

1 General instructions

Make sure you have read the instructions carefully. Some students lose crucial points simply for not following the instructions.

Please note first that the format will be slightly different depending on whether or not you take the course for a semester only or as an annual course.

If you take it for a semester only, then you will have to take the exam during the exam session immediately following the semester in which you have taken the course (so if you take the course in Fall 2024, the exam is in January 2025; if you take the course in Spring 2025, the exam is in June 2025).

If you take the course for the entire year, then the exam will cover the entire year and take place in June 2025. Please let me know in advance if you would like to take the annual course, but prefer to do two semester exams.

Regardless of whether you take the exam for the annual course or just for the spring semester, the format of the exam is exactly the same, as is the time (2 hours). The difference between them is in the topics covered.

The written exam will be **closed books**, which means that you will not be allowed to use books, notes or electronic devices with memory or communication functions during the exam. For each option, the different subjects covered in the course will have more or less the same relative importance.

The topics and problems below (see the topics for the relevant semesters) give you a list of material that has been seen in class, in the readings or both. Study them carefully. The examination will consist of three parts. The first part will consist of ten **identification questions**. You will be asked to characterise or define a term or expression using one or two short sentences. The second part will consist of six **questions requiring short answers** for which I expect one-paragraph answers. In this second part, you will sometimes be able to choose from two questions. In the third part, there will be one **essay question** which will require an argumentative text, in which you will draw on all the relevant content from the course.

The evaluation of the exam is anonymous.

2 Topics Fall 2024

History of philosophy of science

- Aristotle's theory of causality
- Newton's "hypotheses non fingo"
- Hume's solution to the problem of induction
- Mach's positivism

Science vs pseudoscience

- What is the demarcation issue?
- relevance of demarcation issue
- give some examples of criteria that could be used to demarcate science from pseudoscience

Arguments, deduction, induction

- singular and universal propositions
- observation and theoretical statements
- validity (deductive), truth, sound arguments
- general characteristics of deduction and induction, difference between the two
- Hume's problem of induction
- necessary connection between fallibility and ampliativity
- enumerative induction
- eliminative induction
- causal inference
- Mill's methods of agreement and difference
- inference to the best explanation, and its problems

Logical empiricism

- manifest of the Vienna Circle, empiricism and role of logic
- verificationist theory of meaning
- justification and epistemology of observation statements
- context of discovery vs context of justification
- the unity of science
- Nagel's model of inter-theoretic reduction
- homogeneous vs heterogeneous reduction, examples of both

Popper and falsificationism

- deductivism
- asymmetry between verification and falsification
- falsifiability, its definition and use as demarcation criterion
- degrees of falsifiability; generality, precision
- falsificationism

- conjectures and refutations
- problems of falsificationism:
 - observation statements
 - holism and immunisation of theories; ad hoc hypotheses
 - probabilistic hypotheses
 - scientific progress and corroboration (with Popper's response)

Scientific revolution

- main points of scientific revolution
- relevance of the Renaissance
- Aristotle's cosmos
- Paracelsus, Vesalius, Harvey
- Ptolemaic astronomy and its problems
- Copernican astronomy, its advantages and problems
- shipmast experiment
- idea of Galilean relativity in Bruno and Galileo
- Descartes and mechanical philosophy
- Newton and his problems with mechanical philosophy

Kuhn and scientific revolutions

- paradigm (broad and narrow sense)
- contrast with Popper
- normal science
- anomaly and crisis
- scientific revolutions and how they occur
- changing standards and Kuhn losses
- incommensurability (linguistic and methodological)
- two misunderstandings of incommensurability
- scientific progress according to Kuhn, its qualifications

Holism and underdetermination

- confirmation holism according to Duhem
- Duhem on crucial experiments in physics
- Quine's confirmation holism
- underdetermination of theories or hypotheses by data
- logical vs methodological underdetermination
- weak and strong methodological underdetermination

Induction and confirmation

- naive inductivism and Hempel's critique
- role of hypotheses, 'significant data'
- hypothetico-deductive reasoning, example of Blaise Pascal as illustration
- confirmation theory, general idea
- instantial model of inductive confirmation
- model of hypothetico-deductivism
- problems with the hypothetico-deductivist model:
 - Hempel's raven paradox (equivalence condition, instance condition), resolutions
 - Goodman's "new riddle of induction" (gruesome predicates), resolutions, application

Scientific explanation

- The deductive-nomological model of explanation (including conditions of adequacy)
- difficulties of the D-N model: the D-N model as unnecessary and as insufficient (know an example for each)

Scientific realism

- scientific realism
- no-miracles argument, and the antirealist Darwinian response
- constructive empiricism
- pessimistic meta-induction, weak and strong version
- structural realism
- argument from underdetermination of theory by data or observation
- base rate fallacy

3 Topics Spring 2025

To be determined.