– course syllabus –

Philosophy 109
Introduction to Formal Reasoning and Decision Making (Online)
Spring semester 2018

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Introduction

Hello! If you are reading this it means you have enrolled for Philosophy 109: Introduction to Formal Reasoning and Decision Making. This is a lower-division, undergraduate course and it is an online course. Being an introductory course, it aims to introduce students to the fundamentals of logical thinking, both deductive and inductive forms, and to the basic principles of decision theory. The course has no prerequisites: it is designed to familiarize students with basic logical principles and techniques that can be applied to real-world quantitative reasoning problems. As such, it does presuppose any significant formal (or mathematical) background on behalf of the student. The idea is to make the material as simple and fundamental as possible.

Disclaimer about the online course

There are many inherent challenges to taking courses online, and in this case, we face some additional obstacles: I will be teaching this course from abroad (from the Netherlands to be exact), and this means that I cannot provide face-to-face meetings or host an introduction workshop in which to meet all of you. (I am also 6 hours ahead of East Coast Time (EST)). Nevertheless, it is my goal to create a learning environment that fosters self-sufficiency and autodidactic skills. In addition to the information provided in this syllabus, I have attached a schedule that specifies a reading and assignment workflow, which includes by a brief description of the lesson plan for each week.

Course website

This course uses the Sakai learning platform. For those of you who've not used this platform, it is user-friendly and easy to navigate. All course materials (except for your books) will be made available on Sakai. Likewise, all assignments and exams will be distributed and graded via Sakai. Information about how to access assignments and exams, and how to use Sakai's assessment tools will be included in an introductory email to the class.

All information pertaining to the course curriculum will be available on Sakai starting January 16th, 2018. Locate the '**RESOURCES**' tab on the home page (on the left-hand side of the page) and search its contents. Here you will find separate folders labeled 'Curriculum', 'Lectures", "Assignments", "Exams", "Additional reading materials", and "Answer keys". The curriculum folder contains a semester plan which lists weekly readings and a tentative assignment / exam schedule.

Textbooks and instructional Materials

A Concise Introduction to Logic (11th edition), by Patrick Hurley
Choices: An Introduction to Decision Theory, by Michael Resnik

In addition to the main texts, I will provide instructional materials in the form of:

- Lecture notes
- Supplementary readings
- Web content (the internet is a wonderful place – expect many links to instructional videos)
- Video lectures (if requested)

Availability

I will have weekly "office hours" in which I respond to emails and will make time for video chats via Skype. My Skype user name is **james.d.grayot**. If you email me outside of my office hours, I ask that you patiently await my response.

- Office hours: MWF 9am – 3pm (EST) (3pm – 9pm CEU)

Grading policy

- Weekly assignments: 10 %.

There will be 10 homework assignments worth 5 points each. You will submit via the course website.

I will set it so that each assignment is "open" by default, meaning you can access each week's assignment anytime up until the deadline, at which point the assignment "expires" and you can no longer submit it. It is up to you to submit your assignment before the expiration time (which is set 11:55 pm on the specified due dates). All assignments can be found in the '**ASSIGNMENTS'** tab, which is where they are to be uploaded. However, you can find duplicates of all assignments in the '**RESOURCES**' tab after they are posted – I provide an answer key for each assignment after the due date. (More information about how to access and submit assignments on Sakai will be made available during the first week.)

The weekly assignments are not graded for accuracy. They are an opportunity for you to apply and test concepts and formal techniques covered in the course readings each week. Many of these assignments will be paired with lecture notes which will help you along the way. It may help to think of the weekly assignments as proxies for class participation. I will collate all received assignments each week and apply that to your "participation" grade, which is worth 10%.

NOTE: While this is an introductory course, it moves along quickly, and one can quickly get behind if they do not understand each new concept or formal technique. I therefore encourage you to contact me if you are not grasping the material or are having difficulty applying the concepts / techniques.

- Exams: 20% each (60% collectively)

There will be 3 exams: two on the logic module and one on the decision theory module. Like the assignments, you will submit the exams through the course website. However, unlike the assignments, the exams are not "open" by default – they will only be accessible during a specified window of time. You will be given 36 hours to complete each exam. This means that you have to plan your time accordingly. (More information about how to access and submit exams on Sakai will be made available prior to the first exam.)

- Final Examination: 30%

The final exam will be cumulative, and will focus on student understanding of central issues and themes from the whole course. You will be required to take this exam *in-person* (with your student ID) at the university with a designated proctor.

Point break down:

Assignments 5pts (x 10) = 50 pts
Exams 100pts (x 3) = 300 pts
Final exam 150pts (x 1) = 150 pts
Total points: 500

Academic integrity and anonymous grading policy

All students are expected to adhere to Rutgers policies concerning academic integrity. Just because this is an online course does not mean that you are held a different standard than in-person courses. If you have any questions about what the standards of academic integrity are, you can visit the **student conduct** page.

This course employs a blind-grading policy for all exams (not for assignments). This means that exam submissions are anonymous during the grading process. If, for whatever reason, you require me to look over your exam before it is graded (for instance, because you encounter technical issues in Sakai), I will require your permission in the form of a confirmation before disabling the blind-grading system and making the necessary changes.

WEEKLY SCHEDULE:

Week 1 & **2** | *Introduction to logic: foundational terms and concepts, identifying arguments*

- Description: Because we begin the semester mid-week (Sept 7th), the first two weeks are treated as one. This will focus on introducing foundations of formal logic via informal means. You will be introduced to basic terms and concepts, and will learn how to (i) recognize arguments, and (ii) determine whether arguments are valid (invalid), sound (unsound), strong (weak), and cogent (not cogent), and (iii) learn how to prove arguments invalid by counter example.
- Readings: Hurley Ch. 1
- Assignment: Identifying arguments parts 1 & 2 (two documents) | Deadline FEB 2 @ 11:55 pm

Week 3 | *Propositional logic, part 1: variables, operators, translations, and truth-functions*

- Description: Having learned the basic terms and concepts of symbolic logic (week 1 & 2), you are prepared to begin learning propositional logic. Propositional logic, also known as *sentential* logic, is a form of symbolic logic that uses *variables* to represent basic propositions and *operators* to express the relationships between them. Here you will learn how to interpret propositions via their variables and logical operators, and you will also learn how to implement these symbols by translating natural language sentences into formal (propositional) statements.
- Readings: Hurley Ch. 6.1 and 6.2
- Assignment: Proving arguments invalid & natural language translations | Deadline FEB 9 @ 11:55 pm

Week 4 | *Propositional logic, part 2: Truth tables (part 1)*

- Description: The next step in developing your understanding of propositional logic is to apply your knowledge of variables, operators, and truth functions to identify all possible truth values of a propositional statement. You will learn to do this by building truth tables. You will also build your translation skills by generating truth tables for natural language statements and classifying them. You will also to build truth tables for arguments (i.e. propositions that represent premises and conclusions)
- Readings: Hurley Ch. 6.3 and 6.4
- Assignment: Translating natural language & truth tables | Deadline FEB 16 @ 11:55 pm

Week 5 | *Propositional logic, part 3: Truth tables (part 2), and argument forms*

- Description: Once you know how to build truth tables and test natural language statements for various truth outputs, you can now test arguments for validity via truth tables. This will allow you to verify whether an argument is (in)valid by virtue of its symbolic form rather than by substitution via the counterexample method. Having developed a good understanding of how arguments work, you can now start to identify arguments forms merely by identifying arrangements of operators that link premises with conclusions.
- Readings: Hurley Ch. 6.5 and 6.6
- Assignment: NO ASSIGNMENT – PREPARE FOR EXAM 1 - opens FEB 22 @ 12:00 pm

Week 6 | *Natural deduction in propositional logic, part 1: rules of implication and replacement*

- Description: Now that you know how to identify various argument forms, and also know how to prove whether arguments are valid or invalid, you can test inferences by using different rules of implication and replacement to connect premises to conclusions. In this way, natural deduction in propositional logic works similarly to geometric proofs: you are given a set of premises and a conclusion, and by applying different rules of implication and replacement, you can demonstrate, via a proof, that the conclusion logically follows from the premises. In some cases, you may be able to construct more than one proof.
- Readings: Hurley Ch. 7.1 - 7.4
- Assignment: Natural deduction, part 1 - Deadline MAR 2 @ 11:55 pm

Week 7 | *Natural deduction in propositional logic, part 2: conditional and indirect proofs*

- Description: In addition to proving the validity of arguments via direct means, you can also prove the validity of arguments by conditional assumptions and indirect proofs. Conditional proofs work by assuming what is already given in the premises and using this assumption to derive the conclusion; by contrast, indirect proofs build on the conditional proof method by assuming the negation of conclusion and proving it false.
- Readings: Hurley Ch. 7.5 - 7.6
- Assignment: Natural deduction, part 2 - Deadline MAR 9 @ 11:55 pm

Week 8 | *SPRING RECESS* – MARCH 10 - 18

Week 9 | *Natural deduction in propositional logic, part 3: proving logical truths*

- Description: As we saw in the previous section, the proof for such an argument does not use the premises at all but derives the conclusion as the exclusive consequence of either a conditional or an indirect sequence. Using this strategy for logical truths, we write the statement to be proved as if it were the conclusion of an argument, and we indent the first line in the proof and tag it as being the beginning of either a conditional or an indirect sequence.
- Readings: Hurley Ch. 7.7
- Assignment: NO ASSIGNMENT – PREPARE FOR EXAM 2 - opens FEB 23 @ 12:00 pm

Week 10 | *Introduction to decision theory, part 1: overview and key concepts*

- Description: We now fully immerse ourselves in decision theory and do so by discussing the foundations of rationality and rational choice theory. Here you will learn about framing decision problems, how to talk about and formally represent beliefs and desires via probability and utility functions, and become introduced to the formal framework of von Neumann-Morgenstern expected utility theory
- Readings: Resnik Ch. 1 and 2.1 - 2.4
- Assignment: Intro to decision theory part 1 - Deadline MAR 30 @ 11:55 pm

Week 11 | *Introduction to decision theory, part 2: preferences, utility and expected utility*

- Description: Having discussed key concepts of rational choice theory (viz. probability and utility via representation theorems), you are now prepared to understand revealed preference theory and become better acquainted with basic decision axioms, such as consistency and completeness, and other preference ordering technologies (maximin and minimax). You will also learn about the basic differences between cardinal and ordinal utility theories.
- Readings: Resnik Ch. 4
- Assignment: Intro to decision theory part 2 - Deadline APR 6 @ 11:55 pm

Week 12 | *Expected utility theori*es

- Description: Various paradoxes can arise when we theorists attempt to represent belief and desire via probability and utility functions. In week 11 we discuss these decision paradoxes and consider their importance for representational theorems that go beyond vNM expected utility theory. You will learn how the representation of decisions under risk and uncertainty differ, and how this difference is formally conceived.
- Readings: Resnik Ch. 4
- Assignment: Utility and expected utility theory - Deadline APR 13 @ 11:55 pm

Week 13 | *Descriptive decision theories*

- Description: In contrast with expected utility theories, descriptive decision theories provide alternative axiomatisations of expected utility. Prospect and regret theory are two prime examples of this and you will learn each formally conceives of preference formation, as well as how each connects with empirical literature on the psychology of decision-making.
- Readings: see "Reading Materials" folder:
    - Kahneman, D. and Tversky, A. 1979. *Prospect Theory: An Analysis of Decision under Risk.*
    - Loomes, G. and Sugden, R. 1982. *Regret Theory: An Alternative Theory of Rational Choice*
- Assignment: Descriptive decision theories - Deadline APR 20 @ 11:55 pm

Week 14 | PREPARE FOR EXAM 3 - opens APR 26 @ 12:00 pm

Week 15 | *PREPARE FOR FINAL EXAM - TBD*