Philosophy of Science (Phl 470/570)

Fall 2025

Instructor: Tom Seppalainen; 725-3519; seppalt@pdx.edu
Office Hours: Zoom, weekly, time TBA & through above email

Sources:

Text: Ladyman, J. *Understanding Philosophy of Science* (2002); available through PSU Library as E-book
https://search.library.pdx.edu/permalink/f/p82vj0/CP71310183750001451)
Other reading sources, videos, and powerpoints accessible from weekly Canvas pages

I. Course Description and Learning Objectives

The methodological nature of science has been a matter of debate since the era of the Scientific Revolution. The debate is philosophically important. Rational belief about the metaphysical and epistemological aspects of science must be premised on a view of its method(s). For example, any optimistic view of the epistemology of science, say, that it generates increasingly accurate theories about the nature of reality, must be premised on a corresponding view of the method(s) of science. Similarly, a belief in the rationality and objectivity of science must be premised on a fitting view of its method, say, that it is based in objective data that is processed through protocols of rational inference which, together, deliver cogent theory assessment. And naturally, opposing, "pessimistic" views about the epistemology and metaphysics of science such as relativism and/or social constructivism must be premised on less optimistic views of the rationality and objectivity of the scientific method(s).

The course focuses on the history and philosophy of the scientific method - different conceptualizations of the method of science from classic (e.g., Galileo and Bacon) to the most influential recent (e.g., Popper and Kuhn) sources - and their philosophical implications. Through this study, the course addresses central dimensions of the debates over the epistemology and metaphysics of science, roughly, the rationality and objectivity of science. To accomplish this, the class addresses the following topics (key concepts in italics) from the literature on the methodology of science:

I. Models of the scientific method (*inductivism, falsificationism, Bayesianism, Kuhnian normal science,* etc.) and their epistemological nature (*empiricism, rationalism, pluralism, relativism*, etc.);
II. Logic of the scientific method (*deductive, inductive, analogical, probabilistic including interpretations of probability*, etc.);

III. Nature of scientific change (*positivism, progressivism, reductionism, incommensurability*, etc.);
IV. Relationship(s) between observation/facts and theories/concepts, (*verificationism, theory-ladenness of observation, role of metaphor and analogies*, etc.);
V. Nature of scientific objectivity (*realism(s) and anti-realism(s))*

Note: Each weekly Canvas page will include both an overview of the topic and a detailed articulation of its learning objectives.

II Course Processes

Start by carefully reading this syllabus and then turn to the content. The course content is divided into ten weekly modules (together with an 11th, extra credit module). You will find links to reading sources and videos as well as quizzes, essay questions, and discussion questions (when applicable) under weekly modules. Complete the modules *in order and by completely finishing one before moving to the next*. Although each individual module forms a thematic whole, the material in later modules builds significantly on earlier ones.

III Course Requirements and Grading

III.1 Quizzes and Essays

A. There are **ten** quizzes corresponding to the ten modules of the course. A link to each is in the "Complete" section of each weekly module page. Each quiz is worth 5 points (max 5%) of the total of 100 points for the whole course. Each quiz has 10-13 short questions and a minimum two hour time limit of completion.

All of the quizzes are available from the beginning of the class. The quiz for each weekly module is due by the beginning of the subsequent week, Sunday, midnight (so, e.g., the 1st module quiz is due Sunday, 10/5,11.59 pm). I will give collective feedback on quizzes directly to the whole class through pdx-email - once I have identified and analyzed questions that caused difficulties, on the average.

Take your time with each quiz. Since you have a minimum 2 hours to complete each, you should think of them as homework questions that test not only your comprehension of the most basic concepts, ideas, and arguments but also your ability to retrieve the relevant information from the relevant sources for the week.

Note that once you start a quiz, the clock for its completion starts ticking: you cannot return to the quiz later (than within the allotted time) such as a day after and turning off your computer will not stop the clock from running, etc.

B. There are **eight** "weekly essays:" one for each of weeks 2,3,4,5,6,7,8, and 10. The weekly question including directions on sources and structural requirements are linked in these weeks' Canvas page in the "Complete" section under "Weekly Essay." Each essay is worth 5 points (max 5% of the total of 100 points for the whole course). Each essay is due by the beginning of the subsequent week, Monday, midnight: so, e.g., the 1st (2nd week/module) essay is due Monday, 10/13, midnight. I will send feedback to each essay in Canvas in a timely manner.

Use of Quizzes and Essay Questions for the Final Grade: A maximum of 50 points (50%) from the above two categories of assignments will be counted towards your final grade. In other words, I will choose **the best 10** scores across the 2 categories for final grading purposes. **You can choose** the mixture: for example, you can choose to do only the 10 weekly quizzes and I will count only quiz scores towards the final grade from this category; you can choose to do 7 essays and 3 quizzes or 5 quizzes and 5 essays …; or, finally, you can do each quiz and each essay and I will pick the 10 **best** scores from the lot.

How to choose which type of assignments to do? This is largely a matter of personal preference but the following may help to inform it. The quizzes cover material from the videos and the required readings that, for most weeks, include a textbook-level introduction. The essays, in turn, require the mastery of the main ideas and arguments from a scholarly and typically more recent article(s) – in addition to some of the main ideas and arguments covered in the videos and required readings. Furthermore, the quizzes test the mastery of the key ideas and arguments in a largely discriminative semantic context comprised of standard philosophical "lexical" definitions. The essays require an understanding of the ideas and arguments in a context of deep(er) "theoretical" definitions – specific meanings in specific theoretical roles. The quizzes are mostly comprised of multiple-choice and true/false questions whereas the essays demand accurate and detailed interpretation of a specific text, creative analysis & synthesis, and adherence to the conventions of academic, philosophical writing. The essays require no doubt more time & effort.

III. 2 Discussion

Process

There are **four** Discussion questions: one for each of weeks 2, 4, 6, and 9 (week 1 discussion is extra credit). A link to each is in the "Complete" section of the relevant week's module page. Each discussion is comprised of your post that answers the question posed and (minimum one) reply to a class peer's post. In your reply, you can either agree or disagree (or both, in parts). If you agree, you must articulate the agreement and elaborate on the significance of it for the issue at hand; if you disagree, you must describe the crux of the disagreement and offer an argument for your rival view. Approach the reply-task with this mindset: *a charitable critic is the philosopher's best friend.*

Schedule:

Each of the discussion questions is open for a week, from Saturday of the week previous to the week in question to the Saturday of the designated week (11.59 pm). For example, the 1st discussion, one for week 2, is open from Saturday, 10/4 until Saturday, 10/11, 11.59 pm. But please do not leave your post to the last minute if only because (each of) you also have to find a post to reply to!

Grading:

Each discussion is worth a maximum of 7 points – max 5 points for your post and max 2 for your reply – for a total of 28% for this portion of your final grade. Discussion posts are graded through the following rubric:

0 (no response); 1/.4 (no genuine use of course content and a poor understanding of the question and/or post); 2/.8 (poor understanding and argumentative use of the source material and a partial understanding of the question and/or post); 3/1.2 (superficial understanding and argumentative use of the source material and some mistakes in understanding of the question and/or post); 4/1.6 (good identification of information from and argumentative use of the source and an adequate understanding of the question and/or post); 5/2 (precise argumentative use and integration of source information and an accurate understanding of the question and/or post)

III.3 Research Essay

Short, 6-8 page research essay on "a fixed topic & fixed sources(s):" the task is to explore a question articulated by the instructor through specific sources, 2-3 articles, from the course readings. Directions for the essay will be available from a "Research" module in Canvas that will open at the beginning of the 8th week. There will be two essay topics from which to choose. The essay is due Wednesday, noon, of Finals week. It comprises 22% of the final grade.

III.4 Extra Credit

1st week discussion is extra credit (5 points max). In addition, see “Extra Credit” Module in Canvas for essay topics and sources.

III.5 Final Grading Scale

A: 90% and higher; A-: 87-89%; B+: 83-86%; B: 80-82%; B-: 77-79%; C+: 73-76%; C: 70-72%; C-: 67-69%; D+: 63-66%; D: 60-62%; D-: 58-59; F: 57% and lower.

III.6 Specific Note on Plagiarism

Intellectual integrity forms the bedrock of academic communities and serves as the cornerstone for impartial evaluation of your work. All coursework completed and/or submitted for this class must be your own - represent your skills and effort - and adhere to the University’s Academic Integrity Guidelines. Unauthorized collaboration or the use of ChatGPT or any other generative AI application is **prohibited**. This entails that your work must not read, to me, like it was generated by AI. If it does, expect a further review (including, but not limited to, a rewrite, a brief oral examination on Zoom) and to face consequences described in V.4 below.

IV. Schedule of Classes

Week 1.
I Introduction & Importance of the Scientific Method

Week 2
II Externalism and Baconian Empiricism&Inductivism

Week 3
III Internalism and Galilean Rationalism&Deductivism

Week 4
IV (Hume’s) Problems: Causation and Induction

Week 5
V Popper’s Falsificationism

Week 6
VI Quine-Duhem Thesis & Underdetermination of Theory by Evidence

Week 7
VII Bayesianism & Interpretations of Probability

Week 8
VIII.1 Holistic Scientific Epistemologies: Kuhnian Paradigms

Week 9
VIII.2 Holistic Scientific Epistemologies: Kuhnian Incommensurability

Week 10
VIII.3 Methods, Goals, and Values of Science

Extra Credit Module
IX Scientific Method and Metaphysics: Four Routes to Scientific Realism

V General PSU Course Expectations

Academic Integrity

1. Engage in appropriate classroom behavior. In this (online/remote) class, you are expected to:
    - Treat your peers and your instructor with respect, tolerance, and professionalism. This includes being aware of "tone" when responding in writings to others in discussion boards and communications.
    - Be dependable and responsible to your peers in group activities.
    - Contribute equitably and frequently to group assignments.
2. **Log in to your course frequently - at least once every 24 hours - to check for updates and to do work.**
3. Review all items in this course site thoroughly. Participate fully in all course activities. Read all assigned readings for this class at the beginning of the week and before you attempt to do assignments; submit all assignments on time. Late submissions are NOT accepted.
4. Demonstrate academic honesty. Review the Student Conduct Code to know your rights and responsibilities as a member of the Portland State University community. This code describes behavior for which a student may be subject to disciplinary action. Academic misconduct will not be tolerated. An act of academic dishonesty (e.g., cheating, plagiarism, misrepresenting or improper/no citing that leads the instructor/viewer of content to believe that the writing and

content are original to you, or unauthorized possession of examinations will automatically result in a grade of "F" for the affected assignment and the case will be referred to university authorities. If you are still unclear as to what constitutes plagiarism, consult this site explaining plagiarism from the PSU Library. When in doubt, cite the source. For assistance with APA citation format, see: Purdue OWL: APA Formatting and Style Guide.

Make sure you keep electronic copies of all your assignments – if applicable - also outside of Canvas so that you can produce them should the need arise.

Demeanor & Courtesy

Controversy with civility. Disagreement and diversity of opinions and ideas are encouraged. It is expected that while trying to understand differences in points of view the discussion will always be respectful. Disruptive or offensive behavior has no place in an inclusive and supportive learning environment. Students engaging in such behavior will be asked to leave.

Accommodations for Learning Differences

It is Portland State University's goal that learning experiences be as accessible as possible. If you anticipate or experience physical or academic barriers based on disability, please register with the Disability Resource Center (DRC) (503-725-4150 or drc@pdx.edu) in order to establish reasonable accommodations. Once you have registered with the DRC, please schedule a time to talk to me or email me so that we can discuss your needs for the term.