

Philosophy of Science Syllabus

Course Description

This course is an advanced introduction to philosophical issues that arise from scientific thinking and practice. The course will be centered around four units. First, we will look at what science is and how the scientific method demarcates it from other disciplines. Questions include what the scientific method is, how science differs from pseudo-science, and how we should characterize scientific explanations and what makes such explanations good or successful. Second, we will look at philosophical and sociological/historical accounts of scientific theory change. We will focus on the two most prominent accounts in the twentieth century: Popper's falsificationism and Kuhn's paradigm shifts. Third, we will look at the scientific realism debate. Questions include whether philosophy is continuous with or rendered otiose by, science, what it means if two theories are consistent with the evidence, whether historical reflection undermines the reliability of the scientific method, and whether we need to believe everything a scientific theory says about the world is true or if we could treat theories merely as useful tools to make predictions. Fourth, we will look at theoretical and empirical issues that arise out of scientific practice, especially as it relates to questions concerning *value*. Topics include the nature of scientific creativity, the ethical responsibilities of scientists, whether science is or can be fully objective or if it has sexist, racist, or other biases and what consequences this has for scientific knowledge, and the general relation between scientific knowledge and human values.

Course Goals and Learning Outcomes

In this course, we will explore a number of foundational issues in the philosophy of science through a survey of its most important developments from the early twentieth century to today. By the end of the course, you will be able to:

- Characterize many of the central issues and key concepts in philosophy of science.
- Discuss and evaluate the main theses and arguments about those issues in a reasoned and neutral way.
- Apply key concepts to actual scientific cases not previously encountered.
- Situate the philosophy of science and the issues therein in relation to other areas of philosophy as well as other disciplines.
- Articulate and defend your own view on issues in philosophy of science and relate it to more general theories of science and scientific practice.
- Write a research paper in a philosophically rigorous, analytic, and concise manner that displays critical reflection on the readings and topics covered in the course.
- Think at a very high level of abstraction – a skill that is very valuable in many different fields but which takes a great deal of practice, which you will get in this course.
- Appreciate and reflect on the value ladenness of science and its relation to other aspects of human life.

Course Readings

Students require a copy of *The Structure of Scientific Revolutions* (4th ed. 2012) by Thomas Kuhn. All other reading materials will be made available on the course website or on reserve from the library.

Grading

Letter grades (corresponding to a 4-point scale: A=4, A-=3.7, B+=3.3, etc.) will be assigned based on the following:

SNTs	20%
First Paper	20%
Second Paper	25%
Final Exam	25%
Participation	10%

Assignments

Socratic Note Taking (SNT)

The purpose of these assignments is to help you read articles more effectively, and to provide accountability for completing the readings. “Socratic Note Taking” is named after Socrates, who famously taught by asking questions. In these notes, you will write questions as you read. Think of it as a reading quiz that you create yourself, along with an answer key. A set of notes is due for each reading. Students will be required to produce three questions and answers per reading, roughly equidistant throughout each reading. Collectively, these are worth 20% of your grade. Complete and submit your questions/answers on the course website prior to the start of the class for which they’re due.

First Paper

The first paper is worth 20% and will apply one of the three main views discussed in our second unit to an actual scientific theory change of the student’s choosing. Papers should be approximately 1000-1500 words (~3-4 pages). Students will provide details of the theory change (this requires outside research) and explain how either Popper, Kuhn, or Feyerabend would understand this transition.

Second Paper

The second paper is worth 25%, is due in the last quarter of the semester, will be 1500-2000 words (~5-6 pages) and will summarize, evaluate, and take a position on, some debate or argument for one of the views discussed so far in the course. Prompts are available on the course website, though if students wish they can come up with their own, however, they must run them by me first.

Final Exam

There is a final exam, worth 25% of the final grade. It will be composed of a mix of short and long answer questions which cover the gamut of topics and readings covered in the course. Students will be given a list of study questions, a random selection of which will make up the final.

Participation

There is a participation grade worth 10% of your final grade, awarded on the basis of participating in class discussions. Coming to office hours to discuss the course material can count towards the participation grade.

Class Expectations

- **Course Readings:** Students should do all the assigned readings before the class in which they're discussed as this is necessary to complete the SNTs, but also because class discussion will be much more fruitful if we're all on the same page.
- **Attendance:** As this is an upper division course, I expect you to attend (though I understand that things come up). I will keep track of attendance and you should notify me of any absences.
- **Electronics Policy:** Laptops, tablets, and phones are not permitted during class unless needed for in-class work. Using electronics is distracting to both yourself and others, and studies have shown that it lowers grades of the user and those around them. If you require a special accommodation regarding electronics please come see me to request an exemption.
- **Communication:** You can contact me via e-mail. I will endeavour to respond within 24 hours, but usually don't respond after 5pm on weekdays nor on weekends.
- **Late Work Policy:** Late assignments without an extension will be downgraded by 1/3 of a letter grade per day after the due date (e.g. A to A-), up to a penalty of 2 full letter grades (after which they won't be accepted). Consult with me to request an extension. Extensions will not be granted for the SNTs; late SNTs will be graded as 0.
- **Grade Disagreement:** I am happy to discuss your graded assignments with you. I ask that you first read through my comments on your assignment, write down any questions you have, and then schedule an appointment with me. Note that I require a 24-hour "cooling off" period before discussing grades. If you think a grade you have received is unfair, please write a paragraph explaining why and send it to me via email. Note that this can result in your initial grade being *either raised or lowered*.
- **Extra Credit:** As a matter of general policy, no extra credit will be offered in this course unless *extremely* unusual circumstances arise which necessitate it.
- **Classroom Etiquette:** Students are expected to respect each other, allow others the chance to speak, and be open-minded to views different from their own. We're here to learn and that's best done through community building, a prerequisite of which is respect and toleration.
- **Syllabus:** Readings and schedule are subject to change. Any changes will be announced in class and on the course webpage.

Provisional Course Schedule

Unit 1: What Is Science?

Week 1: Machamer, “A Brief Historical Introduction to the Philosophy of Science”

Week 2: Ayer, *Language, Truth, and Logic* (selections)
Carnap, “Empiricism, Semantics, and Ontology”
Hempel, “Explanation in Science and in History”

Week 3: Hempel, “Two Models of Scientific Explanation”
Thagard, “The Best Explanation: Criteria of Theory Choice”

Unit 2: Theories and Theory Change

Week 4: Popper, *The Logic of Scientific Discovery* (selections)

Week 5: Kuhn, *The Structure of Scientific Revolutions* (ch. 1-5)

Week 6: Kuhn, *The Structure of Scientific Revolutions* (ch. 6-10)

Week 7: Feyerabend, *Against Method* (selections)

Unit 3: Scientific Realism

Week 8: Musgrave, “The Ultimate Argument for Scientific Realism”
Van Fraassen, “Arguments Concerning Scientific Realism”
First Paper Due

Week 9: Laudan, “A Confutation of Convergent Realism”
Saatsi, “On the Pessimistic Meta-Induction and Two Fallacies”

Week 10: Hacking, “Do We See Through a Microscope?”
Alspector-Kelly, “Should the Empiricist be a Constructive Empiricist?”

Unit 6: Scientific Practice

Week 11: Dunbar and Fugelsang, “Scientific Thinking and Reasoning”
De Cruz and De Smedt, “The Value of Epistemic Disagreement in Scientific Practice. The Case of *Homo floresiensis*”
Second Papers Due

Week 12: Douglas, “The Moral Responsibilities of Scientists”
Fricker, *Epistemic Injustice: Power and the Ethics of Knowing* (selections)

Week 13: Longino, “Multiplying Subjects and the Diffusion of Power”
Anderson, “Feminist Epistemology: An Interpretation and Defense”