

Introduction to Formal Reasoning and Decision Making

Philosophy 109:02 (Spring 2018)

Instructor: Dr. Max Bialek

Lecture: TuF 9:50–11:10am

Location: SC-214

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Office Hours: Tu 11:10–1pm

Office Hours Location: TBA

Course Description. “Fundamentals of logical, probabilistic, and statistical thinking, as well as the basic principles of rational decision making. Reasoning through data (and rhetoric) encountered on a daily basis using elementary principles of deductive logic and inference.”

Resolving differences of opinion isn't always impossible. Figuring out what you should believe isn't just a matter of checking what's true. Deciding what you should do doesn't have to be left up to your whim. Formal tools have been (and continue to be) developed that enable us to talk very precisely about the strength of arguments and of evidence, the rationality of beliefs we have, and the value of choices we make.

This course will introduce students to some of those formal tools and their applications to formal reasoning and decision making: Formal Logic will be used as a model for judging arguments and reasoning deductively. Probability and Statistics serve as tools for making inductive inferences, evaluating evidence, and quantifying risk and uncertainty. Decision Theory will provide a system that employs those logical and probabilistic tools in order to help guide our decision making. For all of these, we will also discuss their peculiarities, limits to their application, and their potential for expansion and sophistication.

Course Materials. We will be working out of the course textbook, *Choices: An Introduction to Decision Theory* by Michael Resnik, and additional notes provided by the instructor that will be posted to the course website.

Course Website. Sakai will be used sparingly to send out emails. Assignments and additional course materials will be made available on the course website:

maxbialek.com/phil-109-spring-2018

Course Requirements & Grading. There will be 10 short assignments, each worth 4% of the course grade, for a total of 40% of the course grade. These will range in style from regular in-class quizzes and short homework assignments, to more unusual fare, like developing a potential exam problem.

Each unit will end with an exam worth 20% of the course grade. A comprehensive final exam will be worth 20% of the course grade. The lowest exam grade will be dropped, for a total of 60% of the course grade coming from exams. This means that if you bomb an exam, you can make up for it with the final, or if you are happy with your grade going into the final, you can skip it.

Attendance is ungraded, but highly recommended (especially since there will be regular graded in-class work).

In short:

40% — 10 Short Assignments at 4% each

60% — 3 Exams at 20% (best of 3 Unit-Specific Exams and 1 Final)

Unpleasantries. You should make sure you are familiar with the rules regarding proper academic conduct as outlined at academicintegrity.rutgers.edu

NOTE: You will be encouraged to work together on assignments for this course, but material that is handed in must be prepared independently (e.g. don't just change the name at the top of the same paper), and the names of your collaborators should be listed.

Schedule. Below is a *tentative* schedule for the course—check the course website at least once a week for assignments, expected reading, and possible changes. Any known attendance issues should be brought to the instructor's attention as soon as possible (e.g. you know now about religious holidays and away games, so if they cause a conflict you should tell me now).

Jan 16. Introduction

Formal Logic

Jan 19. Truth Tables

Jan 23 and 26. Connectives and Translations

Jan 30 and Feb 2. Arguments and Proofs

Feb 6 and 9. Proofs (cont.)

Feb 13. Review / Catch-up

Feb 16. Exam 1

Probability and Statistics

Feb 20 and 23. Probability Theory

Feb 27 and March 2. Games of Chance and Statistics

Mar 6 and 9. Bayes and Belief

Mar 13 and 16. SPRING BREAK

Mar 20 and 23. Confirmation and Priors

Mar 27. Review / Catch-up

Mar 30. Exam 2

Decision Theory

Apr 3 and 6. Decisions and Ignorance

Apr 10 and 13. Utility and Risk

Apr 17 and 20. Games

Apr 24. Review / Catch-up

Apr 27. Exam 3

May TBA. Extra Office Hours / Review

May 9, 8am–11am. FINAL EXAM