

History and Philosophy of Sciences: Physics and Astronomy (C003940)

Course size *(nominal values; actual values may depend on programme)*

Credits 6.0 **Study time 180 h**

Course offerings and teaching methods in academic year 2026-2027

A (semester 2)	Dutch	Gent	independent work lecture
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Lecturers in academic year 2026-2027

Van Dyck, Maarten	LW01	lecturer-in-charge
Beck, Pieter	LW01	co-lecturer
De Rijcke, Sven	WE05	co-lecturer

Offered in the following programmes in 2026-2027

Master of Science in Physics and Astronomy	crdts	offering
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6 A

Teaching languages

Dutch

Keywords

Philosophy of science, history of science, scientific evidence, scientific models, scientific theories, scientific research communities, expertise, history of physics, history of astronomy

Position of the course

This course teaches the student to think about the natural sciences. We investigate some philosophical questions dealing with the relation between theories, models and their empirical evidence. The goal is to give the student insight in both the possibilities and the limits of scientific evidential reasoning by showing the importance of these philosophical ideas for a proper understanding of the history and contemporary practice of the sciences. Next to this, a few developments from the history of physics and astronomy are discussed in more detail.

Contents

General part: The first part (3 credits, taught in the first six weeks of the semester) introduces the central themesthrough a study of a few episodes from the history of chemistry that are exemplary for the dynamics of all scientific research. By placing the scientific research in its historical context it is shown how empirical observations can only play their evidential role given a number of "background assumptions". We describe how models are formulated for phenomena, based on these observations, and how these models in turn can be integrated withing more abstract theories. The cases discussed are: Lavoisier's oxygen hypothesis, the determination of atomic weights in nineteenth century chemistry, the concept of an element in the table of Mendeleev and the changing relations between chemistry and (sub-)atomic physics.

When describing these cases, we also pay attention to historical evolutions in the organisation of scientific research communities and how these make possible scientific research as a collective endeavor: from the amateurs at the academies of the eigteenth century to the professional scientists at research universities in the nineteenth century and twentieth century (hyper-)specialists. In a concluding class, we discuss the status of expertise in the context of applying scientific theories when dealing with social problems.

Domain-specific part: The second part (3 credits, taught in the next six weeks) focusses on specific aspects from the history of physics and astronomy. The

genesis of Newton's classical mechanics is discussed. Further evolutions within mathematical physics in the period after Newton up till the twentieth century are treated. Philosophical questions having to do with the use of mathematical methods in the study of empirical phenomena are also raised.

Initial competences

Basic familiarity with some central concepts and theories in the natural sciences and physics.

Final competences

- 1 Being able to correctly explain the relations between empirical evidence, models and theories
- 2 Have insight in the historical developments of scientific research communities and being able to correctly assess the impact of these developments
- 3 Being able to accurately interpret the historical cases
- 4 Being able to develop nuanced reflection on the status of expertise
- 5 Possess knowledge about the historical development of physics and astronomy.
- 6 Have insight in philosophical questions raised by historical developments within physics & astronomy.
- 7 Develop a reflective attitude that can be incorporated in one's own scientific practice.

Conditions for credit contract

Access to this course unit via a credit contract is determined after successful competences assessment

Conditions for exam contract

This course unit cannot be taken via an exam contract

Teaching methods

Lecture, Independent work

Study material

Type: Syllabus

Name: Syllabus'

Indicative price: Free or paid by faculty

Optional: no

Available on Ufora : Yes

Additional information: Written syllabubs, scientific papers, historical source-texts, ppt slides

References

Course content-related study coaching

The teacher and his collaborators provide individual feedback when necessary.

Assessment moments

end-of-term and continuous assessment

Examination methods in case of periodic assessment during the first examination period

Oral assessment, Participation, Written assessment with open-ended questions, Presentation

Examination methods in case of periodic assessment during the second examination period

Oral assessment, Participation, Written assessment with open-ended questions, Presentation

Examination methods in case of permanent assessment

Presentation

Possibilities of retake in case of permanent assessment

examination during the second examination period is possible

Extra information on the examination methods

General part: Written examination.

Domain specific part: exampaper on a specific topic treated in the classes + oral examination.

Partim astronomy: the students prepare and give a presentation based on a paper, provided by the lecturer, on a topic related to the course material. All students must be present during these presentations.

Calculation of the examination mark

50 % general part and 50 % domain specific part