Course Title :	**Particle Physics**
Number of hours/semester :	60 h, 1st Semester
Number of ECTS :	6
Lecture outline, contents :	This series of lectures focuses on the experimental and theoretical foundations of the Standard Model of Particle Physics, which describes elementary particles and their interactions. The following topics are covered: • An overview of the basic concepts of elementary particles and fundamental interactions; the history of major discoveries in the field; introduction to the Standard Model • Symmetries: spin, isospin, parity (P), charge conjugation (C), time reversal (T), CP, CPT. • Basics of kinematics, Lorentz's invariant phase space, cross section and widths. • Basics of quantum field theory (scalar fields, spinor fields, Lagrangian). • Electromagnetic interaction: quantum electrodynamics (QED). • The strong interaction, SU(3) – history and phenomenology, quark model, flavour and colour, running coupling, hadronisation and jets, quantum chromodynamics (QCD), deep inelastic scattering, structure functions and their evolution. • Hadron collisions. • Charged Weak interaction (W bosons): Fermi theory, V-A structure, C and P violation, properties of the W boson. • The CKM matrix, flavour oscillations and CP violation. • Neutral currents, the Higgs mechanism and electroweak unification; Higgs boson discovery and properties. • Neutrinos (if time allows). • The standard model and beyond. This course is a basic element in the training of a physicist at M2 level but also the starting point for the pursuit of a doctorate in the field of particle physics.
Pedagogical methods :	Lectures and Tutorials
Prerequisites :	Quantum Mechanics(notions on the composition of kinetic moments, time-dependent perturbations, identical particles); Special Relativity.
Modalities of knowledge assessment :	Written examination at mid-term and at the end of the semester for the first session and Oral examination for second session (for the second session, the maximum grade is limited to 10)
Bibliography :	1. D. Griffiths, Introduction to elementary particles, Wiley-Vch 2. M. Peskin, D.V. Schroeder, An introduction to Quantum Field

Theory, CRC Press
3. D. H. Perkins, Introduction to high energy physics, Cambridge Univ. Press
4. A. Seiden, Particle physics - a comprehensive introduction, Addison-Wesley
5. F. Halzen and A. D. Martin, Quarks and leptons: an introductory course in modern particle physics, John Wiley & Sons
6. B. R. Martin and G. Shaw, Particle physics, John Wiley & Sons