

## 26938 - History of Science

### Syllabus Information

**Academic Year:** 2019/20

**Subject:** 26938 - History of Science

**Faculty / School:** 100 -

**Degree:** 447 - Degree in Physics

**ECTS:** 5.0

**Year:** 3

**Semester:** First semester

**Subject Type:** Optional

**Module:** ---

### 1.General information

#### 1.1.Aims of the course

#### 1.2.Context and importance of this course in the degree

#### 1.3.Recommendations to take this course

### 2.Learning goals

#### 2.1.Competences

#### 2.2.Learning goals

#### 2.3.Importance of learning goals

### 3.Assessment (1st and 2nd call)

#### 3.1.Assessment tasks (description of tasks, marking system and assessment criteria)

### 4.Methodology, learning tasks, syllabus and resources

#### 4.1.Methodological overview

The methodology followed in this course is oriented towards the achievement of the learning objectives. It is focused on the application of basic knowledge on historical development of science and technology to case studies based on primary sources. A wide range of teaching and learning tasks are implemented, such as lectures, analyse of cases, autonomous work, study and assessment tasks.

Students are expected to participate actively in class throughout the semester.

Further information regarding the course will be provided on the first day of class.

#### 4.2.Learning tasks

The 5 ECTS course includes the following learning tasks:

1. Lectures on history of science and physics (40 hours).
2. Analysis of primary sources (10 hours).
3. Teacher-guided case studies based on historical scientific texts: writing a team-based assignment (2-3 students/team) explaining events, procedures, ideas, concepts in a historical scientific text, including what happened

and why.

### 4.3.Syllabus

The course will address the following topics:

#### **Topic 1. Science in the Ancient and Medieval World**

1. The Origins of Rational Science: Technology and Philosophy.
2. Materialism and Idealism. The Scientific Legacy of the Classic World: Mathematics, Astronomy and Mechanics.
3. Science in the Middle Ages: Arabic Science. Medieval Science in the Christian West. The Transformation of Feudalism by the new Techniques.

#### **Topic 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. Bacon and Descartes.
3. Science attains Full Age (1650-1690): The development of the new image of the world. The Synthesis of Newton.

#### **Topic 3. 18<sup>th</sup> century: Science in the Age of Enlightenment and the beginning of the Industrial Revolution**

1. Historical context. Scientific activity and dissemination of science.
2. Electricity. Heat. Astronomy and cosmology.
3. The birth of a new chemistry.
4. Physiology and the problem of the origin of life.
5. Natural history. Geology: the discovery of time.

#### **Topic 4. 19<sup>th</sup> 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 interior. Ramón y Cajal: cells in the nervous system.
4. Scientific medicine: Bernard, Helmholtz, and the first law of thermodynamics. Pasteur: the microbial origin of diseases.
5. The development of organic chemistry. 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. Nineteenth century clouds over physics.
8. Spectroscopy and the birth of astrophysics.
9. Analytical mathematics and group theory. New mathematical worlds: non-Euclidean geometry and the concept of infinity.

#### **Topic 5. 20<sup>th</sup> century: ?The century of Science?**

1. Planck and the quantum discontinuity. The structure of the atom and the old quantum theory. Quantum mechanics (1925-1927).
2. Nuclear physics. Elementary particles. The transistor and quantum chemistry.
3. Einstein: special relativity and general relativity.
4. The expansion of the Universe. Wegener and continental drift.
5. Gödel and the limits of mathematics. Computers and experimental mathematics. Fermat's last theorem.
6. The discovery of DNA and the chemistry of life

### 4.4.Course planning and calendar

Further information concerning the timetable, classroom, office hours, assessment dates and other details regarding this course, will be provided on the first day of class or please refer to the Facultad de Ciencias web <https://ciencias.unizar.es/grado-en-fisica-0>

### 4.5.Bibliography and recommended resources