Philosophy 2300: Introduction to Philosophy of Science

Fall 2026

Meets MWF, Sept. 9 – Dec. 9

Instructor Information

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Meeting times: MWF 9:30 - 10:20 (location TBD) Term: Sept. 9 – Dec. 9, 2026 (Fall Reading Week: Oct. 10 – 18)

Course Description

This course explores philosophical questions about the nature of science, and the status and impact of science. Over the course of the semester, we will look at examples of successes and failures in science and reflect on issues such as: What are the aims of science? Does science make progress? Is scientific knowledge objective? How do historical and social contexts affect the work of scientists, and how does science shape culture? These questions will be explored through a wide range of topics in the natural and social sciences. No prior background in these scientific fields will be assumed.

See the course orientation on Brightspace for more information.

Topics and Readings

We will have one required book: Michael Strevens, *The Knowledge Machine* (New York: Liveright / WW Norton, 2020). This book will be available through the Dellelce family bookstore. Price as listed on Amazon (paperback edition): approx. $25. We will also read papers and selections from several books, all posted to the Brightspace website, listed below along with brief descriptions of the three major themes of the course.

1. *Scientific Method and Progress*: What makes science distinctive (if anything), and what are the nature, scope, and limits of scientific knowledge? We begin with Duhem's classic analysis of the aim of physical theory and the relation between theory and experiment — including his holism, his denial of "crucial experiments," and his appeal to "good sense" in resolving controversies. With Duhem in hand, we turn to the problem of induction, the hypothetico-deductive method and its limits,

and accounts of confirmation. We then take up the "great method debate" between rationalist and historicist pictures of science (Popper and Kuhn), and close with Strevens's recent proposal of an "iron rule" as a way of reconciling the two.

- Duhem, *The Aim and Structure of Physical Theory*, Chapter 6 (with expanded coverage).
- Hempel, *Philosophy of Natural Science*, Chapters 2–3.
- Kuhn, *The Structure of Scientific Revolutions,* Chapters 3–4, 9–10.
- Kuhn, "Objectivity, Value Judgment, and Theory Choice," from *The Essential Tension*.
- Strevens, *The Knowledge Machine*, Parts I and II.
- *(Optional)* Shapin, *The Scientific Revolution*, Chapter 1.

2. *Science as a Social Enterprise*: Even the best scientists do not know everything within their field, and "scientific knowledge" is, in a sense, best attributed to the entire community rather than to any individual. We consider what happens once we shift perspective from the individual researcher to a community of researchers whose interactions — whom they trust, how they communicate, what incentives they face — partly determine how a field progresses. We look at how the structure of a field can produce effects such as polarization, how doubt can be deliberately manufactured, and how some commonly adopted methodologies can lead a field astray (the replication problem). We close by asking when, and why, the public should trust science.

- Kitcher, "The Division of Cognitive Labor," *Journal of Philosophy* (1990).
- O'Connor and Weatherall, *The Misinformation Age*, selections.
- Oreskes and Conway, *Merchants of Doubt*, Chapters 1 and 6.
- Oreskes, *Why Trust Science?*, Chapters 1–2.
- Strevens, *The Knowledge Machine*, Chapter 11.
- Simmons, Nelson & Simonsohn, "False-Positive Psychology," and a short piece by Ed Yong, on the replication problem (full bibliographic details to be added).
- *(Optional)* Selection from Longino on objectivity and critical communities.

3. *Science and Public Policy*: Today's sciences provide information essential to wise public-policy choices, yet policymakers and citizens alike are often ill-equipped to interpret that information or to assess contested scientific claims. Choices about which research to pursue with scarce public funding are equally important, yet it is unclear how — and by whom — those choices should be made. This module explores the interplay between science and democratic governance: the tension between scientific expertise and democratic legitimacy, Kitcher's ideal of "well-

ordered science," and debates over the role of values in scientific practice (the value-free ideal).

- Kitcher, *Science in a Democratic Society,* Chapters 1, 5.
- Strevens, *The Knowledge Machine*, Part IV.

Schedule

The schedule below gives a week-by-week outline of topics. Readings should be completed *before* the first meeting of the week in which they appear. More detailed reading assignments and discussion questions will be posted on Brightspace as the term progresses.

Week 1 (Sept. 9, 11) — Introduction

Course overview and the three themes; what is science?; the demarcation problem and "science in court." Tools for the course: deductive vs. inductive arguments, validity and soundness, and argument mapping.

Readings: Syllabus. *Due:* Assignment 1 (argument mapping).

Week 2 (Sept. 14, 16, 18) — Duhem I: The Aim and Structure of Physical Theory

Duhem in context: the aim of physical theory — representation vs. explanation, and whether theory is more than an economical description of experience. How a theory acquires its content: Duhem's semantics and the idea of theory as a system. Theory and experiment (§§2–5): the three principles, and why an experiment never condemns a single hypothesis in isolation.

Readings: Duhem, Ch. 6 (opening sections through §5). *Due:* Assignment 2.

Week 3 (Sept. 21, 23, 25) — Duhem II → The Problem of Induction

Holism and underdetermination: the "Duhem problem," the absence of crucial experiments, and consequences for the status of hypotheses (§§7–9). Resolving controversies: Duhem's appeal to "good sense" (§10), and why method alone cannot decide. The problem of induction: Hume; matters of fact vs. relations of ideas; naïve inductivism.

Readings: Duhem, Ch. 6 (remaining sections); Hempel, Ch. 2. *Due:* Assignment 3.

Week 4 (Sept. 28, 30, Oct. 2) — Hypothesis Testing and Confirmation

The hypothetico-deductive method: hypotheses, testing, holism revisited, and *ad hoc* hypotheses. Falsificationism (Popper); the 1919 eclipse expedition; demarcation via falsifiability. Confirmation theory: evidential support, variety of evidence, novel predictions, and simplicity.

Readings: Hempel, Ch. 3. *Due:* Assignment 4.

Week 5 (Oct. 5, 7, 9) — The Great Method Debate and Kuhn

The "great method debate": rationalist/methodist vs. historicist pictures; can science be captured by a single method?; Strevens's challenge. Kuhn: normal science and paradigms; anomaly, crisis, and scientific revolutions (the Copernican revolution as a case study); incommensurability, perception, and the worry about relativism; theory choice and the theoretical virtues.

Readings: Kuhn, Ch. 3–4 and 9–10; "Objectivity, Value Judgment, and Theory Choice"; *(optional)* Shapin, Ch. 1. *Due:* Assignment 5.

Fall Reading Week (Oct. 12, 14, 16) — No classes

Week 6 (Oct. 19, 21, 23) — Strevens: The Iron Rule

Strevens reframes the great method debate and introduces the Iron Rule. The Iron Rule of explanation: what it is, how it differs from "method," and why "iron." Baconian convergence; shallow empiricism; the "sterilization" of science and the question of objectivity.

Readings: Strevens, Parts I and II. *Due:* Assignment 6.

Week 7 (Oct. 26, 28, 30) — Evaluating the Iron Rule; Synthesis

Why science is “unnatural”; evaluating the Iron Rule — strengths and criticisms. Comparing the views: Duhem’s holism and “good sense,” Kuhn’s paradigms, and Strevens’s Iron Rule; does science make progress? Method and Progress wrap-up and discussion.

Readings: —. *Due:* Paper 1 due.

Week 8 (Nov. 2, 4, 6) — From Individuals to Communities

From individual to community knowledge; the division of cognitive labor. Network epistemology and agent-based models: how communication structure shapes inquiry. Polarization, information cascades, and conformity.

Readings: Kitcher, “The Division of Cognitive Labor”; O’Connor & Weatherall (selections); Strevens, Ch. 11. *Due:* Assignment 7.

Week 9 (Nov. 9, 11, 13) — Manufactured Doubt and the Replication Problem

The tobacco strategy: manufacturing doubt and the “non-existent debate.” From tobacco to climate: the propaganda playbook — biased production, selective sharing, and selective promotion. When science fails to self-correct: replication problems.

Readings: Oreskes & Conway, Ch. 1 and 6; Simmons, Nelson & Simonsohn, “False-Positive Psychology”; a short piece by Ed Yong (details TBD). *Due:* Assignment 8.

Week 10 (Nov. 16, 18, 20) — Objectivity, the Marketplace of Ideas, and Trust

Mill’s case for free expression and the “marketplace of ideas” reconsidered; objectivity through critical communities. Why trust science? Oreskes’s diagnosis: the problem of trust, the appeal to “the scientific method,” and why it fails. Oreskes’s positive account: consensus, the social character of objectivity, and the role of values. Wrap-up of Social Enterprise.

Readings: O’Connor & Weatherall (selections, cont.); *(optional)* Longino excerpt; Oreskes, *Why Trust Science?*, Ch. 1–2.

Week 11 (Nov. 23, 25, 27) — The Science–Democracy Problem and the Role of Values

Kitcher's central challenge: the tension between scientific expertise and democratic legitimacy; the contemporary crisis of trust. Four models of science and democracy; expertise vs. democratization, and the problems with each. The value-free ideal: can — should — science be value-free? Kitcher on values; case study: evolution education.

Readings: Kitcher, *SDS*, Ch. 1. *Due:* Paper 2 due.

Week 12 (Nov. 30, Dec. 2, 4) — Well-Ordered Science and Its Critics

Kitcher's alternative: well-ordered science — the system of public knowledge; significance and "significance graphs." Enlightened deliberation and the ideal deliberative process, and its advantages; public reason, certification, and transparency (the Mbeki/HIV case). Philosophical criticisms: the justification problem; autonomy vs. democratic control (the Iron Rule vs. well-ordered science); feasibility and action-guidance; trust and "chimeric epistemologies."

Readings: Kitcher, *SDS*, Ch. 5; Strevens, Part IV. *Due:* Assignment 9.

Week 13 (Dec. 7, 9) — Synthesis and Review

The Knowledge Machine and its discontents: synthesis across the three themes; can the machine be "tinkered with"? Final reflections and exam review. (Dec. 9 is the last day of classes.)

Readings: —.

Final Exam: Cumulative essay exam. *Date set by the Registrar (December exam period)*. Note: I will post more detailed information regarding readings and topics for specific class meetings on Brightspace as the course progresses.

Course-Level Learning Outcomes

This course has three main objectives. First, students will reflect on the nature of scientific inquiry from a philosophical perspective, including a critical assessment of the methods of science, their rationale, and the nature of scientific progress. Second, the course will invite students to reflect on the relation of science to other aspects of our culture, including ethical questions related to the conduct of research, the role of values in guiding inquiry, and the broader implications of scientific research. Third, the assignments for the course

will help students to develop their ability to identify and evaluate arguments, to assess different viewpoints fairly and critically, to develop their own positions, and to present clear arguments in writing.

Assessment

1. Attendance and participation (5%)
2. Short Assignments (15%): 9 assignments over the term. This is a flexible assessment: no late assignments are accepted, but the lowest score will be dropped (the mark is based on the best 8 of 9). These assignments will include argument-mapping exercises and brief written reflections.
3. Papers (50%): two papers of roughly 1200–1500 words, due on **Oct. 30** and **Nov. 27**. Rubrics, suggested topics, and detailed guidelines will be distributed as the term progresses. The late penalty is 3% per work day and 5% for the weekend, with a maximum penalty of 20%. Supporting documentation is required for accommodation for this assessment.
4. Final exam (30%): cumulative essay exam.

Regarding the essays, students are required to share their research and writing process, which will be an integral part of the assessment. Students will be required to write the papers in a fashion that supports assessment of the full process, to ensure that academic integrity can be upheld in line with the policies below. (More information will be provided about this process at the appropriate time. This may include, for example, writing the paper in a dedicated computer lab, or using software that provides transparency regarding authorship.)

Late submissions: The short formative assessments are integrated with the coursework, and it is essential to keep pace and meet deadlines. These are flexible assessments: we will not accept late work, but we will automatically drop the lowest score (the mark for short assignments will be based on the top 8 out of 9).

Statement on the use of Generative AI

In this course, students are permitted to use AI tools exclusively for information gathering and preliminary research purposes. These tools, if used appropriately, can enhance the learning experience by providing access to diverse information sources. However, it is essential that students critically evaluate the outputs and use of this tool, exercise independent thinking, and engage in original research to synthesize and develop their own

ideas, arguments, and perspectives. The use of AI tools can serve as a starting point for exploration; however, students are expected to uphold academic integrity by appropriately attributing all sources and avoiding plagiarism. Assignments should reflect the students' own thoughts and independent written work. By adhering to these guidelines, students contribute to a responsible and ethical learning environment that promotes critical thinking, independent inquiry and allows them to produce original written contributions.

If plagiarism or unauthorized AI use is suspected, the instructor may review information regarding the writing process, and may also review research notes and other relevant materials after the assignment has been submitted. If the students use generative AI tools, these research records must include a transcript of their interactions with the LLM or other tool they have used. Students must keep all notes and first drafts until the assignment is returned to them.

Departmental Policies

The Department of Philosophy policies that govern the conduct, standards, and expectations for student participation in Philosophy courses are available in the Undergraduate section of the *Department of Philosophy website*. It is your responsibility to understand the policies set out by the Senate and the Department of Philosophy, and thus ignorance of these policies cannot be used as grounds of appeal.

Audit

Students wishing to audit the course should consult with the instructor prior to or during the first week of classes.

Accommodation

Students seeking academic accommodation on medical grounds for any missed tests, exams, participation components and/or assignments worth 10% or more of their final grade must apply to the Academic Counselling office of their home Faculty and provide documentation. Academic accommodation cannot be granted by the instructor or department. Documentation shall be submitted, as soon as possible, to the Office of the Dean of the student's Faculty of registration, together with a request for relief specifying the nature of the accommodation being requested. The UWO Policy on Accommodation for Medical Illness and further information regarding this policy can be found here.
The Student Medical Certificate is available here.

Academic Consideration

Students may request academic consideration in cases of extenuating circumstances — that is, personal circumstances beyond the student's control that have a substantial but temporary impact on the student's ability to meet essential academic requirements.

1. Requests for academic consideration are made to the Academic Advising office of Faculty in which the student is registered.
2. Requests for academic consideration include the following components:
    a. Self-attestation signed by the student;
    b. Indication of the course(s) and assessment(s) relevant to the request;
    c. Supporting documentation as relevant

Requests without supporting documentation are limited to one per term per course. Documentation for medical illness, when required, includes the completion of a Western Student Medical Certificate (SMC) or, where that is not possible, equivalent documentation, by a health care practitioner. Requests linked to examinations scheduled by the Office of the Registrar during official examination periods as well as practice laboratory and performance tests typically scheduled in the last week of term always require formal supporting documentation.
Policy on Academic Consideration — Undergraduate Students in First Entry Programs

Religious Accommodation

Western's Policy on Accommodation for Religious Holidays can be found here. In the case of mid-term tests, notification is to be "given in writing to the instructor as early as possible, but not later than one week prior to the writing of the test."

Course Assignment

The last day of scheduled classes in any course will be the last day on which course assignments will be accepted for credit in a course. Instructors will be required to return assignments to students as promptly as possible with reasonable explanations of the instructor's assessment of the assignment.

Scholastic Offences

Scholastic offences are taken seriously, and students are directed to read the appropriate policy, specifically, the definition of what constitutes a Scholastic Offence, at the following Web site.

Statement on the use of plagiarism-checking software

All required papers may be subject to submission for textual similarity review to the commercial plagiarism detection software under license to the University for the detection of plagiarism. All papers submitted for such checking will be included as source documents in the reference database for the purpose of detecting plagiarism of papers subsequently submitted to the system. Use of the service is subject to the licensing agreement, currently between The University of Western Ontario and Turnitin.com.

Academic Advising

Your Home Faculty's Academic Advising Office will support or refer whenever you have an issue that is affecting your studies, including information on adding/dropping courses, academic considerations for absences, appeals, exam conflicts, and many other academic related matters. Do not hesitate to reach out to them if you are struggling and unsure where to go for help. Contact info for all Faculties is here.

Mental Health Support

Students who are in emotional/mental distress should refer to Mental Health@Western for a complete list of options about how to obtain help. Immediate help in the event of a crisis can be had by phoning 519.661.3030 (during class hours) or 519.433.2023 after class hours and on weekends (24/7 availability).

Gender-based and Sexual Violence

Western University is committed to reducing incidents of gender-based and sexual violence (GBSV) and providing compassionate support to anyone who is going through or has gone through these traumatic events. If you are experiencing or have experienced GBSV (either recently or in the past), you will find information about support services for survivors, including emergency contacts at the following website: link. To connect with a case manager or set up an appointment, please contact support@uwo.ca.