

Program/Schedule Particle Physics (2020/2021)

Series 1 – 21/9

1 - Tuesday – 22/9 – Mário, Jorge, Ruben

Introduction. Program. Evaluation.

Elementary particles and fundamental interactions

2 - Thursday – 24/9 – Ruben

Cosmic ray discovery. The neutron. Beta decay and the neutrino hypothesis.

Isospin. The strangeness.

Particle zoo: leptons, mesons and baryons. The PDG.

Series 2 – 28/9

3 - Tuesday – 29/9 – Mário

Total and differential cross-section. Elastic and inelastic cross-section.

Brief review of relativistic kinematics (I)

4 - Thursday – 1/10 – Ruben

Particles interaction with matter

Series 3 – 5/10

5 - Tuesday – 6/10 – Mário

Exercises (1)

6 - Thursday – 8/10 – Ruben

Particle physics accelerators and detectors

Series 4 – 12/10

7 - Tuesday – 13/10 – Jorge

Non-relativistic quantum mechanics

Fermi golden rule. Rutherford's experiment.

8 - Thursday – 15/10 – Jorge

Relativistic quantum mechanics: collisions and decays

The discovery of anti-matter.

Series 5 – 19/10

9 - Tuesday – 20/10 – Jorge

Group Theory and $SU(3)_f$

10 - Thursday – 22/10 – Ruben

Exercises (2)

Series 6 – 26/10

11 - Tuesday – 27/10 – Mário

Deep inelastic scattering of electrons in protons

Bjorken scaling and Quarks.

12 - Thursday – 29/10 – Mário

Partons, PDFs, QCD and Exercises (3)

Series 7 – 2/11

13 - Tuesday – 3/11 – Jorge

Klein-Gordon and Dirac equations

14 - Thursday – 5/11 – Jorge

Quantum field theory and Feynman diagrams: ABC theory

Series 8 – 9/11

15 - Tuesday – 10/11 – Ruben/Mário

Simulated Test

1° Teste - quarta - 11/11

16 - Thursday – 12/11 – Jorge

QED. The electromagnetic field. Gauge invariance.

Series 9 – 16/11

17 - Tuesday – 17/11 – Jorge

Weak interactions. Fermi model.

Parity violation. V-A theory.

18 - Thursday – 19/11 – Jorge

Spontaneous symmetry breaking: Higgs mechanism.

Electroweak theory

Series 10 – 23/11

19 - Tuesday – 24/11 – Mário

Weak interaction experimental tests

The discovery of the Z and W bosons.

20 - Thursday – 26/11 – Jorge

Electroweak theory: examples.

Series 11 – 30/11

21 - Thursday – 3/12 – Mário

Experimental tests to the electroweak theory and the Higgs boson discovery

Series 12 – 7/12

22 - Thursday – 10/12 – Ruben

Exercises (4)

23 - Tuesday – 15/12 – Mário (Sofia)

Neutrinos e neutrino oscillation

25 - Thursday – 17/12 – Mário (Alessandro)

Astroparticle: gamma rays

2° Teste – 15/12