

TEACHING GUIDE ON

**Physics Beyond the Standard Model**

MASTER MODULE	SEMESTER	CREDITS	COURSE TYPE
Particle Physics and Astrophysics	2	6	Optative
PROFESSOR(S)	CONTACT DETAILS		
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	TUTORIALS TIMETABLE		
<a href="http://www.ugr.es/~fteorica/Docencia/Tutorias.php">http://www.ugr.es/~fteorica/Docencia/Tutorias.php</a>			
MASTER DEGREE			
University Master in Physics: Radiations, Nanotechnology, Particles and Astrophysics, University of Granada			
TEACHING DATES AND TIMES			
Second semester: Tuesday, Wednesday and Thursday, 15:00-16:00			
PRE-REQUISITES FOR REGISTRATION			
Bachelor Degree in Physics. Basic level in Quantum Mechanics, Field Theory, and Mathematical Methods for Physics.			
BRIEF CONTENTS DESCRIPTION			
Extensions of the Standard Model of Particle Physics.			
PROGRAM			
<b>Lecture 1.</b> The Higgs sector in the SM. Spontaneous symmetry breaking. The Higgs mechanism.			



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Custodial symmetry. The hierarchy problem.

**Lecture 2.** Minimal extensions of the SM. Z's. Scalar singlets. Vectorlike quarks. Massive neutrinos. Parametrization of the indirect effects of new physics.

**Lecture 3.** Search for new physics at colliders. Signal and background. Collider observables. MonteCarlo simulations.

**Lecture 4.** Extensions of the Standard Model: Composite Higgs. Formalism and model building.

**Lecture 5.** Extensions of the Standard Model: Composite Higgs. Phenomenological implications.

#### BIBLIOGRAPHY

- M. D. Schwartz, "TASI Lectures on Collider Physics", arXiv:1709.04533.
- M. Perelstein, "Introduction to Collider Physics", arXiv:1002.0274.
- T. Han, "Collider Phenomenology: Basic knowledge and techniques, hep-ph/0508097.
- Daniele Alves et al., "Simplified Models for LHC New Physics Searches", arXiv:1105.2838.
- P. Langacker, "The Standard Model and Beyond", CRC Press.
- P. Ramond, "Journeys Beyond the Standard Model", Frontieres in Physics.
- G.G. Ross, "Grand Unified Theories", Addison-Wesley
- J. Wess y J. Bagger, "Supersymmetry and Supergravity", Princeton
- I. Aitchison, "Superymmetry in Particle Physics: An Elementary Introduction", Cambridge U.P.
- Particle Physics beyond the Standard Model (Lecture notes of the Les Houches Summer School 2005).

