PHIL 305: Introduction to Formal Methods

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Course Description

This course will introduce some important formal tools that are used elsewhere in philosophy. We will look at propositional logic, probability theory and the logic of modals and conditionals. Obviously that's a lot to cover in a short time - the aim here is to make sure you understand the basics, and the symbolism, so you can follow simple applications of these tools, and you have the foundations to understand more complicated applications.

Canvas

There is a Canvas site for this course, which can be accessed from https://canvas.umich.edu. Course documents (syllabus, lecture notes, assignments) will be available from this site. Please make sure that you can access this site. Consult the site regularly for announcements, including changes to the course schedule. And there are many tools on the site to communicate with each other, and with me.

Required Materials

There are three textbooks for the course. All of them are open access, and hence free. The third is on Canvas, the other two have to be downloaded from elsewhere.

- forall x: Calgary by P. D. Magnus, Tim Button, J. Robert Loftis, Robert Trueman, Aaron Thomas-Bolduc and Richard Zach. Available at http://forallx.openlogicproject.org.
- Odds and Ends by Jonathan Weisberg. Available at https://jonathanweisberg.org/vip/.
- Boxes and Diamonds: Ann Arbor remix by Richard Zach and edited by Brian Weatherson. Available on Canvas.

Course Requirements

- There will be 10 weekly quizzes. Of these your best 8 will count towards your grade, with each counting for 10%.
- There will also be a final exam, given through Canvas, that counts for 20% of the grade.

Summary of Grading System

1. Weekly assignments - 10% each, 8 assignments count, 80% total.
2. Final exam - 20%.

Plagiarism

Although team-work, and even co-authorship, is encouraged, plagiarism is strictly prohibited. You are responsible for making sure that none of your work is plagiarized. Be sure to cite work that you use, both direct quotations and paraphrased ideas. Any citation method that is tolerably clear is permitted, but if you'd like a good description of a citation scheme that works well in philosophy, look at http://bit.ly/VDhRJ4.

You are encouraged to discuss the course material, including assignments, with your classmates, but all written work that you hand in under your own name must be your own. If work is handed is as the work of two people, you are affirming that each person did a fair share of the work. (Note that when you're submitting work on Canvas, you have to each submit the paper, even if it is co-authored. That way Canvas knows that everyone has turned in work.)

You should also be familiar with the academic integrity policies of the College of Literature, Science & the Arts at the University of Michigan, which are available here: http://www.lsa.umich.edu/academicintegrity/. Violations of these policies will be reported to the Office of the Assistant Dean for Student Academic Affairs, and sanctioned with a course grade of F.

Disability

The University of Michigan abides by the Americans with Disabilities Act of 1990, Section 504 of the Rehabilitation Act of 1973, and other applicable federal and state laws that prohibit discrimination on the basis of disability, which mandate that reasonable accommodations be provided for qualified students with disabilities.

If you have a disability, and may require some type of instructional and/or examination accommodation, please contact me early in the semester. If you have not already done so, you will also need to register with the Office of Services for Students with Disabilities. The office is located at G664 Haven Hall.

For more information on disability services at the University of Michigan, go to http://ssd.umich.edu.

Virtual

This course is being taught virtually because of the still raging pandemic. Hopefully we all learned a bit from virtual teaching/learning in the Fall, but it's still new for a lot of us. I suspect I'll get some things wrong, and I'll have to make adjustments on the fly. If/when that happens, I'll do everything I can to make sure everything is done fairly - but if I don't, you should let me know that I'm messing up.

The college has put a lot of things in place for this rather distinctive semester, including extended add/drop deadlines, and a new grade of NRC. I won't repeat here all of what they've done, in part because I suspect that will be changing as the semester goes along. But I wanted you to know that I know this semester will be a challenge for all of us. And I'll do what I can to make it as productive an educational experience as it can be - even if that isn't as good as what you'd have hoped for.

Class Schedule

The readings will all be from the three textbooks. I'll produce short videos going over the material in the book, and occasionally other philosophically interesting points. Then the time in class will be entirely spent on questions people have, and going over worked examples. So you should do the reading, and watch the lectures, before the scheduled class.

The video lectures will have a number of the form *x*.*y*, where *x* is the week they are for, and the *y* is their order in the week. There will typically be 8-10 lectures each week, each of them roughly 10-12 minutes.

Week 1: Introduction

Monday, January 18

No class, Martin Luther King Jr Day.

Wednesday, January 20

Topic Introduction
Reading forall x, Chapters 1-2.
Lectures 1.1-1.3.

Week 2: Propositional Logic

Monday, January 25

Topic Symbolization
Reading forall x, Chapters 4-6.
Lectures 2.1-2.3.

Wednesday, January 27

Topic Truth Tables
Reading forall x, Chapters 9-11.
Lectures 2.4-2.6.

Week 3: Tables and Trees

Monday, February 01

Topic Truth Tables and Validity
Reading forall x, Chapter 12.
Lectures 3.1-3.4

Wednesday, February 03

Topic Truth Trees
Reading Boxes and Diamonds, Sections 2.1-2.3
Lectures 3.5-3.6.

Week 4: Trees and Proofs

Monday, February 08

Topic Using Truth Trees
Reading Boxes and Diamonds, Sections 2.4-2.5
Lectures 4.1-4.3

Wednesday, February 10

Topic Introducing Natural Deduction
Reading forall x, Chapter 15 and sections 16.1-16.4.
Lectures 3.5-3.6.

Week 5: Proofs

Monday, February 15

Topic Rules for Natural Deduction
Reading forall x, Sections 16.5-16.8.
Lectures 5.1-5.3

Wednesday, February 17

Topic Strategies for Natural Deduction
Reading forall x, Chapter 17.
Lectures 5.4-5.6

Week 6: Revision

No new content this week, and no class on Wednesday.

Week 7: Introducing Probability

Monday, March 01

Topic Probability Basics
Reading Odds and Ends, chapters 1 and 5
Lectures 7.1-7.3.

Wednesday, March 03

Topic Conditional Probability
Reading Odds and Ends, chapter 6
Lectures 7.4-7.5.

Week 8: Conditional Probability

Monday, March 08

Topic Conditional Probability
Reading Odds and Ends, chapter 8
Lectures 8.1-8.5.

Wednesday, March 10

Topic Base Rates and Multiple Updates
Reading Odds and Ends, chapter 9
Lectures 8.6-8.9.

Week 9: Probability and Decision

Monday, March 15

Topic Expected Utility
Reading Odds and Ends, chapters 11 and 12
Lectures 9.1-9.4.

Wednesday, March 17

Topic Utility and Money
Reading Odds and Ends, sections 12.5 and 13.1.
Lectures 9.5-9.6.

Week 10: Probability and Learning

Monday, March 22

Topic Theories of Probability
Reading Odds and Ends, chapters 4, 15, 16 and 18.
Lectures 10.1-10.5.

Wednesday, March 24

Topic Statistical Learning
Reading Odds and Ends, chapters 19 and 20.
Lectures 10.6-10.7.

Week 11: Introduction to Modal Logic

Monday, March 29

Topic Varieties of Modalty
Reading Boxes and Diamonds, sections 3.1-3.3.
Lectures 11.1-11.3

Wednesday, March 31

Topic Models and Frames
Reading Boxes and Diamonds, sections 3.4-4.5.
Lectures 11.4-11.7

Week 12: Proofs in Modal Logic

Monday, April 05

Topic Modal Tableau
Reading Boxes and Diamonds, chapter 5.
Lectures 12.01-12.04

Wednesday, April 07

Topic Examples
Reading No new reading
Lectures 12.05-12.12.17

Week 13: Conditionals

Monday, April 12

Topic Varieties of Conditionals
Reading Boxes and Diamonds, chapter 6.
Lectures 13.1-13.4

Wednesday, April 14

Topic Counterfactual Conditionals
Reading Boxes and Diamonds, chapter 7.
Lectures 13.5-13.6

Week 14: Finishing Up

Monday, April 19

Topic The Logic of Counterfactuals
Reading Boxes and Diamonds, chapter 7.
Lectures 14.1-14.2

Wednesday, April 21

Topic Revision
Reading No new reading
Lectures No new lectures