



$$\begin{aligned}\mathcal{L} = & -\frac{1}{4}F_{\mu\nu}F^{\mu\nu} \\ & + i\bar{\Psi}\not{D}\psi \\ & + D_{\mu}\Phi^{\dagger}D^{\mu}\Phi - V(\Phi) \\ & + \bar{\Psi}_L\hat{Y}\Phi\Psi_R + h.c.\end{aligned}$$

Master on Physics of the Universe: Cosmology, Astrophysics, Particles and Astroparticles

NUEVO MÁSTER DE REFERENCIA DE LA UNIVERSIDAD DE ZARAGOZA



A short description

- Specialization in the study of Cosmology, Astrophysics, Astronomy, Astroparticles and Particle Physics
 - Two complementary orientations:
 - **theoretical-phenomenological**
 - **experimental or technological**
- Entry requirements: degree in Physics, Mathematics or Engineering
 - Distribution of learning activities: 90 ECTs in 3 Semesters
 - Erasmus agreements & double Master title with Cergy Paris University
 - Language of instruction: English/Spanish

A reference Master's degree

- Organized by [Centro de Astropartículas y Física de Altas Energías](#)
- with strong implication of
 - [Laboratorio Subterráneo de Canfranc](#)
 - [Centro de Estudios de Física del Cosmos de Aragón](#)
 - other national and international institutes



Centro de Astropartículas y
Física de Altas Energías
Universidad Zaragoza



LSC

Laboratorio Subterráneo de Canfranc



Research lines of teaching staff

- Dark matter, axion physics and neutrino physics
- Low background techniques and detector development
- Lattice gauge theory and field theory applications
- Standard Model extensions and quantum gravity
- Observational astrophysics and cosmology



What does the master's degree offer?

- Learning in leading research centers
- Theoretical-phenomenological or/and experimental-technological formation
- International research environment
- International agreements for the Master Thesis
- Participation in training, research and dissemination activities
- Possibility of starting research grants
- Possibility of becoming a PhD student after having completed 60 ECTs

Syllabus

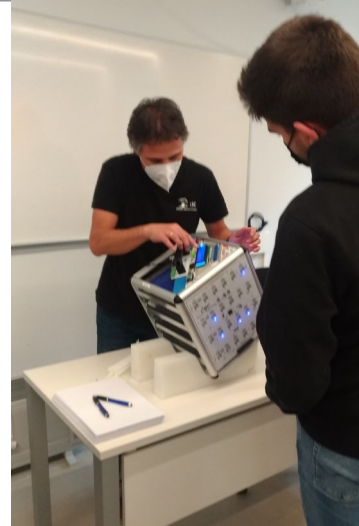
	S1	S2
12 Compulsory ECTs	-Frontier topics in cosmology, astrophysics and particle physics -Mathematical and computational methods in cosmology, astrophysics and particle physics	
48 Optional ECTs (4 courses / semester)	1. Cosmology I: the early Universe 2. Quantum Field Theory 3. Electrodynamics: radiation and matter interaction 4. Theory and phenomenology of the Standard Model of particle physics. 5. Astroparticle physics I: gamma rays, neutrinos and cosmic rays. 6. Observational astrophysics 7. Low radioactivity techniques 8. Advanced instrumentation for astronomy and particle physics experiments	1. Cosmology II: structure formation in the Universe 2. General relativity and gravitational waves. 3. Particle physics beyond the Standard Model 4. Astroparticle physics II: the dark Universe 5. Stellar astrophysics 6. Extragalactic astrophysics 7. Physics and engineering of particle detectors
	S3	
30 Compulsory ECTs	-Master Thesis (18 ECTs) -External internship and other activities (12 ECTs)	

Educational methodology

Active methodologies, with the students being responsible for their own learning, following the dictates of the European Space of Higher Education for the training of professionals

- Specific resources and didactic methods: face-to-face classes, research laboratories, computing, virtual learning, seminars, outreach ...
- Activities will be offered in English and Spanish languages
- Visits and activities in the Laboratorio Subterráneo de Canfranc and the Observatorio Astrofísico de Javalambre (OAJ)

First accademic year 2021-22: LSC activities



What to do next ?

- Starting a doctoral thesis (already after the 30ECTs of the first year)
- Applying for technical positions in research centres (particle physics, astroparticles, astrophysics, big data, software, medical physics, ...)
- Continuing technical training at universities and research centres.
- Preparing for the FIR exam
- ...

Cosmology, astrophysics, particle and astroparticles frontier physics

Do you want to join us in this learning adventure?



Master of the Universe
distribution list



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CAPA

Centro de Astropartículas y
Física de Altas Energías
Universidad Zaragoza

 Facultad de Ciencias
Universidad Zaragoza

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