# Universo Primitivo
## 2018-2019 (1º Semestre)

### Mestrado em Física – Astrofísica e Cosmologia

## Universo Primitivo

DOCENTE:

**Prof. António da Silva** (ajosilva@ciencias.ul.pt, gab. 8.1.42):
Teórica: T11
Tutorial: TP11;

RECURSOS:

**Fenix:** https://fenix.ciencias.ulisboa.pt/courses/up-1128979398395741
**Moodle:** migration to Fenix…

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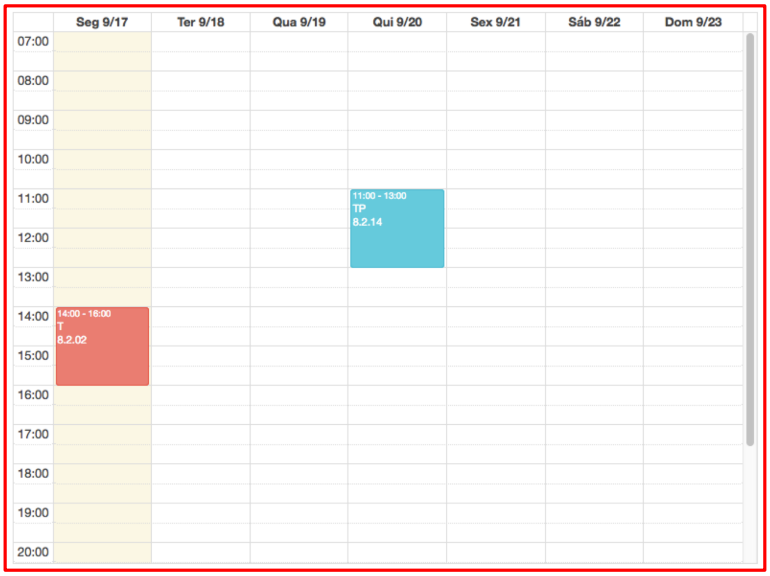
## HORÁRIO



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## OBJECTIVES

**Study of the physics of the Primordial Universe** in the context of the Standard Model of Cosmology – the Hot **Big-Bang theory**. The students will learn about the key ideas of the model and are expected to acquire knowledge that will allow them apply these ideas to solve applied problems related with the physics of the primordial universe, Cosmology and Astroparticle physics.

The “teórico-práticas” lectures will be given, as much as possible, in a “tutorial regime” where the students can interact with the lecturer and colleagues to solve the proposed exercise sheets and discuss questions they may have in their individual studies of the course topics”.

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## PROGRAMA

1. The observed Universe
2. The Standard Model of Cosmology
3. Thermodynamics in a expanding Universe
4. Neutrino Decoupling
5. Dark Matter and WIMP relics
6. Big-Bang Nucleosynthesis
7. Recombination and CMB decoupling
8. Baryogenesis
9. The theory of Inflation
10. Perturbation theory during inflation
11. Evolution of perturbations after inflation
12. Dark Energy



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## BIBLIOGRAFIA

PRINCIPAL:


- Edward Kolb and Michael Turner -'The early universe' - Addison Wesley 1990.
- Patrick Peter and Jean-Philippe Uzan, "Primordial Cosmology", Oxford U. Press, 2009;
- Scott Dodelson -'Modern Cosmology' - Academic Press, Elsevier, 2003;
- Daniel Boumann, Cosmology, Part III Mathematical Tripos, Course Lectures


Other:


- A. Liddle and D. Lyth - 'Cosmological inflation and large-scale structure' - CUP 200
- Barbara Ryden - "Introduction to Cosmology" - Addison Wesley, 2003
- Inflation and the theory of Cosmological Perturbations, A. Riotto, Lectures on Astroparticle , Physics and Cosmology

## EVALUATION

Final grades will be computed as a weighted score of the grades obtained by the student in the following proposed activities:

- **Exercise sheets** (40%);
- Individual research work (50%) on a topic (chosen from a proposed list or an accepted topic proposed by the student). This research work has two component:
  - ***Written article*** (25%): to be submitted electronically (using a latex based platform such as Overleaf – Gdocs is to be avoided as much as possible) for the book of "proceedings" of the Primordial Universe 2018/19 course)
  - ***Presentation*** (25%): Maximum duration is 40 minutes.
- "**Continuous assessment**" (10 %): e.g., participation in the discussion of topics in the theoretical and practical lectures