

MASTER MODULE	SEMESTER	CREDITS	COURSE TYPE
Particle Physics and Astrophysics	1	6	Optative
PROFESSOR(S)	CONTACT DETAILS		
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	TUTORIALS TIMETABLE		
	www.ugr.es/~fteorica/Docencia/Tutorias.html		
MASTER DEGREE			
University Master in Physics: Radiations, Nanotechnology, Particles and Astrophysics, University of Granada			
TEACHING DATES AND TIMES			
PRE-REQUISITES FOR REGISTRATION			
Basic knowledge on Field theory and particles, Quantum mechanics and Mathematical methods for physics			
BRIEF CONTENTS DESCRIPTION			
Introduction to the Standard Model of electroweak and strong interactions of elementary particles			
PROGRAM			
PART I. INTRODUCTION. GAUGE THEORIES AND ELECTROWEAK INTERACTIONS - Introduction to gauge theories: The gauge principle. Quantization of gauge theories. Spontaneous Symmetry Breaking. - The Standard Model of electroweak interactions (EWSM): Gauge group and particle representations. The EWSM with one family. Electroweak spontaneous symmetry breaking. Several families: fermion mixing. Complete Lagrangian and Feynman rules.			

- Phenomenology of the EWSM: Parameters, observables and experiments. Precision Tests. Neutrinos. Higgs.

PART II. STRONG INTERACTIONS AND FLAVOR PHYSICS

- Quantum Chromodynamics (QCD): Lagrangian, symmetries and basic properties of the strong interaction. Hadron spectroscopy and effective theories.
- The flavor sector of the SM: Cabibbo-Kobayashi-Maskawa (CKM) matrix. Unitarity triangle.
- Analysis tools for flavor physics: Effective theories. Lattice QCD.
- Flavor phenomenology: CP violation. Light quark phenomenology. Heavy quark phenomenology.

BIBLIOGRAPHY

- P. Langacker, *The Standard Model and Beyond*, CRC Press (2010). ISBN: 978-1-4200-7906-7.
- C.P. Burgess and G.D. Moore, *The Standard Model: A Primer*, Cambridge University Press (2007). ISBN: 0-521-86036-9.
- W. N. Cottingham and D. A. Greenwood, *An Introduction to the Standard Model of Particle Physics*, Cambridge University Press (2007). ISBN: 978-0-521-85249-4.
- A.H. Mueller, *Perturbative Quantum Chromodynamics*, World Scientific Publishing (1998). ISSN: 0218-0324.
- R.K. Ellis, W.J. Stirling and B.R. Webber, *QCD and Collider Physics*, Cambridge Monographs on Particle Physics, Nuclear Physics and Cosmology (1996). ISBN: 0521 58189 3.
- E.V. Shuryak, *The QCD vacuum, hadrons and superdense matter*, World Scientific Lecture Notes on Physics, Vol 71, World Scientific Publishing (2004). ISBN: 981 238 573 8.
- J. Smit, *Introduction to Quantum Fields on a Lattice*, Cambridge University Press (2002). ISBN: 978-0521890519.

