

4300430: Introdução à Cosmologia Física

Course Information

The purpose of this course is to introduce you to Astrophysics and Cosmology through the discussion of important physical concepts in these areas. The course also aims at preparing you for *research work* on this topic, which may range from theoretical work to analysis of observed data, and the phenomenology connecting both. We will focus both on the foundations, as well as on a few more advanced topics and recent developments.

Instructor: Marcos Lima, mlima@if.usp.br

Website: www.fma.if.usp.br/~mlima + click "Teaching" + "Introdução à Cosmologia"

Meetings: Tuesdays (16 hrs) and Thursdays (14 hrs), Ala II Room: 208.

Monitor: Rodrigo Voivodic, rodrigo.voivodic@usp.br

Office hours: TBA.

There will **not** be make-up class for lectures which are undelivered due to "student strikes".

References:

- Main text: Dodelson, *Modern Cosmology*.
- Other references:
 - Ryden, *Introduction to Cosmology*
 - Weinberg, *Gravitation & Cosmology* and *Cosmology*,
 - Peacock, *Cosmological Physics*,
 - Kolb & Turner, *The Early Universe*,
 - Peebles, *Principles of Physical Cosmology* and *Large-Scale Structure of the Universe*,
 - Little & Lyth, *Cosmological Inflation and Large Scale Structure*,
 - Mukhanov, *Physical Foundations of Cosmology*,
 - Padmanabhan, *Structure Formation in the Universe*,
 - Amendola & Tsujikawa, *Dark Energy: Theory and Observations*.
- Lecture Notes will also be provided throughout the course.
- Given that Cosmology is a topic of active research, all material used in this course is in English. It is extremely important that you master English (writing, reading, speaking) if you wish to pursue a research career, not only in Physics, but on on any area of Science.

Grades:

Your grade will be based on roughly weekly Problem Sets (50%) and a Final Project (50%) on a topic chosen from a list. Some rules:

- The Problem Set must be returned to me directly on the *due date* at the end of class. No excuse will be accepted for returning homework late. Late homework will be

accepted but will have 1.0 point discounted for each late day, up to a maximum of 3 days, after which the homework will not be accepted. If you return your solutions on the due date, but after class time, you must send it to me by e-mail (either a LaTeX generated pdf or a scanned pdf); failing to do so will count as one day late.

- Some problems will require numerical calculations in a programming language of your choice. Prepare yourself: if you don't now how to code, you will have to learn fast.
- Since the idea is to prepare you for professional work on Cosmology, if you write your Problem Set Solutions in English, you get an extra 0.5 point in each set.
- If you type your Problem Set in LaTeX (electronic format) you get an extra 0.5 point in each set.
- You may discuss the Problem Set with other people, but make sure you write your own numerical programs, and that you understand and write your own solution to each problem. Copying someone else's work is regarded as very dishonest. If it is detected that you **copied** someone else's Problem Set, you will **automatically fail** the course.
- From all 10 Problem Set grades, the *lowest grade* will be *disregarded* when computing your average grade, which will then be based on your 9 highest grades. So in principle you may choose not to return one Problem Set, with no effect on your final grade.
- If you fail to hand in more than 2 Problem Sets due to academic or medical reasons, you may be eligible to hand in a Problem Set "substitutiva". Since you have many days to do a Problem Set, for a valid excuse, your reason for not handing it in must extend for at least 3 days in a week (for weekly PSs) or 6 days in a week (for bi-weekly PSs). If you take the "substitutiva", it will *necessarily* replace your 3 lowest Problem Set grades, i.e. $1/3$ of your Problem Set grade.
- The Final Project will consist of an individual Final Paper and a group Final Presentation given at the end of the semester.
- You may discuss your Final Project with other people that have similar topics, but you must write yourself every word in your Final Paper.
- In the Final Presentation, your group will be evaluated for the content of your talk, and also for its ability to communicate and compress ideas properly in the appropriate time. You should practice your talk many times before the actual presentation.

Final Project: See details and ideas for topics in separate sheet.

Course Schedule: See rough tentative schedule in separate sheet.

Recuperação: We may schedule a make-up exam in December to replace your grades from either your Problem Sets or your Final Project (whichever is lowest), but not both.