

FORMAL EPISTEMOLOGY  
PHL 2117

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*All models are wrong, but some are useful.*

—George Box

This course surveys modeling tools common in academic philosophy, as well as other academic fields and industry. The immediate goal is to help you get comfortable with tools you are likely to encounter, whether you pursue an academic career or a non-academic one.

But I also hope you will develop an appreciation for how these tools are used, and misused. Some of you may even discover a passion for such tools, and thus the ability to learn new ones on your own as needed.

### Evaluation

You have a lot of freedom to choose the kind of work you want to be evaluated on in this course. The material has several, quite different facets. So you can choose where and how you want to focus your efforts, according to your goals, needs, and strengths.

The central requirement is a major project demonstrating mastery of some aspect of the course material. Here are some suggestions.

- A standard research paper, usually around 7,000 words long.
- An “opinionated survey” of similar length (but probably slightly longer).
- Two short research papers, roughly 3,500 words each.
- A data analysis project, culminating in a written report, a visualization tool, or some other presentation format appropriate to the content.
- A piece of software.

Whatever your project, **you must get advance approval from me by November 15.**

Up to 15% of your grade in the course can be based on in-class participation. But you can be evaluated solely on your major project if you prefer.

## Books & Videos

A list of sources for each week will be maintained on Quercus as we go. The initial plan for this schedule appears below, and often refers to the following sources.

- *Logic for Philosophy*, by Theodore Sider
- *Odds & Ends*, by Jonathan Weisberg
- *Introduction to Linear Algebra*, 5<sup>th</sup> edition, by Gilbert Strang
  - *Lecture videos* by Gilbert Strang
- *Machine Learning (Videos)*, by Andrew Ng
- *Networks: An Introduction*, by M. E. J. Newman

Here are some additional resources I recommend if you want to broaden or deepen your knowledge in this general area.

- *An Introduction to Probability & Inductive Logic*, by Ian Hacking
- *Notes on Bayesian Confirmation Theory*, by Michael Strevens
- *Introduction to Probability (Videos)*, by Joe Blitzstein
  - The *textbook* by Blitzstein & Hwang is also excellent and free. (It assumes knowledge of calculus.)
- *R for Data Science*, by Hadley Wickham
- *Statistical Learning (Videos)*, by Trevor Hastie and Robert Tibshirani
- *Introduction to Programming in Python (Videos)*, by Ana Bell, Eric Grimson, and John Guttag

## Overview of Course Content

- Sep. 11: Propositional & Modal Logic
- Sep. 18: Modal Logic & Counterfactuals
- Sep. 25: Probability & Accuracy
- Oct. 2: Bayesian Confirmation, Hypothesis Testing
- Oct. 9: Introduction to Regression
- Oct. 16: **Reading Week, No Class**
- Oct. 23: More Regression, IBE, & Overfitting
- Oct. 30: Coherentism & Graphs
- Nov. 6: Networks & Centrality
- Nov. 13: Marx & Markov Chains
- Nov. 20: Decisions, Preferences, & Representation Theorems
- Nov. 27: SVD & Recommender Systems
- Dec. 4: “Deep” Learning

## Tentative Schedule

Note: there is a *lot* of material here, and I don't really expect everyone to get through all of it every week. But I do expect you to get through most of it every week, and all of it on lighter weeks.

If you need to prioritize, prioritize the Strang readings and videos. That material is cumulative, so it's essential to keep on top of it to keep up with the course.

Week 1, Sep. 11: Propositional & Modal Logic

- Sider:
  - Skim 1.0–1.6 and the first few pages of 1.8 (up to “The topic of infinity...”)
  - Read 2.0–2.4 and 2.6 (skim 2.7 if you're keen)
  - Start reading/skim 6.0–6.4

Week 2, Sep. 18: Modal Logic & Counterfactuals

- Read Sider 6.0–6.4 and 8.0–8.3
- Read Strang Chapter 1
- Watch Strang Lecture 1
- Watch Ng 3.1–3.3

Week 3, Sep. 25: Probability & Accuracy

- Read *Odds & Ends* 5–8, skim Appendix B
- Read Pettigrew, “Epistemic Utility and Norms for Credences”
- Watch Ng 3.4–3.6
- Read Strang 2.0–2.4
- Watch Strang Lectures 2 and 3

Week 4, Oct. 2: Bayesian Confirmation, Hypothesis Testing

- Read *Odds & Ends* 9, 10, 15, 18–20
- Read Horwich, “Wittgensteinian Bayesianism”
- Separately, as prep for the following two weeks:
  - Read Strang 2.5–3.3 especially 3.3
  - Watch Strang Lectures 4–8 especially 4, 6, 8

Week 5, Oct. 9: Introduction to Regression

- Read Strang 3.4–4.3 especially 4.2, 4.3
- Watch Strang 9, 10, 14, 15, 16, especially 15, 16
- Watch Ng 2.1–2.8

Week 6, Oct. 16: No Class (Reading Week @ UTM & UTSC)

Week 7, Oct. 23: More Regression, IBE, Overfitting

- Read Forster & Sober, “How to Tell When Simpler, More Unified, or Less Ad Hoc Theories Will Provide More Accurate Predictions”
- Watch Ng 4.1–4.7, 6.1–6.7

Week 8, Oct. 30: Coherentism & Graphs

- Read Bonjour, Ch 5 of *The Structure of Empirical Knowledge*
- Read Newman Ch 6
- Watch Strang Lectures 18, 19
- Read Strang Ch 5.1, 6.1, 6.2, 6.4
- Optional supplement:
  - Berker, “Coherentism via Graphs”

Week 9, Nov. 6: Networks & Centrality

- Watch Strang Lectures 21, 22
- Read Newman 7.0–7.7
- Skim Spizzirri, “Justification and Application of Eigenvector Centrality”

Week 10, Nov. 13: Marx & Markov Chains

- Read Fitelson, “Inductive Logic”
- Watch most of Strang Lecture 24 (stop at 35:10)
- Read Strang 10.3
- Watch Wolff’s Lecture 3 on Karl Marx
  - Optional supplement: Wolff’s 1984 book, *Understanding Marx*. Or see his 1981 and 1983 papers leading to it.

Week 11, Nov. 20: Decisions, Preferences, & Representation Theorems

- Read *Odds & Ends* 11–13
- Read Resnik 4.1–4.4
- Read Eriksson & Hajek, “What Are Degrees of Belief?”

Week 12, Nov. 27: SVD & Recommender Systems

- Watch Strang Lecture 27
- Read Strang Ch 7
- Watch Ng 14.1–14.7, 16.1–16.6

Week 13, Dec. 4: “Deep” Learning

- Read Buckner, “Deep Learning: A Philosophical Introduction”
- Watch Ng 8.1–9.8