

Course title:

Observational Cosmology

Duration [number of hours]: 12

PhD Program [MERC/MPS/SPACE]: SPACE

Name and Contact Details of Unit Organizer:

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Course Description [max 150 words]:

This course aims to apply the elements studied in the previous course *Introduction to Cosmology* (Prof. Matarrese), by calculating the observational predictions of the theory in order to compare it with observational data. I will introduce the programs currently most widely used for this purpose, and in particular I will focus on CosmoMC program, a Fortran Markov-Chain Monte-Carlo (MCMC) engine for exploring cosmological parameters space. It uses CAMB (Code for Anisotropies in the Microwave Background) to solve the equations of Einstein-Boltzmann and obtain theoretical predictions. I will explain the many functionalities of CAMB and we will resolve several classroom exercises to understand how to modify the code to analyse cosmological models other than the standard one. Then I will focus on CosmoMC code, showing how to install and use the code, how to modify the input parameters and how to deal with its results to obtain accurate analysis of the theoretical model analysed.

Syllabus [itemized list of course topics]:

- Introduce data/observable in cosmology
- Introduce the cosmological analysis codes with special focus on CAMB and CosmoMC
- Show you how to use the CAMB code
 - how modify the input values
 - how run the code
 - how to treat the output files
 - how modify the code for your own research
- Show you how to use the CosmoMC code
 - how modify the input values
 - how run the code
 - how to treat the output files

Assessment [form of assessment, e.g. final written/oral exam, solutions of problems during the course, final project to be handed-in etc.]:

An oral exam, with an exercise to solve

Suggested reading and online resources:

1. Lectures slides
2. Proposed literature references

Students should have a Linux system or a virtual machine (as MobaXterm or Cygwin or CosmoBox) with gfortran compiler.

We will use this version of CAMB: <https://github.com/cmbant/CAMB/tree/Aug2017>