Reference Master's degree offered by Centro de Astropartículas y Física de Altas Energías of the University of Zaragoza with the participation of Laboratorio Subterráneo de Canfranc and Centro de Estudios de Física del Cosmos de Aragón, and the collaboration of national and international institutes

- 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

INFORMACIÓN

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Universidad Zaragoza

MASTER ON PHYSICS OF THE UNIVERSE

Cosmology, Astrophysics, Particles and Astroparticles

Centro de Estudios de Física del Cosmos de Aragón CEFCA

LSC Laboratorio Subterráneo de Canfranc

CAPA Centro de Astropartículas y Física de Altas Energías Universidad Zaragoza

Facultad de Ciencias Universidad Zaragoza

90 ECTS in 3 semesters
Entry requirements: degree in Physics, Mathematics or Engineering

12 compulsory ECTs (2 courses of 6 ECTs each)
48 optional ECTs (8 courses of 6 ECTs each to choose from a total offer of 15)
12 ECTs of external internship (of which 4 ECTs can be optionally taken in activities such as attendance at schools, conferences and other activities)
18 ECTs of Master's Thesis

Year 1 - Compulsory courses (annual)
Frontier topics in cosmology, astrophysics and particle physics
Mathematical and computational methods in cosmology, astrophysics and particle physics

Year 1 - Optional courses (semester S1 or S2)
Cosmology I: the early Universe (S1)
Cosmology II: structure formation in the Universe (S2)
General relativity and gravitational waves (S2)
Quantum Field Theory (S1)
Electrodynamics: radiation and matter interaction (S1)
Theory and phenomenology of the Standard Model of particle physics (S1)
Particle physics beyond the Standard Model (S2)
Astroparticle physics I: gamma rays, neutrinos and cosmic rays (S1)
Astroparticle physics II: the dark Universe (S2)
Observational astrophysics (S1)
Stellar astrophysics (S2)
Extragalactic astrophysics (S2)
Low radioactivity techniques (S1)
Advanced instrumentation for astronomy and particle physics experiments (S1)
Physics and engineering of particle detectors (S2)

Year 2 (first semester)
External internship and other activities
Master Thesis

RESEARCH LINES

- Direct detection of dark matter
- Modelization of dark matter in galaxies
- Axion physics: theory and detection
- Neutrino physics: double beta decay and neutrino mass
- Radioactivity and low background techniques
- Development of particle detectors
- Gauge theories in the lattice
- Field Theory applications to quantum information and topological materials
- Standard Model phenomenology and physics beyond the SM
- Theory and phenomenology of quantum gravity
- Cosmology and galaxy evolution