

# Introduction to Formal Reasoning and Decision Making

Fall 2019

*Class Time:* Tuesday and Friday 9:50–11:20am

*Instructor:* Rory Harder

*E-mail:* rh670@scarletmail.rutgers.edu (see e-mail policy below)

*Office Hours:* Immediately after class or by appointment

## Course Description

This course is an introduction to the formal tools philosophers use to understand reasoning and decision making. The two main forms of reasoning are deductive and inductive. Deductive reasoning involves figuring out what must be true given what one already accepts. We begin the course by studying propositional logic, which provides a simple model of deduction. We then study probability theory as a model of inductive reasoning, which involves figuring out what one should take to be the likelihood of various possibilities. We conclude by looking at expected value theory, which builds on probability theory and is a theory of how one should make decisions under uncertainty. We end the course with a brief look at some basic concepts from statistics. Throughout the course we will apply all these formal tools to cases from everyday life and theoretical science.

## Course Material

The primary course textbook is Hacking's *An Introduction to Probability and Inductive Logic*. This will be available at the bookstore. All other readings will be made available on the course webpage.

## Course Evaluation

1. Homework: 20%. Four problem sets worth 5% each. No group work allowed.
2. Mid-term: 30%. In-class.
3. Final Exam: 40%. During final exam period.
4. Attendance and Participation: 10%. You are expected to attend class and participate in discussion and working through exercises in class.

## Schedule

The following schedule is tentative. The timing and content may be adjusted as the semester evolves.

Week	Dates	Readings	Topic	Homework
1	September 3		Course Introduction	
	September 5	FaX ch. 1	Basic Concepts of Logic I	
2	September 10	FaX chs. 2–3	Basic Concepts of Logic II	
	September 12	Hardegree ch. 1	Basic Concepts of Logic III	
3	September 17	FaX chs. 4–5	Syntax	HW1 Due
	September 19	Hardegree ch. 4	Symbolization I	
4	September 24	Cont'd	Symbolization II	
	September 26	Feldman ch. 5	Reconstruction	
5	October 1	FaX chs. 8–9; Hardegree ch. 2	Semantics I	HW2 Due
	October 3	FaX ch. 10; Hardegree ch. 3	Semantics II	
6	October 8	FaX ch. 11	Semantics III	
	October 10	FaX part IV	Proof Theory	
7	October 15		Review	
	October 17		Midterm	
8	October 22	Hacking ch. 2	Deduction vs. Induction	
	October 24	Hacking ch. 3	The Gambler's Fallacy	
9	October 29	Hacking ch. 4	Basic Concepts of Probability	
	October 31	Hacking ch. 5	Conditional Probability	
10	November 5	Hacking ch. 6	Axioms of Probability Theory	
	November 7	Hacking ch. 7	Bayes' Rule	
11	November 12	Hacking ch. 8	Basic Concepts of Decision Making	HW3 Due
	November 14	Hacking ch. 9	Utility	
12	November 19	Hacking ch. 10	Paradoxes of Decision Theory	
	November 21	Hacking ch. 11	Interpretations of Probability I	
13	November 26	Hacking ch. 16	Key Concepts of Frequentism	
	November 28		No class—Thanksgiving	
14	December 3	Hacking ch. 17	Normal Approximations	HW4 Due
	December 5	Hacking ch. 18	Significance Tests	
15	December 10		Review	

## Core Curriculum Goals: QQ or QR

The course meets core curriculum goals QQ (Formulate, evaluate, and communicate conclusions and inferences from quantitative information) and QR (Apply effective and efficient mathematical or other formal processes to reason and to solve problems).

## Additional Information

*Classroom Etiquette:* During class you must not engage in any behaviour that is disruptive to me or your fellow students. This includes speaking or whispering when it is others's turn to speak, and using your phone. Failure to do so may result in a loss to your participation grade.

*E-mail Policy:* I will not answer e-mails that either ask substantive philosophical questions, or ask for information easily obtainable by checking the syllabus or the course website.

*Academic Integrity:* You must follow the Rutgers Academic Integrity Policy.

*Lateness:* Late homeworks will not be accepted, except where there is a legitimate reason for an extension and proof that it is needed (e.g. medical documentation).

*Course Webpage:* You are expected to check the course webpage on a regular basis to check for updates with regard to assignments and course readings.