UAB
Universitat Autònoma de Barcelona

Cosmology and Culture

Code: 106231
ECTS Credits: 6

2024/2025

Degree	Type	Year
2504235 Science, Technology and Humanities	OB	2

Contact

Name: Francesc Xavier Roque Rodriguez

Email: xavier.roque@uab.cat

Teachers

(External) Juan Meléndez Sánchez

Teaching groups languages

You can view this information at the end of this document.

Prerequisites

There are none.

Objectives and Contextualisation

Understand the characteristics of mythical cosmologies and their differences with later cosmologies, elaborated within the philosophical and scientific framework.
Distinguish between the different conceptions of the pre-Socratic philosophers about the origin and ultimate reality of the cosmos.
Be able to explain how the cosmological two-sphere model was arrived at, starting with the rational interpretation of astronomical observations.
Explain the subsequent developments of Greek astronomy, up to Ptolemy's synthesis, and its integration into the Aristotelian conception of the world.
Understand the situation of astronomy at the beginning of the Renaissance, and the role played by Copernicus, Brahe and Kepler in the elaboration of the new heliocentric cosmology.
Appreciate the impact of heliocentrism and the new conception of science that the Scientific Revolution on the culture of the time: how it affected the self-concept of humanity.
Being able to describe the achievements of the two greatest figures of the Scientific Revolution, Galileo and Newton, in the field of science, astronomy, and scientific methodology. Being able to solve basic physics problems by applying their discoveries.
Appreciate the impact of the Newtonian worldview, both in the concept of science and in the conception of the universe. Learn about the main scientists who built the worldview of classical physics throughout the 18th and 19th centuries.

Understand the reasons for the crisis in the worldview of classical physics at the beginning of the 20th century. Distinguish the changes produced by quantum theory and by relativity.
Be able to describe the main results of astronomical observation and their relationship with cosmological models. Appreciate the role of technology (in particular, the evolution of telescopes) in achieving these advances. Qualitatively understand contemporary ideas about the origin, structure and evolution of the universe. Appreciate the effect of these cosmological ideas on humanity's view of itself.

Competences

- Describe the fundamental forces of nature in relation to the configuration of the universe and the structure of matter.
- Identify the various philosophical, ethical and sociological conceptions of science and technology and recognise their evolution throughout history.
- Make critical use of digital tools and interpret specific documentary sources.
- Recognise the political, social and cultural dimension of science and technology development in the different historical periods.
- Students must be capable of communicating information, ideas, problems and solutions to both specialised and non-specialised audiences.
- Work collaboratively in teams.

Learning Outcomes

1. Assess the reliability of sources, select important data and cross-check information.
2. Be aware of the importance of the new telescopes in our present-day conception of the universe.
3. Describe the impact of the latest cosmological models on our conception of the world and of our own role in it.
4. Develop teamworking skills, blend in and actively collaborate in achieving common goals.
5. Present your own scientific results to both professionals and the general public.
6. Recognise the different cosmological models that explain the universe in its entirety and the historical evolution of these models.
7. Recognise the impact of the Ptolemaic and Copernican models on the conception of the role of the human being in the universe.

Content

1. From myth to logos: Thales of Miletus and his time
2. The birth of physical theory: the universe of the two spheres
3. Aristotle's cosmos
4. From antiquity to the modern era: astronomy vs cosmology
5. The Copernican Revolution
6. Galileo: the birth of modern science
7. Newtonian cosmology
8. The universe of classical physics: rise and fall
9. Relativistic cosmology
10. Origin, structure and evolution of the universe: contemporary ideas

Activities and Methodology

Title	Hours	ECTS	Learning Outcomes

Type: Directed			
Learning exercises	16	0.64	1, 2, 3, 4, 5, 6, 7
Lectures	33	1.32	2, 3, 6, 7
Type: Supervised			
Essay supervision	4.25	0.17	1, 4, 5
Type: Autonomous			
Essay writing and personal study	94.75	3.79	1, 2, 3, 4, 6, 7

Lectures.
Cooperative learning.
Text discussion.
Classroom practices.
Essay writing.
Seminars.

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.

Assessment

Continous Assessment Activities

Title	Weighting	Hours	ECTS	Learning Outcomes
Final exam	50%	2	0.08	2, 3, 6, 7
Submission of essays and presentations in class	25%	0	0	1, 4, 5
Tests of short duration, taken during class time	25%	0	0	1, 2, 3, 6, 7

Final exam.
Submission of problems and/or short essays; presentations in class.
Tests of short duration, taken during class time.

If the student commits any type of irregularity that may lead to a significant variation in the grade of an evaluation act, it will be graded 0, regardless of the disciplinary process that may result from it. If several irregularities are verified in the evaluation acts of the same subject, the final grade for this subject will be 0. In addition, those evaluation activities in which irregularities have been detected will not be recoverable.

Single assessment
Students who opt for the single assessment system will have to submit two essays (50%) and take an exam (50%), on the indicated date.

Bibliography

Crowe, M. J. *Theories of the World. From Antiquity to the Copernican Revolution*. New York: Dover, 2001.
Drake, S. *Galileo*. Madrid: Alianza Editorial, 1991.
Elizalde, E. *Cosmología moderna desde sus orígenes*. Madrid: Libros de la Catarata, 2020.
Freely, J. *La llama de Mileto: El nacimiento de la ciencia en la Antigua Grecia*. Madrid: Alianza Editorial, 2021.
García Hourcade, J. L. *Copérnico y Kepler. La rebelión de los astrónomos*. Madrid: Nivola, 2000.
Koestler, A. *Los sonámbulos*. Santiago de Chile: Hueders, 2017.
Kuhn, Thomas S. *La revolución copernicana: la astronomía planetaria en el desarrollo del pensamiento occidental.* Barcelona: Ariel, 1996 .
Meléndez, J. *De Tales a Newton: ciencia para personas inteligentes*. Pontevedra: Ellago, 2013.
Ordóñez, J.; Navarro, V.; Sánchez Ron, J. M. *Historia de la ciencia*. Madrid: Espasa, 2013.
Rioja, A.; Ordóñez, J. *Teorías del Universo. Vol. I: De los pitagóricos a Galileo*. Madrid: Síntesis, 1999.
Rioja, A.; Ordóñez, J. *Teorías del Universo. Vol. II: De Galileo a Newton*. Madrid: Síntesis, 1999.
Rioja, A.; Ordóñez, J. *Teorías del Universo. Vol. III: De Newton a Hubble*. Madrid: Síntesis, 2006.
Rossi, P. *El nacimiento de la ciencia moderna en Europa*. Barcelona: Crítica, 1998.
Sambursky, S. *El mundo físico de los griegos*. Madrid: Alianza Editorial, 1990.

Additional references

Arana, J. *Materia, universo, vida*. Madrid: Tecnos, 2001.
Butterfield, H. *Los orígenes de la ciencia moderna*. Madrid: Tecnos, 2019.
Cohen, Bernard L. *Los orígenesde la ciencia moderna*. Madrid: Alianza Editorial, 1989.
Geroch, R. *La relatividad general: de la A a la B*. Madrid: Alianza Editorial, 1989.
Sobel, Dava. *Longitud*. Barcelona: Debate, 1997.
Westfall, R. S. *La construcciónde la ciencia moderna*. Barcelona: Labor, 1980.
Wootton, D. *La invención de la ciencia: Una nueva historia de la Revolución Científica*. Barcelona: Crítica, 2020.

Software

No specific software is required.

Language list

Information on the teaching languages can be checked on the CONTENTS section of the guide.