Last update: 19-04-2018

205071 - Introduction to Planetary Atmospheres

Coordinating unit: 205 - ESEIAAT - Terrassa School of Industrial, Aerospace and Audiovisual Engineering

Teaching unit: 748 - FIS - Department of Physics

Academic year: 2018

Degree: MASTER'S DEGREE IN AERONAUTICAL ENGINEERING (Syllabus 2014). (Teaching unit Optional)
MASTER'S DEGREE IN SPACE AND AERONAUTICAL ENGINEERING (Syllabus 2016). (Teaching unit Optional)

ECTS credits: 3 Teaching languages: English

Teaching staff

Coordinator: ENRIQUE GARCÍA MELENDO

Prior skills

During the lessons, students will need a background on basic physics (fluid mechanics, black body radiation, spectroscopy, astronomy).

Teaching methodology

The course is divided into parts:
- Theory classes.
- Self-study for assimilating concepts and doing the final assignment.

During the theory classes, the teacher will introduce the theoretical concepts, methods and results.
During the self-study hours students will need to work on the materials provided by the teacher in order to fix and assimilate the concepts.
The final assignment will require from the students to work on groups and to manage their time in order to develop a project.

Learning objectives of the subject

In space missions it is important to have a knowledge of environments found when exploring other planets, specially those with an atmosphere. For this reason in this course we will focus on the diverse solar system atmospheres found in other worlds, including a wide variety of diverse phenomena.
Some of the main goals are:
- Have a basic knowledge of some of the essential mechanisms of Earth's atmosphere considering it as a global system and its application to other planets.
- Have a basic knowledge of the atmospheres of terrestrial planets.
- Have a basic knowledge of the atmospheres of the giant planets and some unique meteorologic phenomena related to them.
- Analyze basic planetary data to experimentally illustrate phenomena found in planetary atmospheres.

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Study load

Total learning time: 75h	Hours large group:	27h	36.00%
	Hours medium group:	0h	0.00%
	Hours small group:	0h	0.00%
	Guided activities:	0h	0.00%
	Self study:	48h	64.00%

Content

INTRODUCTION TO THE SOLAR SYSTEM

Learning time: 6h

Theory classes: 2h
Self study : 4h

Description:
General view of the structure of our Solar System and the main properties of planets and satellites.

TERRESTRIAL PLANETS

Learning time: 40h

Theory classes: 15h
Self study : 25h

Description:
We begin with the Earth's atmosphere structure, its radiative equilibrium and greenhouse effect, global circulation and important related phenomena, clouds, etc. Most of these aspects are also reviewed for the rest of the terrestrial planets, following with the atmospheres of Venus and Mars. The atmosphere of Titan is also considered.

THE GIANT PLANETS

Learning time: 29h

Theory classes: 10h
Self study : 19h

Description:
Review of the atmospheres of the giant gas planets, Jupiter and Saturn, and the icy giants Uranus and Neptune. We will see some relevant phenomena such as the general circulation, giant convectice storms, waves, vortices, clouds, etc.

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Qualification system

Attendance to classes and participation in practical exercises will be a 40% of the total grade. 60% of the rest of the grade will depend on a class presentation and a document on a topic related to the subject of the course.

Any student who does not have a satisfactory grade, will have the opportunity to take an additional global exam that will take place the date fixed in the calendar of final exams. The grade obtained in this test will range between 0 and 10, and will replace that of the previous tests only in case it is higher.

Bibliography

Basic:

Taylor, F. W. Planetary atmospheres. Oxford: Oxford University Press, 2010. ISBN 9780199547418.

Ingersoll, Andrew P. Planetary climates. Princeton, New Jersey: Pricenton University Press, 2013. ISBN 9780691145051.

Randall, David A. Atmosphere, clouds, and climate. Princenton, New Jersey: Princeton University Press, 2012. ISBN 9780691143750.

Sánchez-Lavega, Agustín. An introduction to planetary atmospheres. Boca Raton: CRC Press/Taylor & Francis, 2011. ISBN 9781420067323.

Wallace, J.M.; Hobbs, P.V. Atmospheric science: an introductory survey [on line]. 2nd ed. Burlington, Mass.: Elsevier Academic Press, cop. 2006 [Consultation: 17/04/2018]. Available on: <https://www.sciencedirect.com/science/book/9780127329512>. ISBN 9780127329512.

Complementary:

De Pater, Imke; Lissauer, Jack J. Planetary sciences. Updated 2nd ed. Cambridge: Cambridge University Press, 2015. ISBN 9781107091610.

Salby, Murry L. Fundamentals of atmospheric physics. San Diego: Academic Press, 1996. ISBN 0126151601.