

TEACHING GUIDE ON
Astroparticle Physics

MASTER MODULE	SEMESTER	CREDITS	COURSE TYPE
Particle and Astroparticle Physics	2	6	Optative
PROFESSOR(S)	CONTACT DETAILS		
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	TUTORIALS TIMETABLE		
	AB: Monday 16:00-18:00, Friday 10:00-14:00 MM: M-W-F 15:00-17:00		
MASTER DEGREE			
University Master in Physics: Radiations, Nanotechnology, Particles and Astrophysics, University of Granada			
TEACHING DATES AND TIMES			
PRE-REQUISITES FOR REGISTRATION			
Degree in Physics. Basic knowledge on quantum mechanics, quantum field theory, particles, astrophysics and applied mathematics to physics problems.			
BRIEF CONTENTS DESCRIPTION			
Astroparticle physics: neutrinos, charged cosmic rays, gamma rays and dark matter.			
PROGRAM			
- 1. Introduction: Particles and radiation in the Universe. Acceleration mechanisms. - 2. Neutral cosmic rays: Neutrinos and their basic properties (mass, oscillations, neutrino sources, detection):			



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- **3. Charged cosmic rays:** Energy spectrum, chemical composition and production sources. Radiation of ultra-high energy.
 - **4. Dark Matter:** Evidence of its existence and potential candidates. Direct and indirect detection methods.
 - **5. Gamma rays:** Production and detection of gamma radiation.

BIBLIOGRAPHY

- T. Stanev, "High Energy Cosmic Rays". Springer; ISBN: 978-3540851486.
- M. Spurio, "Particles & Astrophysics". Springer; ISBN: 978-3-319-08050-5.
- C. Grupen, "Astroparticle Physics". Springer; ISBN: 978-3-642-06455-5.
- D.H. Perkins, "Particle Astrophysics". Oxford University Press; ISBN: 978-0198509523.
- L. Bergstr.m & A. Goobar, "Cosmology and Particle Astrophysics", Springer; ISBN: 978-3540329244.
- R. Mohapatra & P. Pal, "Massive Neutrinos in Physics and Astropysics", World Scientific, ISBN:978-9812380708.
- E. Kolb & M.S. Turner, "The Early Universe". Addison-Wesley; ISBN: 978-0201626742.

