

26938 - History of Science

Syllabus Information

Academic year: 2024/25

Subject: 26938 - History of Science

Faculty / School: 100 - Facultad de Ciencias

Degree: 447 - Degree in Physics

ECTS: 5.0

Year:

Semester: First semester

Subject type: Optional

Module:

1. General information

This subject provides students with a historical perspective of the evolution of Physics as a science, as well as the relationship between Physics and other sciences. Such a perspective makes it possible to gauge both the achievements of the human mind and the historical conditioning factors (social, economic, cultural, religious, gender) that frame this evolution, and stimulates the desire to deepen the knowledge of the various sub-disciplines.

Fundamental objectives of the subject will be to foster in students a critical attitude with respect to the methodology of science, the structure of scientific theories, and the philosophical questions they raise and to stimulate them to deepen in the biographical knowledge of the characters whose footprint marked the historical development of Science, as well as in particular topics of epistemological aspects in the development of physical theories.

2. Learning results

Upon completion of the subject, the student will be able to:

- Know the evolution of theories, physical concepts and fundamental principles of Physics throughout history
- Know the philosophical or epistemological currents behind the main physical theories.
- Acquire awareness of the interrelation of Physics with other sciences.
- Achieve specific oral communication skills, through discussions based on texts that will be proposed to them for reading and analysis.

The student, in order to pass this subject, must demonstrate the following results:

- Is able to describe the historical development of the main scientific disciplines, as well as the evolution of important scientific concepts, with particular emphasis on Physics.
- Is able to indicate biographical data of major figures in the history of science.
- Is able to analyse epistemological texts on the development of Science in general and Physics in particular
- Is able to describe the mutual influence between Physics and other sciences.
- Is able to understand the historical character of scientific change.

3. Syllabus

1. Ancient and medieval science

1. Science in Antiquity: the technological and philosophical genesis of scientific knowledge.
2. Materialism and idealism. The scientific legacy of the classical world: Mathematics, Astronomy and Mechanics.
3. Science in Middle Ages: Islamic and Christian West Science, and the transformation of feudalism by new techniques.

2. The Birth of Modern Science (1450-1690)

1. The Renaissance (1440-1540): Science and Technology in the Renaissance. Copernicus and Vesalius.
2. Science during the first bourgeois revolutions (1540-1650): Kepler, Galileo and Harvey. Descartes and Bacon.
3. Coming of Age of Science (1650-1690): The elaboration of the new image of the world. The synthesis of Newton.

3. 18th century: Science at the time of the Enlightenment and the beginnings of the Industrial Revolution

1. Historical framework. Scientific activity and the diffusion of science in the 18th century.
2. Mathematics and Mechanics. Electricity. Heat. Astronomy and Cosmology.
3. The birth of the new chemistry.

4. Physiology and the problem of the origin of life.
5. Natural history. Geology: the discovery of time.

4. 19th century: The Institutionalization of Science and the Beginning of the Contemporary World

1. French Science between 1789 and 1814.
2. Lamarck, Darwin and Wallace. Charles Lyell and modern geology.
3. Mendel: the father of Genetics. The cell and its interior. Ramón y Cajal: the cells of the nervous system.
4. Scientific medicine: Bernard, Helmholtz and the first principle of Thermodynamics. Pasteur and the microbial origin of diseases.
5. Organic chemistry and the institutionalization of science. Dalton and the foundations of modern chemistry.
6. Electromagnetism: Faraday and Maxwell. Thermodynamics and Statistical Physics. A new electromagnetic world.
7. X-rays, radioactivity and the electron. Clouds over Physics at the end of the 19th century.
8. Spectroscopy and the birth of astrophysics.
9. Analytical mathematics and group theory. New mathematical worlds: Non-Euclidean geometry and the concept of infinity.

5. 20th century: The Century of Science

1. Planck and the quantum discontinuity. The structure of the atom and the ancient quantum theory. Quantum Mechanics (1925-1927).
2. Nuclear Physics. Elementary particles. The transistor and Quantum Chemistry.
3. Albert Einstein: special relativity and general relativity.
4. The expansion of the universe. Wegener and the drift of the continents.
5. Gödel and the limits of mathematics. Computers and experimental mathematics. The last theorem of Fermat.
6. From Genetics to Molecular Biology: the discovery of DNA and the Chemistry of life.

4. Academic activities

- Master classes to acquire basic knowledge in the history of science and physics (40 hours).
- Resolution of problems and cases based on bibliographic search activities and analysis of primary sources (10 hours).

5. Assessment system

The student must demonstrate that they has achieved the intended learning results through the following assessment activities:

- Class attendance and participation, evaluation of problems and cases (Moodle assignments) (50% final grade).
- Performance of two written tests, corresponding to the two parts of the syllabus described in section 4.3 (Topics 1-2 and 3-4-5). The tests may combine short open questions and quizzes with multiple choice, matching, true/false questions (50% final grade).

Passing the subject by means of a single global test:

Those students who do not take the continuous evaluation or who want to achieve a higher grade, must take a written test to check that the student has acquired the expected competences of the subject (100% grade).

In the case of having passed the continuous evaluation, students who intend to take the global test must notify the teachers in advance.

6. Sustainable Development Goals

- 4 - Quality Education
- 5 - Gender Equality