PHYS-730

Cosmology: Dark and Luminous Matters

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Cursus	Sem.	Type
Physics		Obl.

Language of teaching	English
Credits	4
Session	
Exam	Oral
Workload	120h
Hours	**56**
Courses	56
Number of positions	

Frequency

Every year

Remark

Every year / Fall and Spring

Summary

Two of the most important problems in modern astrophyiscs and cosmology are (i) galaxy formation and their evolution with time and (ii) the study of the distribution and the nature of dark matter and dark energy in the Universe.

Content

A) Gravitational Lensing as a Tool for Astrophysics and Cosmology

1. Phenomenology and history
2. Basic equations
3. Multiple images, Fermat's principle, magnification, time delays
4. Quasar lensing
5. Lensing by individual galaxies: dark matter and substructures
6. Microlensing by stars
7. Extragalactic microlensing
8. Microlensing searches for exoplanets
9. Lensing by galaxy clusters
10. Gravitational lensing as a natural telescope
11. Weak gravitational lensing: principles and applications
12. Weak gravitational lensing: detection and analysis methods
13. Weak lensing by large scale structures
14. Gravitational lensing and cosmology : a bright future

B) Galaxy Evolution : Stellar Populations and Cosmology

1. The different classes of galaxies and their components
2. Evolution of morphologies
3. Basic equations of chemical evolu-tion
4. The star formation rate
5. The initial mass function
6. First stars
7. The chemical abundances
8. Integrated stellar populations
9. Resolved stellar populations
10. The first galaxies
11. Stellar populations and dynamical models
12. Popula-tion synthesis
13. Chemo-dynamical simulations
14. Large structures of the Universe

Note

slides and exercises

Keywords

cosmology; astrophysics; galaxies; gravitational lensing; stellar population; dark matter

Learning Prerequisites

Recommended courses

master in astrophysics or physics

Resources

Websites

- http://lastro.epfl.ch