

The Origins of Modern Science

Code: 42284
ECTS Credits: 15

Degree	Type	Year	Semester
4313223 History of Science: Science, History and Society	OT	0	2

The proposed teaching and assessment methodology that appear in the guide may be subject to changes as a result of the restrictions to face-to-face class attendance imposed by the health authorities.

Contact

Name: Carlos Tabernero Holgado
Email: Carlos.Tabernero@uab.cat

Use of Languages

Principal working language: catalan (cat)

Teachers

Xavier Roqué Rodríguez
Miquel Forcada
Josep Casulleras
Montserrat Díaz

Prerequisites

Those of the master in general.

Objectives and Contextualisation

The overall objective is to identify the elements that characterize multicultural premodern science, as well as those

Competences

- "Recognise, evaluate and catalogue the scientific and technical heritage (this competence is acquired by students who take the specialisation ""Communication, Heritage and History of Science"")."
- Apply this discipline's own analysis methods and techniques in the construction of various historical narratives.
- Develop an original, interdisciplinary historical narrative that integrates humanistic and scientific culture.
- Display a sound knowledge of history so as to pinpoint the great events of the past with accuracy: authors, theories, experiments, practices, etc., and their stages of stability and transformation.
- Display rigorous, advanced knowledge of the evolution of science throughout history.
- Gather and critically assess information for problem solving, in accordance with the discipline's own analysis methods and techniques.
- Interpret, comment on and edit scientific texts on science's past and place them rigorously within their historical context.
- Use acquired knowledge as a basis for originality in the application of ideas, often in a research context.
- Use information and communication technologies appropriately in research and in professional activity.
- Work in interdisciplinary teams, showing leadership and initiative.

- Work independently: solving problems, taking decisions and making innovative proposals.

Learning Outcomes

1. Ascribe medieval astronomical instruments to their historical period and their political, social, cultural and technological environment.
2. Assess the processes of transmission and transformation of medicine and the natural sciences in Arab-Islamic civilisation and their contribution to European scientific development.
3. Contextualise and scientifically exploit the various primary sources.
4. Critically apply knowledge of secondary sources and documentation strategies.
5. Describe what medieval doctors and naturalists knew and how they reasoned and acted, and know the institutions in which they conducted their activity.
6. Explain the (conceptual, technological and artistic) origin and evolution of medieval astronomical instruments.
7. Explain the fundamental aspects of the relationships between science, philosophy and religion in the 17th century.
8. Explain the institutional and scientific role of the medieval Islamic observatories, and the names and contributions of the most significant Arabic astronomers.
9. Formulate a narrative for presenting and communicating.
10. Formulate detailed critical syntheses of complex topics within the thematic area of the module.
11. Gather and critically assess information for problem solving, in accordance with the discipline's own analysis methods and techniques.
12. Identify and distinguish fundamental aspects of the problem areas in natural philosophy in the 17th century, such as matter and activity, mechanical philosophy and mechanistic science, mechanical philosophy and experimental philosophy, and the relationship of God with the mechanical universe.
13. Identify and distinguish the different relevant contexts and their relations in the trial of Galileo.
14. Identify and distinguish the main elements of the two great moments in the trial of Galileo (1610-1616 and 1623-1633).
15. Identify and distinguish the multicultural elements belonging to premodern science.
16. Organise and manage information on the origins of modern science.
17. Present one's own ideas orally and in writing.
18. Recognise the essential elements of the history of medieval science, especially astronomy and medical and natural sciences.
19. Recognise the role of astrology and the Islamic religion in the development of Arabic astronomy.
20. Recognise the typological morphology that identifies the different Arabic astronomical instruments and their connections to subsequent European instruments.
21. Understand and contextualise the secondary literature on the theme of the module.
22. Use acquired knowledge as a basis for originality in the application of ideas, often in a research context.
23. Use information and communication technologies appropriately in research and in professional activity.
24. Work in interdisciplinary teams, showing leadership and initiative.
25. Work independently: solving problems, taking decisions and making innovative proposals.

Content

Presentation

Location: UB Faculty of Philology

Block 1a. Medieval and Arabic Science: Natural and Medical Sciences

Location: UB Faculty of Philology, Mondays 15-18.30 h

1. The acculturation of the classical scientific legacy
2. The acculturation of the classical scientific legacy: the natural and medical sciences
3. The development of medical manuals
4. The case of al-Andalus: the beginnings of the scientific tradition (ss. IX-XI)
5. Al-Andalus: the natural and medical sciences s.XI

6. Al-Andalus: medical sciences, natural and following the ss.XII
7. Influence of Islamic medicine and the natural sciences in Europe
8. An overview of medicine and the natural sciences in the Islamic world

Block 1b. Medieval and Arabic Science: Astronomy and astrology mathematics

Location: UB Faculty of Philology, Fridays 15-18.30 h

1. Astronomy, Astrology and Islam
2. The astronomers' activity: practical problems and theoretical research
3. Construction and use of the astrolabe, a medieval computer
4. Applied astronomy: geography and geodesy, orientation, time keeping,

5. The three fundamental practices of the horoscope: aspects, houses and progressions

6. Authors, methods and attributions in astrology
7. The astrolabe in astrology
8. The other tools of the astrologer: tables and calculations

Block 2 Aspects of Scientific Revolution

Location: Faculty of UB, Mondays and Fridays 15-18.30 h

1. Science and the Renaissance
2. Medicine and astrology in the XVI and XVII centuries
3. The astronomical revolution: Copernicus to Galileo

4. The new science of motion

5. The experimental philosophy

6. The mechanical philosophy

7. The Newtonian synthesis

8. Chemistry and the Scientific Revolution

Final synthesis session

Methodology

The course is organized into two parts that cover the medieval period and the Scientific Revolution, respectively.

Activities

Title	Hours	ECTS	Learning Outcomes
Type: Directed			
Lectures	90	3.6	21, 3, 5, 10, 8, 7, 6, 12, 13, 15, 14, 1, 11, 19, 18, 20, 22, 24, 23, 2
Type: Autonomous			
Readings and essays	275	11	4, 21, 3, 5, 10, 9, 8, 7, 17, 12, 13, 15, 14, 16, 11, 19, 18, 20, 25, 23, 2

Assessment

Continuous evaluation

-Assistance and active participation in the carrying out of exercises and in the discussion in the classroom of the proposed readings; weight: 30%.

-Block 1a: presentation of essay; weight: 20%.

-Block 1b: solving exercises; weight: 20%.

-Block 2: two reviews of two articles; weight: 30%.

Review of qualifications

Each teacher will indicate to the students the specific dates for reviewing the corresponding grades in their blog.

Reevaluation

Submission of a corrected version of evaluation activities not passed. The reassessment will take place in July for the modules of the second semester.

In the event that activities and tests or exams cannot be taken onsite, they will be adapted to an online format made available through the UAB's virtual tools (original weighting will be maintained). Homework, activities and class participation will be carried out through forums, wikis and/or discussion on TEAMS, etc. Lecturers will ensure that students are able to access these virtual tools, or will offer them feasible alternatives.

Assessment Activities

Title	Weighting	Hours	ECTS	Learning Outcomes
-------	-----------	-------	------	-------------------

Continued assistance and participation in the classroom	30 %	3	0.12	4, 21, 3, 5, 10, 9, 8, 7, 6, 17, 12, 13, 15, 14, 1, 16, 11, 19, 18, 20, 22, 24, 23, 2
Essay review part 1a	20 %	2	0.08	9, 11, 22, 25, 23
Exercises part 1b	20 %	2	0.08	9, 11, 22, 25, 23
Two essays part 2	30 %	3	0.12	9, 11, 22, 25, 23

Bibliography

Part 1

ALVAREZ DE MORALES, C. & MOLINA, E. (eds.): *La medicina en al-Andalus*, Fundación El Legado Andalusi, Granada, 1999.

BOLENS, L. : *Agronomes andalous du Moyen-Age*, Droz, Ginebra-París, 1981.

CASULLERAS, J. *La astrología de los matemáticos*, Barcelona, 2010.

CASULLERAS, J. & HOGENDIJK, H. «Progressions, rays and houses in medieval Islamic astrology: A mathematical classification», *Suhayl* 11 (Barcelona, 2012), pp. 33-102.

GARCÍA SÁNCHEZ, E. & ALVAREZ DE MORALES, C. (eds.): *Ciencias de la Naturaleza en al-Andalus. Textos y Estudios* (1990 i ss., diversos vols.).

GLICK, Th. et al. (eds.): *Medieval Science Technology and Medecine. An Encyclopedia*, Routledge, Nova York et al., 2005.

GUTAS, D. *Greek Thought, Arabic Culture*, London-New York, 1998

GUNTHER, R. *The Astrolabes of the World*. Oxford, 1932.

KENNEDY, E.S. *Studies in the Islamic Exact Sciences*. Beirut, 1983.

KING, D. (1987). *Islamic Astronomical Instruments*. London: Variorum Reprints, 1987.

LIROLA, J. & PUERTA VÍLCHEZ, J.M. (eds.): *Biblioteca de al-Andalus*, Fundación Ibn Tufayl, Almería (2004 i ss., diversos vols).

MICHEL, H. *Traité de l'astrolabe*. Paris, 1947.

NORTH, J. *Horoscopes and History*, London, 1986.

POULLE, E. *Les instruments astronomiques du Moyen Age*. Paris, 1983.

PORMANN, P.E. & SAVAGE-SMITH, E. *Medieval Islamic Medicine*, Edinburgh U.P., 2007.

RASHED, R. (ed.): *Encyclopedia of the History of Arabic Science*, 3 vols. London & New York, 1996.

SALIBA, G. *Islamic Science and the Making of the European Renaissance*, MIT Press, Cambridge, Mass., and London, 2007.

SAMSO, J.: *Las Ciencias de los Antiguos en al-Andalus*, Madrid, 1992.

SAYILI, A. *The Observatory in Islam*. Ankara, 1988, 2a.ed.

ULLMANN, M.: *Die Medizin im Islam*, E.J. Brill, Leiden et al., 1970; *Die Natur un Geheimwissenschaften im Islam*, Leiden et al., Brill, 1972.

VERNET, J.: *La cultura hispanoárabe en Oriente y Occidente*, Barcelona, 1978 (Reedició amb el títol *Lo que la cultura europea debe a los árabes de España*, Barcelona, 1999).

CATÀLEGS: *Instrumentos astronómicos en la España medieval* (1985) i *El legado científico andalusí* (1992).

Part 2

Beltrán, A., *Revolución científica, Renacimiento e historia de la ciencia*. Madrid: Siglo XXI, 1995.

Biagioli, M., *Galileo Courtier. The Practice of Science in the Culture of Absolutism*. Chicago: The University of Chicago Press, 1993.

Clavelin, M., *La philosophie naturelle de Galilée*. París: Albin Michel, 1996.

Cohen, H. F., *The Scientific Revolution. A Historiographical Inquiry*. Chicago: The University of Chicago Press, 1994.

Cohen, I. B., *La revolución newtoniana y la transformación de las ideas científicas*. Madrid: Alianza Editorial, 1983.

Dear, P., *La revolución de las ciencias. El conocimiento europeo y sus expectativas, 1500-1700*. Madrid: Marcial Pons, 2007.

Hall, A. R., *La Revolución Científica. 1500-1750*. Barcelona: Crítica, 1985.

Henry, J., *The Scientific Revolution and the Origins of Modern Science*. Londres: Macmillan, 2008.

Hetherington, N. S. (ed.), *Cosmology. Historical, Literary, Philosophical, Religious, and Scientific Perspectives*. Nueva York y Londres: Garland, 1993.

Kuhn, T. S., *La revolución copernicana*. Barcelona: Ariel, 1978.

Sellés, M., y Solís, C., *La Revolución científica*. Madrid: Síntesis, 1991.

Shapin, S., *La Revolución Científica. Una interpretación alternativa*. Barcelona: Paidós, 2000.

Shapin, S., y Schaffer, S., *Leviathan and the Air-Pump. Hobbes, Boyle and the Experimental Life*. Princeton: Princeton University Press, 1985.

Shea, W., *La magia de los números y el movimiento. La carrera científica de Descartes*. Madrid: Alianza Editorial, 1993.

Westfall, R. S., *Never at Rest. A Biography of Isaac Newton*. Cambridge: Cambridge University Press, 1980.

Westfall, R. S., *La construcción de la ciencia moderna. Mecanismo y mecánica*. Barcelona: Labor, 1980.