Universitat Autònoma de Barcelona

2023/2024

History of Physics

Code: 100170
ECTS Credits: 6

Degree	Type	Year	Semester
2500097 Physics	OT	4	2
2504235 Science, Technology and Humanities	OT	4	2

Contact

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Teaching groups languages

You can check it through this link. To consult the language you will need to enter the CODE of the subject.
Please note that this information is provisional until 30 November 2023.

Teachers

Sergi Grau Torras

Prerequisites

There are none.

Objectives and Contextualisation

The subject deals with the past and present of Physics with 4 aims:
1. To describe the main changes in the structure, methods and concepts of Physics.
2. To identify the different ways of doing Physics.
3. To analize the social, cultural, and gender relations of Physics.
4. To recognize the historical sources of Physics and the methodological problems that they pose.
The subject also has the general aim of improving the student's capacity to advance and contrast arguments.

Competences

Physics

- Act with ethical responsibility and respect for fundamental rights and duties, diversity and democratic values.
- Carry out academic work independently using bibliography (especially in English), databases and through collaboration with other professionals

- Communicate complex information in an effective, clear and concise manner, either orally, in writing or through ICTs, and before both specialist and general publics
- Develop strategies for analysis, synthesis and communication that allow the concepts of physics to be transmitted in educational and dissemination-based contexts
- Know the fundamentals of the main areas of physics and understand them
- Make changes to methods and processes in the area of knowledge in order to provide innovative responses to society's needs and demands.
- Take sex- or gender-based inequalities into consideration when operating within one's own area of knowledge.
- Use critical reasoning, show analytical skills, correctly use technical language and develop logical arguments
- Work independently, have personal initiative and self-organisational skills in achieving results, in planning and in executing a project
- Working in groups, assume shared responsibilities and interact professionally and constructively with others, showing absolute respect for their rights.

Learning Outcomes

1. Analyse the sex- or gender-based inequalities and the gender biases present in one's own area of knowledge.
2. Chronologically and thematically locate the concepts and practices that lead to the development of quantum mechanics.
3. Communicate complex information in an effective, clear and concise manner, either orally, in writing or through ICTs, in front of both specialist and general publics.
4. Consider how gender stereotypes and roles impinge on the exercise of the profession.
5. Describe and analyse Einstein's physical arguments and his way of presenting them.
6. Describe and analyse Galileo's demonstration of the law of falling bodies and characterise its mathematisation of movement.
7. Describe and analyse the contribution of Galileo to the establishment of a mathematical and experimental physics.
8. Describe and analyse the reaction of the public and the scientific community to Einstein's visit to Spain in 1923.
9. Describe the changes in the methods and tools of physics, concerning the division of the discipline into different areas.
10. Describe the contribution of Newton to the use of mathematics in natural philosophy.
11. Describe the origins of the concept of field.
12. Describe the problems raised by the use of instruments in natural philosophy.
13. Describe the relationship between the theory of relativity and the problems of the electrodynamics of moving bodies.
14. Described the Platonic attitude to the mathematical foundations of physical reality.
15. Develop an understanding of the structure and content of the mathematical principles in natural philosophy of Isaac Newton.
16. Distinguish the different stages of formation in the main areas of physics, in addition to the reasons for their grouping into categories such as Aristotelian physics, geocentric physics, Newtonian physics, classical physics and modern or contemporary physics.
17. Explain the challenge of mathematising electricity in the Enlightenment, from an analysis of the experimental demonstration of the law of force between charged objects.
18. Explain the explicit or implicit code of practice of one's own area of knowledge.
19. Explain the relationship between Galilean kinematics and Copernican cosmology.
20. Explain the relationship between these factors and their impact on the practice of physics and the genesis of the laboratory.
21. Explain the sense in which Hertz states that Maxwell's theory is Maxwell's system of equations.
22. Identify situations in which a change or improvement is needed.
23. Identify the factors that lead to the professionalisation of research and the teaching of physics in the nineteenth century, especially in France and Germany.
24. In an efficient way, synthesize and present the classic and historical text of physics.
25. Participate in discussions that contrasts different views on the historical significance of a text or a problem of physics.

26. Recognise the main stages in the development of contemporary physics in Spain and Catalonia.
27. Recognize the different traditions that shaped the genesis of electromagnetic theory.
28. Recognize the original meaning of the term physics.
29. Recognize the relationship between physics, philosophy and culture throughout history.
30. Use critical reasoning, show analytical skills, correctly use technical language and develop logical arguments
31. Work independently, take initiative itself, be able to organize to achieve results and to plan and execute a project.
32. Working in groups, assume shared responsibilities and interact professionally and constructively with others, showing absolute respect for their rights.
33. Carry out academic work independently using bibliography (especially in English), databases and through collaboration with other professionals

Content

The contents are grouped in two chronological parts. The first one deals with the rise of classical physics, from Antiquity through to the Enlightenment; the second deals with the development of contemporary physics.

Part 1
1 Introduction: physics and history
2 *Physis*, movement and cosmology
3 The astronomical revolution
4 Newton and *The Mathematical Principles of Natural Philosophy*
5 Electricity and Enlightened physics

Part 2
6 The birth of a discipline: classsical physics
7 The new physics: mattter, energy and radiation
8 The relativistic revolution
9. The quantum revolution
10 Physics, gender, and society in the 20th century

Methodology

Theory lectures: Presentation of each theme (aims, contents, related texts). The presentation will be available at the Aula Moodle.
Practical lectures: Discussion of the theme's readings, available at the Aula Moodle.
Personal work: Guided reading of texts, study, elaboration of essays and essay review.

Annotation: Within the schedule set by the centre or degree programme, 15 minutes of one class will be reserved for students to evaluate their lecturers and their courses or modules through questionnaires.

Activities

Title	Hours	ECTS	Learning Outcomes
Type: Directed			
Practical lectures	16	0.64	3, 16, 33, 25, 30, 29, 24, 32
Theoretical lectures	33	1.32	9, 11, 12, 5, 7, 6, 8, 14, 10, 13, 16, 17, 21, 20, 19, 15, 23, 28,

			27, 26, 29, 2
Type: Autonomous			
Personal work	52	2.08	16, 29, 24
Preparation of essays and essay review	46.5	1.86	3, 16, 33, 25, 30, 29, 24, 31, 32

Assessment

Exam part 1. The exam will be based on the questions proposed in the Campus virtual and will refer to the texts and images discussed. The student will have to identify and explain the historical significance of some of these texts or images.
Essays. For each topic, we will raise questions related to the readings proposed in the Moodle classroom. The student will write six essays of up to 600 words on any of these questions, and submit them through the Aula Moodle. The readings will be discussed in the classroom.
Essay review part 2. consists of an essay review of a text about the history of contemporary physics. The essay will be between 1200 and 3000 words long (depending on whether it is an individual or a two-person essay), and should clearly outline the main ideas of the chosen text and its significance for the history of physics. The Moodle Classroom proposes the texts that can be the subject of the review.

There will be a reevaluation exam, with a total maximum weight of 60 %. To be reevaluated, you must have been evaluated in a set of activities whose weight equals to a minimum of two thirds of the total grade of the subject. The student will be deemed NOT AVALUABLE if he has not participated in all the assessment activities.

One-off assessment. The student who has taken up the One-off Assessment mode will do a final test that will consist of an exam on Part 1 (30%) and the submission of the 6 assays and the review of Part 2. This test will be held on the same day, time and place as the tests for the second part of the continuous evaluation mode.

In the event of a student committing any irregularity that may lead to a significant variation in the grade awarded to an assessment activity, the student will be given a zero for this activity. In the event of several irregularities in assessment activities of the same subject, the student will be given a zero as the final grade for this subject.

Assessment Activities

Title	Weighting	Hours	ECTS	Learning Outcomes
Essay review part 2	30%	0	0	3, 9, 11, 5, 8, 13, 16, 21, 20, 33, 23, 30, 27, 26, 29, 2, 31, 32
Essays	40%	0	0	1, 3, 18, 33, 22, 25, 30, 28, 29, 24, 31, 32, 4
Exam part 1	30%	2.5	0.1	9, 12, 7, 6, 14, 10, 16, 17, 19, 15, 28

Bibliography

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Software

No specific software is required.