

# Probability and Rational Choice

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Philosophy 258, Spring 2019

This course is about how to live with uncertainty. What should our beliefs be like when we can't be fully confident? How should we make decisions when our actions have risky outcomes? How can we trust each other in shared projects, and respect other people's values and beliefs fairly?

This course will have five parts.

1. **Logic.** How can we distinguish a “valid” airtight chain of reasoning from a risky chain of reasoning that might go wrong?
2. **Probability.** What are coherent uncertain beliefs like? How should you change our mind as you learn new things? How can you take into account different sources of evidence?
3. **Choices.** What should you do when you don't know how it will turn out? We'll learn to use standard mathematical tools for evaluating risky decisions. We'll also look at some important challenges for those standard methods.
4. **Foundations.** What *are* probabilities? Are they frequencies of events in the world, or reflections of our own subjective levels of confidence, or something else? Why do probabilities obey the rules that they do?
5. **Relationships.** Why can't we all get along? How should you act when your values conflict with other people's? Even when people share values, why is it hard to solve problems together?

This class fills a **quantitative reasoning general education requirement (GE-F)**. In some ways it will be like a math class. It involves numbers. There will be problem sets. You will occasionally have to solve equations. But this is really a philosophy class. Our main emphasis won't be on *calculation*, but rather on *conceptual understanding*. How can we use probabilities to understand an uncertain world? What do they mean? You will have to think critically, and explain things carefully. You will write an analytical essay.

This class does not assume you have any background in college math. You will need to do a little bit of arithmetic (for example, what is  $2/3$  of  $3/5$ ?), and a little bit of algebra (for example, solve the equation  $3x + 1 = 2$  for  $x$ ). If you don't remember how to do those things, it will probably help to do a little review to brush up. This might be a helpful resource for this:

- <https://www.khanacademy.org/math>

This class does not assume you have any background in philosophy. You will need to think carefully. You will also need to write clearly and directly. If you need help with this, the USC Writing Center might be a helpful resource:

- <https://dornsife.usc.edu/writingcenter/>

## Goals

- You will learn how to represent **logical relationships** using diagrams and symbols. You will use these tools to analyze chains of reasoning.
- You will learn how to represent **probabilities** using diagrams, numbers, and symbols. You will use these tools to precisely describe uncertain situations, and to find out how strongly evidence supports different claims.
- You will learn how to represent **choices** using diagrams, numbers, and symbols. You will use these tools to precisely describe difficult decisions, and to find out what you should do.
- You will learn how to represent **cooperation problems** using diagrams, numbers, and symbols. You will use these tools to precisely describe social relationships and understand the special problems facing group decision-making.
- You will **think critically** about these standard theories of probability and decision-making, to understand and explain what they mean and when they apply.
- You will **apply these tools** to reason about difficult philosophical problems that involve uncertainty, choices, and relationships between different people.

## Resources

There are **two required textbooks** for this course, which are available in the bookstore:

- Hacking, *An Introduction to Probability and Inductive Logic*
- Peterson, *An Introduction to Decision Theory*

We will also use this resource, which is freely available online:

- USC Logic Web. (Created by Gabriel Uzquiano, Brian W. Roberts, and Maegan Fairchild.) <https://dornsife.usc.edu/USCLogicWeb>

I will also distribute some additional readings and course notes on the course website.

## Meetings

Lecture	Tuesday and Thursday	9:30–10:50am	SGM 101
Section	Wednesday	10–10:50am	VKC 200
Section	Wednesday	12–12:50pm	SOS B41
Jeff’s Office Hours	Tuesday	11am–12pm	STO 227
Jeff’s Office Hours	Thursday	8:30–9:15am	STO 227
Madiha’s Office Hours	Tuesday	12:30–1:50pm	
Madiha’s Office Hours	Wednesday	1–1:40pm	
Final exam	Tuesday, May 7	8–10am	SGM 101

I encourage you to **make an appointment** during my office hours using this website:

- <https://calendly.com/jeff-russell>

You’re also welcome to drop by impromptu without an appointment, but I’ll give priority to people who have signed up ahead of time.

If you have class conflicts with my scheduled office hours, you can email me to make an appointment for another time.

## Evaluation

<b>Participation</b>	6%	Every day
<b>7 Problem Sets</b>	35%	See schedule
<b>5 Quizzes</b>	24%	See schedule
<b>Writing Project Part 1</b>	5%	Thursday, March 7
<b>Writing Project Part 2</b>	10%	Thursday, April 25
<b>Final Exam</b>	20%	Tuesday, May 7, 8–10am

## Participation

Be present, be prepared, and be on time to lecture and discussion sections. Ask questions and contribute to discussions. Be helpful and respectful to others.

## Problem Sets

The homework assignments will include problems to solve as well as short written reflections about philosophical questions. The point of the homework is to help you master basic skills and develop your understanding of the important issues.

You get **six “late days”** to spend throughout the semester, in case of illness or emergency. You can spend them all on one assignment and turn it in six days late, or you can turn in all six homework assignments one day late (or part of a day late). There is no grade penalty for spending a late day. But after you have spent all of your late days, you will not get any more credit for late homework. So don't spend all your late days on the first assignment! Save them for real emergencies when you need them.

## Quizzes

There will be five in-class quizzes. The point of the quizzes is to evaluate your understanding and ability to put into practice the skills of logic, probability, and decision theory.

Each quiz will be at the start of class. If you miss class or are late, **you cannot make up quizzes**. Instead, you get one freebie: I will drop your lowest quiz score. Don't use up your freebie right away! Save it for an emergency when you really need it.

## Writing Project

You will write an analytical essay applying tools from probability and decision theory to a philosophical or practical problem. This will have two parts: the first part will be due before spring break, and the second part will be due at the end of the semester. I will give you a separate handout describing this project in detail.

## Final Exam

There will be one in-class final exam, to evaluate your understanding of the ideas from the entire class, and your ability to apply them.

# Schedule

I will make adjustments to the following schedule through the semester if it turns out we need more time for some topics.

<i>Date</i>	<i>Topic</i>	<i>Read This</i>	<i>Do This</i>
<b>Part 1: Logic</b>			
8-Jan	Overview		
10-Jan	Statements and Validity	Hacking, ch. 1	
15-Jan	Venn Diagrams	USC Logic Web Unit 1	USC Logic Web practice problem set 1 (nothing to turn in)
17-Jan	Inductive Logic, Probability Models	Hacking ch. 2	Problem Set 1
<b>Part 2: Probability</b>			
22-Jan	Independence, the Gambler's Fallacy	Hacking, ch. 3	
24-Jan	Venn Diagrams, again	Hacking, ch. 4 and ch. 6 ("Venn diagrams")	Quiz 1
29-Jan	Probability Concepts	Hacking, ch. 4	
31-Jan	Conditional Probability	Hacking, ch. 5, Peterson sec. 6.2	Problem Set 2
5-Feb	Basic Principles	Hacking, ch. 6, Peterson, sec. 6.1	
7-Feb	Bayes' Rule	Hacking, ch. 7, Peterson, sec. 6.3	Problem Set 3
12-Feb	The Base Rate Fallacy	TBD	
14-Feb	TBD	TBD	Quiz 2
19-Feb	TBD	TBD	
<b>Part 3: Choices</b>			
21-Feb	Decision Tables	Peterson ch. 2	Problem Set 4
26-Feb	Dominance	Peterson secs. 3.1–3.2	
28-Feb	Expected Value	Hacking ch. 8	Quiz 3
5-Mar	Expected Value	Peterson secs. 4.1–4.3, Hacking ch. 9	

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7-Mar	The Allais Paradox	Peterson 4.4, Hacking ch. 9	Writing Project Part 1
12-Mar	<i>Spring break</i>		
14-Mar	<i>Spring break</i>		
19-Mar	The St. Petersburg Paradox	Peterson 4.6, Hacking ch. 8	
21-Mar	Newcomb's Problem	Peterson ch. 9	Problem Set 5
26-Mar	Causal Decision Theory	Peterson ch. 9	
	<b>Part 4: Foundations</b>		
28-Mar	Theories of Probability	Hacking ch. 11	Quiz 4
2-Apr	Theories of Probability	Hacking ch. 12, Peterson ch. 7	
4-Apr	Personal Probabilities	Hacking ch. 13 and ch. 14	Problem Set 6
9-Apr	Personal Probabilities, continued	Hacking ch. 15	
	<b>Part 5: Groups</b>		
11-Apr	The Prisoner's Dilemma	Peterson ch. 11	Quiz 5
16-Apr	Coordination Problems	Peterson ch. 11	
18-Apr	Voting	Peterson ch. 13	Problem Set 7
23-Apr	TBD	TBD	
25-Apr	TBD	TBD	Writing Project Part 2
7-May	<b>Final exam</b>		<b>Final Exam</b>

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## Equality

This classroom is a safe space. Discrimination on the basis of race, gender, sexuality, religion, age, or other identities is unacceptable. If at any time while at USC you feel you have experienced harassment or discrimination, you can file a complaint: see <http://equity.usc.edu> for more information. You are also welcome to bring the complaint to any faculty or staff member at USC.

## Academic Conduct

Plagiarism – presenting someone else’s ideas as your own, either verbatim or recast in your own words – is a serious academic offense with serious consequences. Please familiarize yourself with the discussion of plagiarism in SCampus in Part B, Section 11, “Behavior Violating University Standards” <[policy.usc.edu/scampus-part-b](http://policy.usc.edu/scampus-part-b)>. Other forms of academic dishonesty are equally unacceptable. See additional information in SCampus and university policies on scientific misconduct, <http://policy.usc.edu/scientific-misconduct>.

## Support Systems

*Student Counseling Services (SCS) – (213) 740-7711 – 24/7 on call*

Free and confidential mental health treatment for students, including short-term psychotherapy, group counseling, stress fitness workshops, and crisis intervention. <http://engemannshc.usc.edu/counseling>

*National Suicide Prevention Lifeline – 1 (800) 273-8255*

Provides free and confidential emotional support to people in suicidal crisis or emotional distress 24 hours a day, 7 days a week. <http://www.suicidepreventionlifeline.org>

*Relationship and Sexual Violence Prevention Services (RSVP) – (213) 740-4900 – 24/7 on call*

Free and confidential therapy services, workshops, and training for situations related to gender-based harm. <http://engemannshc.usc.edu/rsvp>

*Sexual Assault Resource Center*

For more information about how to get help or help a survivor, rights, reporting options, and additional resources, visit the website: <http://sarc.usc.edu>

*Office of Equity and Diversity (OED)/Title IX Compliance – (213) 740-5086*

Works with faculty, staff, visitors, applicants, and students around issues of protected class. <http://equity.usc.edu>

*Bias Assessment Response and Support*

Incidents of bias, hate crimes and microaggressions need to be reported allowing for appropriate investigation and response. <http://studentaffairs.usc.edu/bias-assessment-response-support>

*The Office of Disability Services and Programs*

Provides certification for students with disabilities and helps arrange relevant accommodations. <http://dsp.usc.edu>

*USC Support and Advocacy (USCSA) – (213) 821-4710*

Assists students and families in resolving complex issues adversely affecting their success as a student EX: personal, financial, and academic. <http://studentaffairs.usc.edu/ssa>

*Diversity at USC*

Information on events, programs and training, the Diversity Task Force (including representatives for each school), chronology, participation, and various resources for students. <http://diversity.usc.edu>

*USC Emergency Information*

Provides safety and other updates, including ways in which instruction will be continued if an officially declared emergency makes travel to campus infeasible. <http://emergency.usc.edu>

*USC Department of Public Safety – UPC: (213) 740-4321 – HSC: (323) 442-1000 – 24-hour emergency or to report a crime.*

Provides overall safety to USC community. <http://dps.usc.edu>