

## SUBJECT TEACHING GUIDE

M1999 - Extragalactic Astrophysics

Master's Degree in Particle Physics and the Cosmos

Academic year 2022-2023

1. IDENTIFYING DATA					
Degree	Master's Degree in Particle Physics and the Cosmos			Type and Year	Optional. Year 1
Faculty	Faculty of Sciences				
Discipline	SPECIALIZATION IN PHYSICS OF THE COSMOS Specialisation Module				
Course unit title and code	M1999 - Extragalactic Astrophysics				
Number of ECTS credits allocated	6	Term	Semester based (1)		
Web	<a href="https://aulavirtual.unican.es/">https://aulavirtual.unican.es/</a>				
Language of instruction	Spanish	English Friendly	Yes	Mode of delivery	Face-to-face

Department	DPTO. FISICA MODERNA				
Name of lecturer	LUIS JULIAN GOICOECHEA SANTAMARIA				
E-mail	luis.goicoechea@unican.es				
Office	Facultad de Ciencias. Planta: + 1. DESPACHO PROFESORES (1020)				
Other lecturers	FRANCISCO JESUS CARRERA TROYANO SILVIA MATEOS IBAÑEZ				

3.1 LEARNING OUTCOMES
- Understand the stellar evolution and nucleosynthesis
- Know the content of galaxies, and understand the relationship between morphology and physical properties
- Learn about procedures to determine properties of galaxies
- Understand the formation and evolution of galaxies
- Differentiate between normal and active galaxies, recognising the galaxies with active nucleus and understanding the physics involved
- Be able to obtain information on a specific topic in the literature, analyse data, perform calculations, draw conclusions and present the corresponding report

#### 4. OBJECTIVES

Learn procedures for obtaining information in Astrophysics

That the student recognises the decisive role that stellar evolution plays in the chemical enrichment of galaxies and their passive evolution, as well as the gravitational effects that give rise to star formation and evolution, the formation and evolution of galaxies, collisions and mergers between galaxies, galaxy cluster formation, rotation curves, central motions of stars and gas, gravitational lens effects at different scales, etc.

Know the structure, formation and evolution of the Milky Way, galaxies with different morphologies, groups and galaxy clusters

That the student acquires a wide knowledge of the Physics and properties of active galactic nuclei

#### 6. COURSE ORGANIZATION

##### CONTENTS

1	Radiation detection
2	Stellar evolution and nucleosynthesis
3	Gravity in galaxies: effects on stars, gas and radiation
4	The Milky Way
5	Spiral and lenticular galaxies
6	Elliptical galaxies
7	Formation and evolution of galaxies
8	Active galactic nuclei (AGNs)
9	AGNs: variability and intervening systems
10	Groups and clusters of galaxies

## 7. ASSESSMENT METHODS AND CRITERIA

Description	Type	Final Eval.	Reassessn	%
Follow-up of face-to-face activities	Others	No	No	10,00
Assessment of lab reports and written works	Work	No	Yes	75,00
Evaluation of oral presentations	Others	No	No	15,00
<b>TOTAL</b>				<b>100,00</b>
<b>Observations</b>				
<p>In the lab reports and written works, the inclusion of text copied directly from the Internet or other sources, without having been cited explicitly, will be considered plagiarism. The UC evaluation rules will be applied in such cases. Although there is no minimum grade for reports, written works and oral presentations, in order to pass the subject, the student must submit reports corresponding to all laboratory sessions and to all his/her work assignments, and must make the oral presentation planned. During the lab sessions and execution of works, the student can consult his/her doubts to the corresponding lecturer, who will give him/her the appropriate indications. After the submission of each report/work, this will be graded and commented by the lecturer. In case a student does not pass the subject during the continuous evaluation process, he/she can present revised reports/works at the end of the semester. In this case, since the revision is guided by a lecturer (it would be based on comments about initial reports/works), the maximum mark in each report/work would be 5.0 out of 10</p>				
<b>Observations for part-time students</b>				
<p>It will be set a lab and presentations schedule that allows the attendance of all students enrolled (full and part time). We will also facilitate learning and follow-up of the subject by part-time students, through the availability of notes, problems, etc. in the virtual classroom (UC Moodle platform)</p>				

## 8. BIBLIOGRAPHY AND TEACHING MATERIALS

### BASIC

Galaxies in the Universe, L.S. Sparke & J.S. Gallagher (2007) Cambridge University Press

Galactic Astronomy, J. Binney & M. Merrifield (1998) Princeton University Press