The ideas of science

Academic Year: (2020 / 2021) **Review date: 23/10/2020 09:03:19**

Department assigned to the subject: Physics Department

Coordinating teacher: MELENDEZ SANCHEZ, JUAN

Type: Courses of humanities ECTS Credits : 3.0

Year : Semester :

REQUIREMENTS (SUBJECTS THAT ARE ASSUMED TO BE KNOWN)

No previous studies necessary.

OBJECTIVES

Most introductory science courses are focused on scientific content (making a popular presentation of results). This is interesting, in particular for students of non scientific or technical degrees), but it is not suited to our needs.
As an alternative, courses focused on "Science, Technology and Society have proliferated lately. However, here science is seen "from the outside", with the risk of presenting it as a mere social force.
In order to learn to appreciate the true value of science, there is only one way: to know how it works. And for that, we have to do science.
This course has been built around the questions asked by scientists along the historic course of science, from its prehistory in Greece to its mature configuration, with Newton. We have limited ourselves to a minimum of results (mainly the cosmological ideas and the origin of mechanics), so as to study them in depth and be able to appreciate the continuity of the questions and the theories developed.
Although we cannot repeat experiments or calculations, the goal is that students understand the problems faced by scientists, that they think for themselves, give their own answers and learn to appreciate those given by scientists. In short, to participate in science, using their critical ability to develop an appreciation of its dynamics and structure.
No special prerequisites are required, but the course will be most rewarding for students of scientific and technical qualifications, as it provides a complementary view to that of technical subjects.

DESCRIPTION OF CONTENTS: PROGRAMME

0. Introduction: Understanding science

1. In the beginning it was measure
1.1. The origins of geometry
1.2. Thales of Miletus
1.3. Pyramids and theorems
1.4. Practical and theoretical generalizations
1.5. The size of the Earth
1.6. Aristarchus: Measuring the Moon and the Sun

2. Models of the Sky
2.1. Looking at the sky
2.2. The universe of the two spheres
2.3. The universe of the two spheres as an example of theory
2.4. The universe of Plato and Eudoxus

3. Maps of Earth
3.1. Down to Earth
3.2. Latitude and longitude

4. The World According to Aristotle

4.1. Affinities and oppositions
4.2. The structure of the world
4.3. Horror vacui
4.4. The theory of motion

5. The sky from Aristotle to Copernicus
5.1. The circular dream of epicycles
5.2. The Greek Copernicus
5.3. Hipparchus: the consecration of the old order

6. The paradoxical Copernican revolution
6.1. What really did Copernicus
6.2. The reasons for Copernicus
6.3. Did Copernicus triumph?

7. The Triumph of the Sun
7.1. Tycho Brahe
7.2. Johannes Kepler
7.3. Acceptance of the Kepler system
7.4. What is Astronomy good for? The problem of length

8. Galileo: the first modern scientist
8.1 A new concept of science
8.2 The new science in action: falling bodies
8.3 The law of inertia
8.4 The telescope
8.5 The importance of Galileo

9. Newton: the coming of age of science
9.1 From a genius to another
9.2 The year of the plague
9.3 Everything fits
9.4 Hypotheses non fingo
9.5 The apotheosis of Newton

10. Recap: What is science, then?

LEARNING ACTIVITIES AND METHODOLOGY

Lectures and student participation with questions and discussions.

ASSESSMENT SYSTEM

% end-of-term-examination/test:	30
% of continuous assessment (assigments, laboratory, practicals…):	70

- Attendance and class participation [35% of grade]
- Comments on the web (blog) of the subject [35% of grade]
- Compulsory Exam in the last session. [30% of grade]

BASIC BIBLIOGRAPHY

- Juan Meléndez Sánchez De Tales a Newton: Ciencia para personas inteligentes, Ellago Ediciones, 2013

ADDITIONAL BIBLIOGRAPHY

- BROWN, LLOYD A The story of maps, Dover, 1979

- COHEN, BERNARD L. El nacimiento de una nueva física, Alianza Editorial, 1989

- CROWE, M. J. Theories of the world - From antiquity to the copernican revolution, Dover, 2001

- DRAKE, STILLMAN Galileo, Alianza Editorial, 1991

- GARCÍA HOURCADE, J.L Copérnico y Kepler. La rebelión de los astrónomos, Ed. Nivola, 2000

- HOYLE, FRED De Stonehenge a la cosmología contemporánea. Nicolás Copernico, Alianza Editorial, 1976

- KOESTLER, ARTHUR The sleepwalkers, Arkana Penguin Book, 1989

- KUHN, THOMAS S La revolución copernicana : la astronomía planetaria en el desarrollo del pensamiento occidental, Ariel, 1996

- SAMBURSKY, S El mundo físico de los griegos, Alianza Editorial, 1990

- SOBEL, DAVA Longitud, Debate, 1997

- VV.AA. Las matemáticas en la vida cotidiana, Addison Weley, 1991

BASIC ELECTRONIC RESOURCES

- Juan Meléndez . Blog "De Tales a Newton": https://detalesanewton.wordpress.com/