan (take pictures of) them or complete them on a tablet. Please [email me](#) if you won't be able to do either and we'll work something else out!

**At the end of the course:** You will complete a reflection about the utility of logic and your perceptions of it as well as choose 2 of 4 shorter modules that are extensions of our course content and complete the corresponding assignments (instead of a final exam!)

**At the beginning and end of the course:** We'll do a small survey to track your reflections about your formal abilities as well as the applicability and limitations of formal systems.

## Grade breakdown

- **40%** - 4 problem sets (10% each)
- **30%** - 8 weekly assignments (5% each; 80% completion, 20% reflection; lowest 2 will be dropped)
- **10%** - Logic reflection
- **20%** - final choice of assignments (pick 2/4 modules and complete the corresponding assignments)

**Grade-related policies:** Weekly assignments (the practice problems on Carnap and reflections) have a 24-hr grace period (meaning that they will be accepted 24 hours late without penalty). If you submit them more than 24 hours late, you will receive half credit. Problem sets will also have a 24-hr grace period.

Regrades will only be considered for the problem sets. If you wish to have a problem set regraded, you must submit a half-page explanation within 72 hours of receiving the grade.

**Office hours:** I will hold office hours at the times designated at the top of the syllabus. I'd strongly encourage you to drop by my (or your TA's!) office hours, whether individually or even as a pair/group! Here are some reasons you might want to come to office hours:

- Receive one-on-one help from me regarding a confusing or difficult topic in the course
- Clarify some aspects of an assignment with me
- Confidentially speak to me about a grade you received and/or your progress in the course
- Talk about career ideas, paths to grad school, or other philosophy courses being offered

**(Optional) Course Discord:** We have a Discord server for the course; you can enroll by clicking [here](#). Discord is a platform where you can voice/text chat with others. Feel free to ask logistical questions, content questions, and/or set up rooms to chat with your peers on Discord. I'll be monitoring it regularly. All official course information will be communicated through Canvas so you do not need to use Discord if you'd prefer not to. If you have any grade-related questions/issues, please do not use Discord for those; send me or your TA an email instead!

### Course Policies

**Academic Integrity:** Any violation of academic integrity (including cheating) will result in an F for the course and letters sent to the appropriate deans. This course will follow the [UCI policy](#) on academic integrity.

**Accessibility and Inclusivity:** Your well-being and success in this course are important to me! If you have any particular needs, concerns about the structure of the course, or concerns about your ability to succeed in the course, please visit me during office hours or, if necessary, at another arranged time. Every student is entitled to a meaningful and stimulating learning experience. Please contact the Disability Services Center (DSC) to make the necessary arrangements. Finally, if you have a preferred name or pronoun besides that provided by the enrollment office, please let me know.

## 2.3 Sample activities

Weekly practice problems also included reflections like the following:

### Week 1 Practice Problems & Reflection

Start Assignment

---

Due Apr 7, 2023 by 11:59pm    Points 5    Submitting a text entry box

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Submit problems for this week on Carnap ([here](#) ↗).

Typically, these will be due Wednesdays at midnight. **However, for Week 1, I've extended the deadline to be Friday at midnight to give you some extra time.**

**In addition to submitting your practice problems on Carnap, please submit a 1-paragraph reflection on this week's problems here.**

Reflections give us an opportunity to pause and consider our learning. This is important especially as we start bringing together more and more concepts. They're also a skill to develop in themselves-- i.e., as we progress through the course, I expect your reflections will become deeper and more useful to you.

**Pick 2-3 questions from below to respond to in your reflection.**

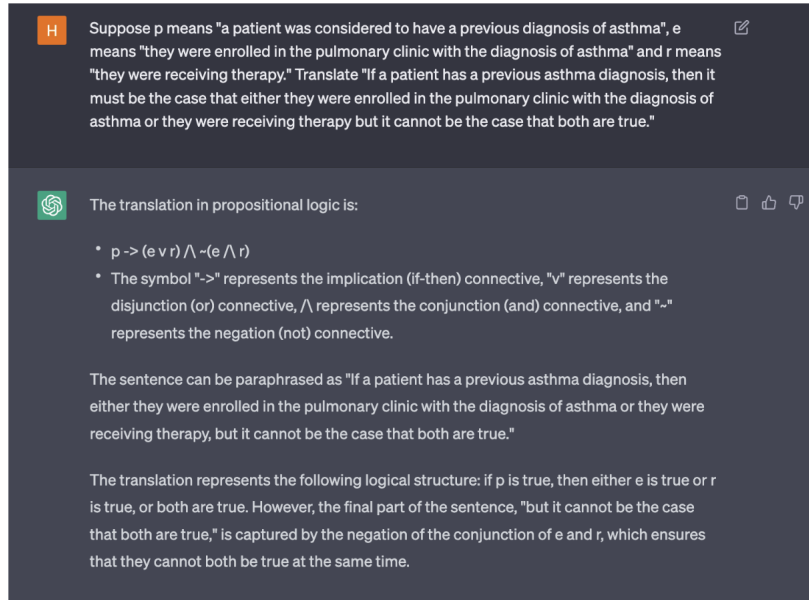
- Which problems would you like more practice with?
- Did any of the solutions surprise you?
- What do you need to study to prepare for the next problem set?
- What are your lingering questions?
- Did anything we learn this week link up to something in another class you've taken/are taking? What about to something happening in your life? Elaborate.

Halfway through the course, students reflected on the utility of ChatGPT for our course content in a Logic Lab. See below for some sample questions from that week's activity.

## Question 1

0 pts

Let's begin with some translations. Here, I've asked ChatGPT to help me with one of the problems from your W1 Practice Problems.



H Suppose  $p$  means "a patient was considered to have a previous diagnosis of asthma",  $e$  means "they were enrolled in the pulmonary clinic with the diagnosis of asthma" and  $r$  means "they were receiving therapy." Translate "If a patient has a previous asthma diagnosis, then it must be the case that either they were enrolled in the pulmonary clinic with the diagnosis of asthma or they were receiving therapy but it cannot be the case that both are true."

The translation in propositional logic is:

- $p \rightarrow (e \vee r) \wedge \neg(e \wedge r)$
- The symbol " $\rightarrow$ " represents the implication (if-then) connective, " $\vee$ " represents the disjunction (or) connective, " $\wedge$ " represents the conjunction (and) connective, and " $\neg$ " represents the negation (not) connective.

The sentence can be paraphrased as "If a patient has a previous asthma diagnosis, then either they were enrolled in the pulmonary clinic with the diagnosis of asthma or they were receiving therapy, but it cannot be the case that both are true."

The translation represents the following logical structure: if  $p$  is true, then either  $e$  is true or  $r$  is true, or both are true. However, the final part of the sentence, "but it cannot be the case that both are true," is captured by the negation of the conjunction of  $e$  and  $r$ , which ensures that they cannot both be true at the same time.

What does your group think of this response?

## Question 12

0 pts

Final reflection:

What does your group think about ChatGPT's and how you might use it for this class? Do you think it'd be helpful? For what kinds of things? Do you think it might be misleading? For what kinds of things?

## 3 Activities ran at both universities

### 3.0.1 Wrappers

We used "wrappers" at both universities. At Michigan, wrappers were used for the discussion sections in which the GSI returned the graded exams. Here is an example:

4. Test 1 wrapper (~10 minutes): This activity is designed to give you a chance to reflect on your exam performance and, more importantly, on the effectiveness of your exam preparation. Try to answer the questions sincerely! The answers will be for you to keep.

- Approximately how much time did you spend preparing for this exam?  
\_\_\_\_\_
- What percentage of your test preparation time was spent in each of these activities? (Make sure the percentages add up to 100.)  
 Reading (or rereading) Restall \_\_\_\_\_  
 Reviewing the feedback on problem sets 3 and 4 \_\_\_\_\_  
 Reviewing your own notes \_\_\_\_\_  
 Reviewing the lecture notes/handouts \_\_\_\_\_  
 Reviewing the section agendas \_\_\_\_\_  
 Doing practice problems \_\_\_\_\_  
 Going to office hours \_\_\_\_\_  
 Other \_\_\_\_\_ (What was it? \_\_\_\_\_)
- Now that you have looked over your graded exam, estimate the percentage of points deducted due to each of the following (make sure the percentages add up to 100):  
 Unclear or imprecise explanations \_\_\_\_\_  
 Mistaken explanations \_\_\_\_\_  
 Missing explanations \_\_\_\_\_  
 Not understanding or misusing the key definitions and methods \_\_\_\_\_  
 Not knowing how to approach the question \_\_\_\_\_  
 Not addressing part(s) of the prompt \_\_\_\_\_  
 Other \_\_\_\_\_ (What was it? \_\_\_\_\_)
- Based on your responses to the questions above, name at least three things you plan to do differently in preparing for the next test. For instance, will you just spend more time studying, change a specific study habit or try a new one (if so, name it), try to sharpen your understanding of key concepts, spend more time doing practice problems, try to sharpen some other skill (if so, name it), or something else?  
 - \_\_\_\_\_  
 - \_\_\_\_\_  
 - \_\_\_\_\_
- Based on your responses to the questions above, name three things you think worked out well this time.  
 - \_\_\_\_\_  
 - \_\_\_\_\_  
 - \_\_\_\_\_

At UCI, each problem set included a “wrapper,” asking students to reflect on their strengths and weaknesses as well as their progress.

**Problem Set 1 Wrapper.**

*Please note: This wrapper is a required component of your problem set!*

Which set of questions did you think was the hardest? Circle one:

- |                    |                              |                               |
|--------------------|------------------------------|-------------------------------|
| a. Multiple choice | c. Translations              | e. Truth tables for arguments |
| b. WFF rules       | d. Truth tables of sentences |                               |

Which set of questions took you the longest? Circle one:

- |                    |                              |                               |
|--------------------|------------------------------|-------------------------------|
| a. Multiple choice | c. Translations              | e. Truth tables for arguments |
| b. WFF rules       | d. Truth tables of sentences |                               |

Which set of questions are you least sure about? Circle one:

- |                    |                              |                               |
|--------------------|------------------------------|-------------------------------|
| a. Multiple choice | c. Translations              | e. Truth tables for arguments |
| b. WFF rules       | d. Truth tables of sentences |                               |

Do you think the problems fairly reflected the topics covered in class?

(How) Will you change your study habits to prepare for the next problem set?

What are your lingering questions having finished the problem set?

**3.0.2 Logic Reflection**

The below reflection activity was run at the University of Michigan and the University of California, Irvine. At Michigan, the activity was especially important for introducing members of the “community of logicians” and was conducted as a group discussion. At UCI, students discussed their answers in groups, but each independently completed and submitted the activity through Canvas. Their reflections were graded on completion and worth 10% of their overall course grade. The activity consisted of the following questions:

1. Do you think studying logic has made you better at reasoning in general? Can you think of some instances in your everyday life where you saw the relevance of the topics we covered in this class?
2. The two formalisms we’ve studied, Sentential Logic and Quantified Logic, represent the world in different ways. Sentential logic thinks about the world in terms of sentences that are true or false. Quantified logic does this, too (somewhat), but it’s more concerned about objects with properties. Do you think one is a better representation of the world than the other? Can you think of contexts in which you’d prefer using one over the other? Are there other ways of representing the world that you can think of that neither is able to capture?

I'd like to introduce another voice into our class conversation: Dr. Eugenia Cheng, a mathematician (she's a category theorist) and author of *The Art of Logic in an Illogical World*. In her book, she argues that we can take lessons from abstract mathematics (for us, also logic) to have more productive discussions and arguments. How? Her first example draws on the analogies used by pure mathematics. *Students were then asked to watch an excerpt from this video.*

3. Consider how we translated natural language into symbolic logic. How was that an example of an abstraction? Can you think of other examples of abstraction and analogies that we've used in this course? Do you agree with Dr. Cheng that abstracts/analogies help us reason better? Please respond with at least 4 complete sentences. In your answer, try to give a few examples.
4. In the previous question, you reflected on the benefits of moving to a formal system via abstractions/analogies. What about the drawbacks? What are the cons of abstracting away from messy, real-world examples and moving to the highly rigorous systems we find in symbolic logic? Please respond with at least 4 complete sentences. In your answer, try to give a few examples.
5. *Only at UCI:* My goals in this course extended beyond improving your skills in symbolic logic. I also wanted to help improve your communication/collaboration skills and your metacognitive skills. To work towards this first goal, we had logic labs every week and a Discord server. For this second goal, we had reflections with every set of practice problems and wrappers for the problem sets. Do you think we successfully accomplished these goals? If so, can you give some examples of how you've improved in these areas? If not, why not?