

**Theoretical Aspects of  
Astroparticle Physics,  
Cosmology and Gravitation -  
2019**

**Report of Contributions**

Contribution ID: 1

Type: **not specified**

# Registration

Contribution ID: 2

Type: **not specified**

## **Lecture: Cosmological perturbation theory and structure formation - Lecturer: Vincent Desjacques**

*Monday, 11 March 2019 11:15 (1h 45m)*

Lecture 1: The FLRW universe

Contribution ID: 3

Type: **not specified**

## **Exercise Session: Cosmological perturbation theory and structure formation - Tutor: Titouan Lazeyras**

*Monday, 11 March 2019 14:30 (1h 30m)*

Contribution ID: 4

Type: **not specified**

## **Lecture: Gravitational waves and compact binaries - Lecturer: Enrico Barausse**

*Tuesday, 12 March 2019 09:00 (1h 45m)*

Lecture 1: General Relativity and the quadrupole formula

Contribution ID: 5

Type: **not specified**

## **Lecture: Cosmological perturbation theory and structure formation - Lecturer: Vincent Desjacques**

*Tuesday, 12 March 2019 11:15 (1h 45m)*

Lecture 2: Linear cosmological perturbation theory 1

Contribution ID: 6

Type: **not specified**

## **Excercise Session: Gravitational waves and compact binaries - Tutor: Andrea Maselli**

*Tuesday, 12 March 2019 14:30 (1h 30m)*

Contribution ID: 7

Type: **not specified**

## **Lecture: Gravitational waves and compact binaries - Lecturer: Enrico Barausse**

*Thursday, 14 March 2019 11:15 (1h 45m)*



Contribution ID: 8

Type: **not specified**

## **Lecture: Cosmological perturbation theory and structure formation - Lecturer: Vincent Desjacques**

*Thursday, 14 March 2019 09:00 (1h 45m)*

Lecture 4: Cosmology with massive neutrinos

Contribution ID: 9

Type: **not specified**

## **Exercise Session: Gravitational waves and compact binaries - Tutor: Andrea Maselli**

*Thursday, 14 March 2019 14:30 (1h 30m)*

Contribution ID: **10**

Type: **not specified**

## **Lecture: Gravitational waves and compact binaries - Lecturer: Enrico Barausse**

*Wednesday, 13 March 2019 09:00 (1h 45m)*

Lecture 2: A more rigorous derivation of the quadrupole formula

Contribution ID: 11

Type: **not specified**

## **Lecture: Cosmological perturbation theory and structure formation - Lecturer: Vincent Desjacques**

*Wednesday, 13 March 2019 11:15 (1h 45m)*

Lecture 3: Linear cosmological perturbation theory 2

Contribution ID: 12

Type: **not specified**

## **Excercise session: Cosmological perturbation theory and structure formation - Tutor: Titouan Lazeyras**

*Wednesday, 13 March 2019 14:30 (1h 30m)*

Contribution ID: 13

Type: **not specified**

## **Lecture: Gravitational waves and compact binaries - Lecturer: Enrico Barausse**

*Friday, 15 March 2019 09:00 (1h 45m)*

Lecture 4: The response of an interferometer to gravitational waves

Contribution ID: 14

Type: **not specified**

## **Lecture: Cosmological perturbation theory and structure formation - Lecturer: Vincent Desjacques**

*Friday, 15 March 2019 11:15 (1h 45m)*

Lecture 5: The growth of large scale structure

Contribution ID: 15

Type: **not specified**

## **Lecture: Gravitational waves and compact binaries - Lecturer: Enrico Barausse**

*Friday, 15 March 2019 14:30 (1h 30m)*

Lecture 5: Gravitational-wave detectors and data analysis



Contribution ID: **16**

Type: **not specified**

## **Lecture: Neutrino physics, Lecturer: F. Feruglio**

*Monday, 18 March 2019 09:00 (1h 45m)*

Lecture 1: Neutrino Oscillations - theory

### **Summary**

Contribution ID: 17

Type: **not specified**

## **Lecture: Galactic cosmic rays and multimessenger astronomy - Lecturer: Fiorenza Donato**

*Monday, 18 March 2019 11:15 (1h 45m)*

Lecture 1: Galactic cosmic rays

- 1.1 Generalities on Galactic Cosmic Rays: particles, energies, fluxes
- 1.2 Transport of charged particles in the Galaxy, diffusion coefficient
- 1.3 Fermi acceleration of second order
- 1.4 Fermi acceleration of first order

Contribution ID: **18**

Type: **not specified**

## **Exercise session: Neutrino physics - Tutor: Olcyr Sumensari**

*Monday, 18 March 2019 14:30 (1h 30m)*

Contribution ID: **19**

Type: **not specified**

## **Lecture: Neutrino physics - Lecturer: F. Feruglio**

*Tuesday, 19 March 2019 09:00 (1h 45m)*

Lecture 2: Neutrino Oscillations - data

Contribution ID: 20

Type: **not specified**

## **Lecture: Galactic cosmic rays and multimessenger astronomy - Lecturer: Fiorenza Donato**

*Tuesday, 19 March 2019 11:15 (1h 45m)*

Lecture 2: Galactic cosmic rays 2

2.1 Fermi acceleration of first order

2.2 Convection in the Galaxy

2.3 Energy losses for nuclei

2.4 Energy losses for electrons

2.5 Catastrophic losses

Contribution ID: 21

Type: **not specified**

## **Exercise session: Galactic cosmic rays and multimessenger astronomy - Tutor: Francesca Calore**

*Tuesday, 19 March 2019 14:30 (1h 30m)*

Contribution ID: 22

Type: **not specified**

## **Lecture: Neutrino physics - Lecturer: F. Feruglio**

*Wednesday, 20 March 2019 09:00 (1h 45m)*

Lecture 3: Neutrino Masses

Contribution ID: 23

Type: **not specified**

## **Lecture: Galactic cosmic rays and multimessenger astronomy - Lecturer: Fiorenza Donato**

*Wednesday, 20 March 2019 11:15 (1h 45m)*

Lecture 3: Galactic cosmic rays 3

3.1 The transport equation

3.2 The sources of CRs: SNRs, PWNe, ISM

3.3 Geometry of the Galaxy

3.4 Solution to the transport equation

3.5 Free parameters of the model

3.6 Species in the Galaxies: nuclei, antinuclei, leptons, gamma-rays



Contribution ID: 24

Type: **not specified**

## Lunch

Contribution ID: 25

Type: **not specified**

## **Exercise session: Neutrino physics - Tutor: Olcyr Sumensari**

*Wednesday, 20 March 2019 14:30 (1h 30m)*

Contribution ID: 26

Type: **not specified**

## **Lecture: Neutrino physics - Lecturer: F. Feruglio**

*Thursday, 21 March 2019 09:00 (1h 45m)*

Lecture 4: Neutrinos and Physics Beyond the Standard Model

Contribution ID: 27

Type: **not specified**

## **Lecture: Galactic cosmic rays and multimessenger astronomy - Lecturer: Fiorenza Donato**

*Thursday, 21 March 2019 11:15 (1h 45m)*

Lecture 4: Particle Dark Matter; Indirect detection

4.1 Particle Dark Matter

4.2 Dark Matter Density distribution

4.3 CRs from Dark Matter, alias Indirect DM detection

4.3.1 Annihilation spectra

4.4  $\gamma$ -rays from dark matter annihilation

4.5  $\gamma$ -rays: the diffuse emission in the Galaxy

4.6 The Fermi-LAT sky and its interpretation

Contribution ID: 28

Type: **not specified**

## **Exercise session: Galactic cosmic rays and multimessenger astronomy - Tutor: Francesca Calore**

*Thursday, 21 March 2019 14:30 (1h 30m)*

Contribution ID: 29

Type: **not specified**

## **Lecture: Neutrino physics - Lecturer: F. Feruglio**

*Friday, 22 March 2019 09:00 (1h 45m)*

Lecture 5: Neutrinos and the Flavor Problem

Contribution ID: 30

Type: **not specified**

## **Lecture: Galactic cosmic rays and multimessenger astronomy - Lecturer: Fiorenza Donato**

*Friday, 22 March 2019 11:15 (1h 45m)*

Lecture 5 - Dark Matter indirect detection - More on multiwave- length and multimessenger

Antimatter in CRs

Antiprotons: secondaries, primaries, data

Antideuterons: secondaries, primaries, perspectives

Positrons: secondaries, primaries, data

The radio fluxes

Anisotropies in charged CRs and gamma rays