Universitat Autònoma de Barcelona

Stellar and Planetary Astrophysics 2016/2017

Code: 42857
ECTS Credits: 9

Degree	Type	Year	Semester
4313861 High Energy Physics, Astrophysics and Cosmology	OT	0	1

Contact

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Use of languages

Principal working language: english (eng)

External teachers

Aldo Serenelli

Josep Maria Trigo

Josep Miquel Girart

Prerequisites

It is assumed that students have a basic knowledge of Mechanics, Classic and Quantum, Thermodynamics, Statistical Mechanics and Atomic and Nuclear Physics. Several specific aspects, like energy transport, will be introduced during lectures.

Objectives and Contextualisation

The goal of this module is to provide the basic knowledge on two funfamental branches of Modern Astrophysics: structure and evolution of stars and structure and evolution of planets and planetary systems.

Skills

- Apply the main principles to specific areas such as particle physics, astrophysics of stars, planets and galaxies, cosmology and physics beyond the Standard Model.
- Formulate and tackle problems, both open and more defined, identifying the most relevant principles and using approaches where necessary to reach a solution, which should be presented with an explanation of the suppositions and approaches.
- Understand the bases of advanced topics selected at the frontier of high energy physics, astrophysics and cosmology and apply them consistently.
- Use acquired knowledge as a basis for originality in the application of ideas, often in a research context.
- Use critical reasoning, analytical capacity and the correct technical language and formulate logical arguments.

Learning outcomes

1. Calculate the evolution of a star type.
2. Make a detailed analysis of the evolution of compact binary systems.
3. Recognise the different states of stellar evolution.
4. Understand the basics of stellar and planetary astrophysics.

5. Understand the interior details of the sun.
6. Understand the mechanisms of the formation of planetary systems.
7. Understand the processes of star formation.

Content

- Fundamental properties of stars
- Stellar atmospheres
- Stellar interiors
- Interstellar medioum and star formation
- Stellar evolution
- Evolution of binary systems
- Variable stars
- The Sun
- The Solar System
- Extrasolar planetary systems

Methodology

Theory Lectures and Exercises

Classwork and Homework

Activities

Title	Hours	ECTS	Learning outcomes
Type: Directed			
Theory Lectures	60	2.4	1, 2, 3, 4, 5, 6, 7
Type: Autonomous			
Discussions, Work Groups, Group Exercises	70	2.8	1, 2, 3, 4, 5, 6, 7
Study of the Theoretical Foundations	70	2.8	1, 2, 3, 4, 5, 6, 7

Evaluation

One exam and one homework for each one of the three main parts of the module: stars, planets and interstellar medium.

Evaluation activities

Title	Weighting	Hours	ECTS	Learning outcomes
Exam on Interstellar Medium and Star Formation	5	1	0.04	7
Exam on Planets and Planetary Systems	15	1.5	0.06	4, 6
Exam on Structure and Evolution of Stars	40	2.5	0.1	1, 2, 3, 4, 5
Homework	40	20	0.8	1, 2, 3, 4, 5, 6, 7

Bibliography

Physics, formation and evolution of rotating stars. A. Maeder. Springer

Stellar interiors. Physical principles, structure and evolution. C. J. Hansen & S. D. Kawaler. Springer-Verlag

The physics of stars. A. C. Phillips. John Wiley & Sons