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

NUEVO MÁSTER DE REFERENCIA DE LA UNIVERSIDAD DE ZARAGOZA

Facultad de Ciencias
Universidad Zaragoza

CAPA
Centro de Astropartículas y Física de Altas Energías
Universidad 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
- Language of instruction: English/Spanish

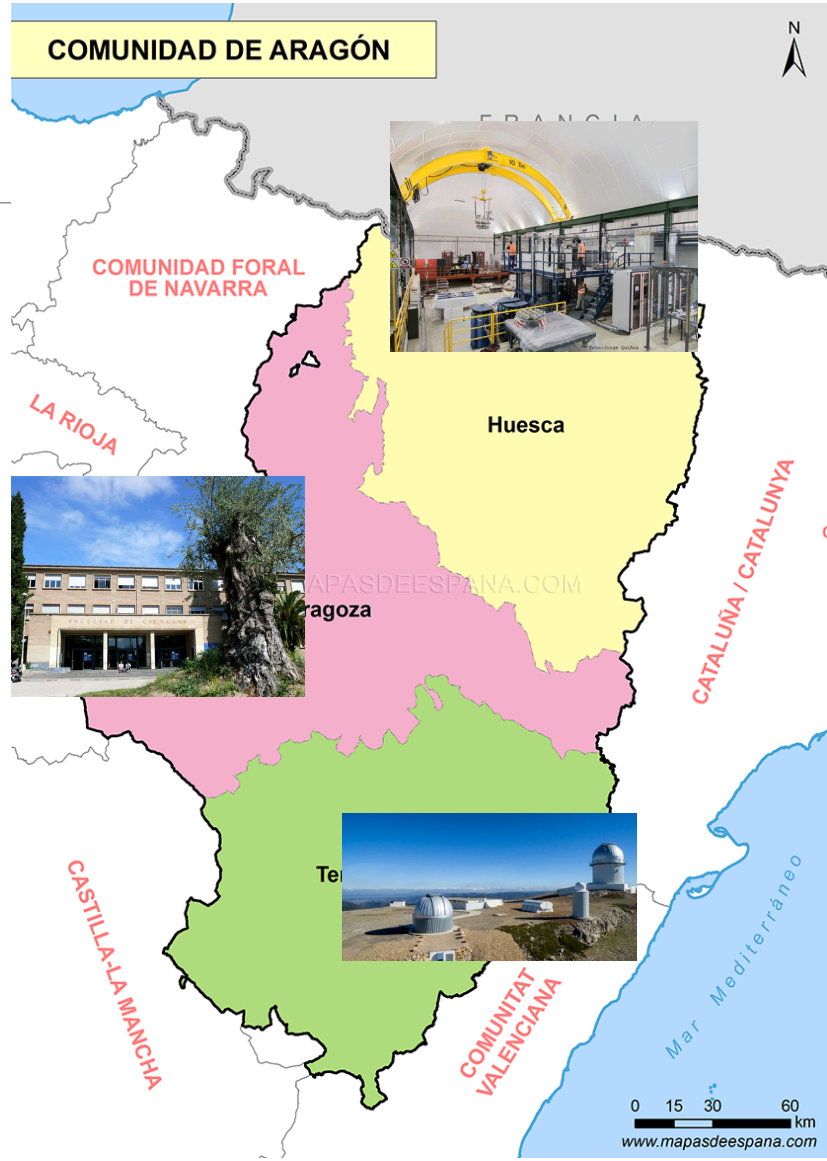
A *reference Master's degree*

- 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

Centro de Estudios de Física del Cosmos de Aragón

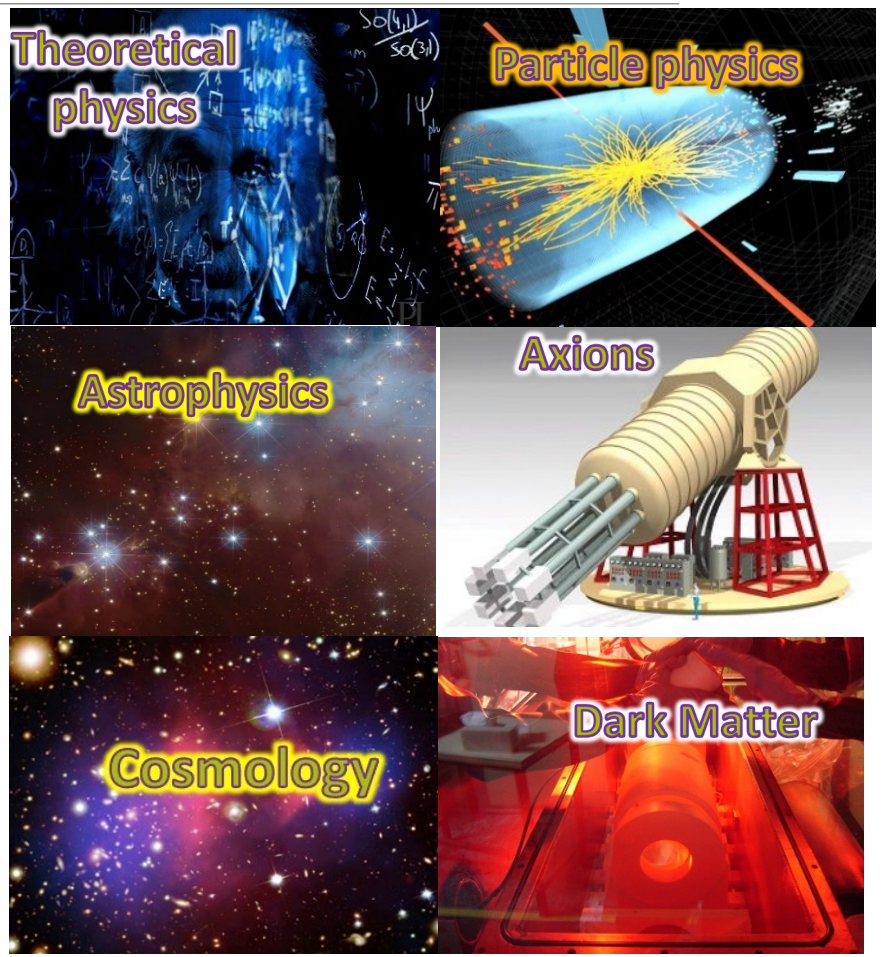


Student profile

- Recommended entry profile: graduate in Physics
- Other university graduates in the field of engineering or mathematics, with a solid background in physics and mathematics, will also be considered
- The Master's Commission will assess the training of each student who has applied for admission to the Degree and the completion of additional training credits could be indicated
- Being able to communicate in English and/or Spanish

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

Aim of the studies

At the end of their studies, graduates will be able to start a Doctoral Thesis and / or join as researchers or qualified technicians research teams in the fields of Cosmology, Astrophysics, Particles and Astroparticles

Aim of the studies: learn to …

- Use computer techniques and tools for modeling, simulation and data analysis
- Analyze, treat and interpret experimental data obtained in experiment
- Raise and solve problems and theoretical questions
- Handle experimental instruments and methods
- Develop and work collaboratively on software projects
- Delve into a research topic and learn about the most recent advances and current lines of research

Basic structure of studies

The curriculum combines theoretical, experimental and instrumental knowledge necessary for the training of scientists and technologists in the fields of the title, as well as the necessary tools for these research

- 12 compulsory ECTS (2 courses, 6 ECTS each)
- 8 elective ECTS (8 courses, 6 ECTS each, from a list of 16 courses)
- 12 ECTS for internship (optionally up to 4 ECTS can correspond to complementary activities as school attendance)
- 18 ECTS Master Thesis

Basic structure of studies

- Compulsory subjects providing a set of knowledge and tools essential to approach the field of research and giving a broad picture about forefront topics
- Elective courses to enter in current cutting-edge research guided by renowned experts
- The Master Thesis, the internship and complementary activities imply an immersion in a real research environment during a full semester

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)

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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