Course guide
205071 - 205071 - Introduction to Planetary Atmospheres

Last modified: 22/04/2021

Unit in charge: Terrassa School of Industrial, Aerospace and Audiovisual Engineering
Teaching unit: 748 - FIS - Department of Physics.

Degree: **Academic year:** 2021 **ECTS Credits:** 3.0
Languages: English

LECTURER

Coordinating lecturer: ENRIQUE GARCÍA MELENDO

Others:

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.

STUDY LOAD

Type	Hours	Percentage
Self study	48,0	64.00
Hours large group	27,0	36.00

Total learning time: 75 h

CONTENTS

INTRODUCTION TO THE SOLAR SYSTEM

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

Full-or-part-time: 6h
Theory classes: 2h
Self study : 4h

TERRESTRIAL PLANETS

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.

Full-or-part-time: 40h
Theory classes: 15h
Self study : 25h

THE GIANT PLANETS

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.

Full-or-part-time: 29h
Theory classes: 10h
Self study : 19h

GRADING 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.