

Particle Physics The Standard Model

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Cours de l'École Normale Supérieure
24, rue Lhomond, Paris

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Part

Introduction

Organisation

Outline of the course

Lectures and Tutorials

- ▶ Thursday
- ▶ 9:00-10:00, 10:15-11:15, 11:30-12:30
- ▶ 2/3 lectures, 1/3 tutorial
- ▶ A total of 30 hours followed by an exam

Validation of the course

- ▶ 30 minutes oral: 10 minute presentation, 20 minute discussion of **paper, lectures and tutorials**
- ▶ Date: April 4th, 2019
- ▶ Distribution of papers: March 7th, 2019
- ▶ Choice of paper and slot: March 21 or 28th, 2019

Contact

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- ▶ In person: LAL (Orsay) Bld. 208 Office 102
- ▶ When? anytime

Literature

- ▶ F. Halzen and A. Martin: Quarks and Leptons
- ▶ D. Griffiths: Introduction to Elementary Particles
- ▶ R. Mann: An introduction to Particle Physics and the Standard Model
- ▶ D. H. Perkins: Introduction to High Energy Physics
- ▶ Chris Quigg: Gauge Theories of the Strong, Weak and Electromagnetic Interactions
- ▶ Gauge theories in Particle Physics
- ▶ O. Nachtmann: Elementary Particle Physics

The course philosophy

- ▶ Emphasis of the course is on phenomenology
- ▶ Some experimental aspects will be discussed altogether with the interpretation of the measurements
- ▶ In the real world: theory and experiment are going in parallel
- ▶ Build the theory knowledge to put the experiments into perspective
- ▶ Natural units: $\hbar = c = 1 \rightarrow \hbar c = 197.3 \text{MeV} \cdot \text{fm}$

Outline

- ▶ Kinematics, Feynman rules, Moëller/Bhabha cross-sections
- ▶ QED
- ▶ QCD, hadrons (SU(2), SU(3))
 - ▶ Fragmentation, PDF, DIS
 - ▶ Asymptotic freedom
 - ▶ gluons
- ▶ EW Theory: Fermi, Higgs, Neutral currents
- ▶ J/ψ : GIM mechanism, discovery
- ▶ Neutrino physics: oscillations, mass hierarchy
- ▶ Cabibbo-Kobayashi-Maskawa (CKM), K and B physics
- ▶ W boson properties
- ▶ Higgs boson

Slides

The slides will be available after the course at the url

<https://users.lal.in2p3.fr/fredericmachefert/m2-icfp/>