UNIVERSITY COLLEGE FREIBURG

Introduction to the Philosophy of Science

Bachelor of Liberal Arts and Sciences

Syllabus from 29 March 2025

Instructor

Prof Dr. Frieder Vogelmann – frieder.vogelmann@ucf.uni-freiburg.de

Office hours: Wednesdays, 16–17h, Bertoldstr. 17, Room 01.071.
Please make an appointment with Silvia Stößer (silvia.stoesser@ucf.uni-freiburg.de).

Times and Rooms

Lecture
Tuesday 16-18h, Max-Kade-Auditorium 2

Workgroups
WG1: Thursdays, 16-18h, KG 1023
WG2: Thursdays, 16-18h, KG 1132
WG3: Thursdays, 18-20h, KG 1023
WG4: Thursdays, 18-20h, KG 1132

Tutors:
Maria Jankowska (WG1, WG3)

Wouter Wiersma (WG1, WG3)

Course Description

The lecture introduces students to philosophy of science by looking at the most important problems and debates: What are sciences, and how are they related to philosophy? How do scientific explanations work? Are there laws of nature? What roles do empirical accuracy, curiosity, diversity and other values play in scientific practices? Does science discover what is real?

The lecture is organised around five broad topics:

(1) *Sciences, Philosophy and History*: Why is there a "philosophy of science" and how does it relate to scientific disciplines? Is there a common "scientific method" that all sciences share? What role does the history of science play for philosophy of science?
(2) *Explanations, Interventions and Experiments*: How do sciences explain the phenomena they study? Are scientific practices more about representing or about intervening? What are experiments and why are they so central?
(3) *Objects, Values and Laws*: What are the components of scientific theories and practices? Are there natural laws? Must sciences strive for the ideal of freedom from moral or political values?
(4) *Realism, Anti-Realism and Relativism*: Do scientific practices discover what is real? Is there progress towards truth? How should we understand objectivity?
(5) *Sciences in Society*: What role does scientific knowledge play in democratic politics? What role should it play?

General Reading

Cartwright, Nancy (2022): *A Philosopher Looks at Science*. Cambridge: CUP.
Bortolotti, Lisa (2008): *An Introduction to the Philosophy of Science*. Cambridge: Polity.
Okasha, Samir (2016): *Philosophy of Science. A Very Short Introduction*. 2nd ed. Oxford: OUP.
Oreskes, Naomi (2021): *Why Trust Science?* Princeton, N.J./Oxford: PUP.
Rosenberg, Alexander and Lee McIntyre (2020): *Philosophy of Science. A Contemporary Introduction*. 4th ed. New York/London: Routledge.

Learning Goals

Upon successful completion of this course, students are able to

- describe and explain fundamental concepts of science,
- discuss different conceptions of scientific explanation and confirmation,
- reflect upon the (alleged) rationality and objectivity of science, and
- understand the difference between a normative and a socio-historical view on science.

Attendance & Punctuality

Standard LAS attendance policies apply. Generally, students should inform the instructor about their absence ahead of time, if possible. Students can miss **2 sessions** in a workgroup without having to give specific reasons. Students may miss another **2 sessions** if they hand in the necessary proof defined in the general LAS attendance guidelines (see ILIAS Info Board). In this case, instructors may ask students to prepare make-up work.

Note that you are expected to arrive punctually for workgroups and the lecture. Presuming that your time is more valuable than everybody else's time is simply arrogant, if not rude.

Assessment and Assignments

Graded Examination I (20%): Students must give a short (10min) presentation of one core text in the workgroups. These presentations can be held by two students, but not by larger groups. They are intended to open up the discussion in class and should answer three questions:

(a) What is the main argument in the text? How can we express its main thesis?
(b) How does the argument work?
(c) Where do you see problems? Identify where you find an argument hard to understand and where you think an argument is inconclusive.

Please be aware that you should reconstruct the argument, not just summarise all of the text. Since you will not have time to include every detail, you must decide what is important and what is not. It is far better if we discover in the discussion that we do need some of the left-out passages than if you try to cramp everything into the presentation.

Graded Examination II (80%): The final exam will be a written exam on **22 July 2025**. The **re-sit date is 23 September 2025**. The exam consists of two parts: A first part with knowledge questions that require short answers about material covered in the lecture, and a second part with essay question to choose from. Further information about the exam will be given in the lecture.

Guiding Questions: To help you with the reading, we will upload guiding questions on ILIAS every week. You can use them to orient your text or write an answer in order to practice for the exam. You can also get feedback for your answers from your workgroup tutor but please talk to them before handing anything in.

Philosophy students can earn 3 ECTS (Studienleistung) by attending the lecture and writing a short essay (3,000 words) at the end of the term (due by **August 30, 2025**). They are free to join the workgroups, if they are not filled to capacity. Please contact me before you start writing your essay so that we can agree on a suitable topic

Exam registration takes place in HISinOne during the first two weeks of the semester/the block. For semester-long courses, there is a withdrawal period in the third week of the semester.

All core texts will be made available via ILIAS and in a reader.

Course Outline/Schedule

#	Date	Topic	Required Reading	Optional Reading
1	22.04.2025	Four Ideas of Science and an Overview	Francis Bacon (2009 [1620]), "The Inductive Method" Galileo Galilei (2009 [1623]), "Tradition and Experience"	Peter Machamer (2002), "A Brief Historical Introduction to the Philosophy of Science"
2	29.04.2025	The Trouble with Induction	**NO WORKGROUPS ON MAY 1ST (LABOUR DAY).** Wesly C. Salmon (2017 [1967]), *The Foundations of Scientific Inference*, 1–11 and 54–56.	Carl G. (Hempel 1998 [1962]), "Two Basic Types of Scientific Explanation"
3	06.05.2024	Logical Empiricism vs. Critical Rationalism	Naomi Oreskes (2021), *Why Trust Science?*, 15–28.	Samir Okasha (2016), *Philosophy of Science*, 1–15. Karl R. Popper (2002 [1963]), "Science: Conjectures and Refutations"
4	13.05.2024	Puzzles, Paradigms & Scientific Revolutions: Thomas Kuhn's Challenge	Thomas S. Kuhn (1998 [1962]), "The Nature and Necessity of Scientific Revolutions"	Thomas S. Kuhn (1970 [1962]), *The Structure of Scientific Revolutions*.
5	20.05.2025	After Kuhn: Rational Reconstruction or Scientific Anarchism?	Naomi Oreskes (2021), *Why Trust Science?*, 28–49.	Alexander Bird (2013), "The Historical Turn in the Philosophy of Science"
6	27.05.2024	Demarcation, Pseudoscience and Objectivity	**NO WORKGROUPS ON MAY 29TH (ASCENCION DAY).** Briana Toole (2022): "Objectivity in Feminist Epistemology"	Larry Laudan (1983): "The Demise of the Demarcation Problem" Ute Frietsch (2015): "The Boundaries of Science/Pseudoscience"

#	Date	Topic	Required Reading	Optional Reading
7	03.06.2024	Explanations, Causation & Natural Laws	Nancy Cartwright (1998 [1980]), "Do the Laws of Physics State the Facts?"	Alexander Rosenberg and Lee McIntyre (2020), *Philosophy of Science. A Contemporary Introduction*, 56–73.
	10.06.2024	**PENTECOST BREAK – NO LECTURE & NO WORKGROUPS**		
8	17.06.2024	"If you can spray them, they are real…"	**NO WORKGROUPS ON JUNE 19TH (CORPUS CHIRSTI).** Ian Hacking (1998 [1982]), "Experimentation and Scientific Realism"	Arthur Fine (1998 [1984]), "The Natural Ontological Attitude"
9	24.06.2024	Anti-Realism & Social Constructivism	Bruno Latour (2002), "The Science Wars: A Dialog" John Dupré (2004), "What's the Fuss about Social Constructivism?"	Lorraine Daston (1992): "Objectivity and the Escape from Perspective"
10	01.07.2024	Sciences, Humanities & Values	Helen Longino (2008), "Values, Heuristics, and the Politics of Knowledge"	Lorrain Daston and Peter Galison (2007), *Objectivity*
11	08.07.2024	The Authority of Scientific Knowledge	Naomi Oreskes (2021), *Why Trust Science?*, 49–68.	Massimo Pigliucci and Maarten Boudry (eds.) (2013), *Philosophy of Pseudoscience*
12	15.07.2024	Philosophy of Science: Contemporary Challenges and Future Issues	Open Discussion in the Workgroups, Q&A for the Exam	---
13	22.07.2025	Written Exam	---	---

Full Biography

Bacon, Francis (2009 [1620]): The Inductive Method. In: Timothy McGrew, Marc Alspector-Kelly and Fritz Allhoff (eds.), *Philosophy of Science. An Historical Anthology*. Malden: Wiley-Blackwell, 190–193.
Bird, Alexander (2013): The Historical Turn in the Philosophy of Science. In: Martin Curd and Stathis Psillos (eds.), *The Routledge Companion to Philosophy of Science*. London/New York: Routledge, 79–89.
Cartwright, Nancy (1998 [1980]): Do the Laws of Physics State the Facts? In: Martin Curd and Jan A. Cover (eds.), *Philosophy of Science. The Central Issues*. New York/London: Norton & Company, 895–877.

Daston, Lorraine (1992): Objectivity and the Escape from Perspective. In: *Social Studies of Science* 22 (4), 597–618.
Daston, Lorraine and Peter Galison (2007): *Objectivity*. New York: Zone Books.
Dupré, John (2004): What's the Fuss about Social Constructivism? In: *Episteme* 1 (1), 73–85.
Fine, Arthur (1998 [1984]): The Natural Ontological Attitude. In: Martin Curd and Jan A. Cover (eds.), *Philosophy of Science. The Central Issues*. New York/London: Norton & Company, 1186–1208.
Frietsch, Ute (2015): The Boundaries of Science/Pseudoscience. In: *European History Online*. Leibniz-Institut für Europäische Geschichte, ‹http://www.ieg-ego.eu/frietschu-2015-en›.
Galilei, Galileo (2009 [1623]): Tradition and Experience. In: Timothy McGrew, Marc Alspector-Kelly and Fritz Allhoff (eds.), *Philosophy of Science. An Historical Anthology*. Malden: Wiley-Blackwell, 135–137.
Hacking, Ian (1998 [1982]): Experimentation and Scientific Realism. In: Martin Curd and Jan A. Cover (eds.), *Philosophy of Science. The Central Issues*. New York/London: Norton & Company, 1153–1168.
Hempel, Carl G. (1998 [1962]): Two Basic Types of Scientific Explanation. In: Martin Curd and Jan A. Cover (eds.), *Philosophy of Science. The Central Issues*. New York/London: Norton & Company, 685–694.
Kuhn, Thomas S. (1970 [1962]): *The Structure of Scientific Revolutions*. 2nd, enlarged ed. Chicago: University of Chicago Press.
——— (1998 [1962]): The Nature and Necessity of Scientific Revolutions. In: Martin Curd and Jan A. Cover (eds.), *Philosophy of Science. The Central Issues*. New York/London: Norton & Company, 86–101.
Latour, Bruno (2002): The Science Wars: A Dialog. In: *Common knowledge* 8 (1), 71–79.
Laudan, Larry (1983): The Demise of the Demarcation Problem. In: Robert S. Cohen and Larry Laudan (eds.), *Physics, Philosophy and Psychoanalysis. Essays in Honor of Adolf Grünbaum*. Dordrecht/Boston/Lancaster: D. Reidel, 111–127.
Longino, Helen E. (2008): Values, Heuristics, and the Politics of Knowledge. In: Martin Carrier, D. O. N. Howard and Janet Kourany (eds.), *The Challenge of the Social and the Pressure of Practice: Science and Values Revisited*. Pittsburgh, PA: University of Pittsburgh Press, 68–86.
Machamer, Peter (2002): A Brief Historical Introduction to the Philosophy of Science. In: Peter Machamer and Michael Silberstein (eds.), *The Blackwell Guide to the Philosophy of Science*. Malden, MA: Blackwell, 1–17.
Okasha, Samir (2016): *Philosophy of Science. A Very Short Introduction*. 2nd ed. Oxford: OUP.
Oreskes, Naomi (2021): *Why Trust Science?* Princeton, N.J./Oxford: Princeton University Press.
Pigliucci, Massimo and Maarten Boudry (eds.) (2013): *Philosophy of Pseudoscience. Reconsidering the Demarcation Problem*. Chicago, Ill.: University of Chicago Press.
Popper, Karl R. (2002 [1963]): Science: Conjectures and Refutations. In: ibid., *Conjectures and Refutations: The Growth of Scientific Knowledge*. London/New York: Routledge, 43–86.
Rosenberg, Alexander and Lee McIntyre (2020): *Philosophy of Science. A Contemporary Introduction*. 4th ed. New York/London: Routledge.
Salmon, Wesly C. (2017 [1967]): *The Foundations of Scientific Inference. 50th Anniversary Edition with an Introductory Essay by Christopher Hitchcock*. Pittsburgh, PA: University of Pittsburgh Press.
Toole, Briana (2022): Objectivity in Feminist Epistemology. In: *Philosophy Compass* 17 (11).