**Syllabus (Tentative) of Particle Physics**

1. Decay rates and cross section

* Concept, orders of magnitude of the effective sections and lifetimes
* Lorentz-invariant phase space
* Fermi’s golden rule revisited
* Interaction cross sections
* Differential cross sections

2. Disintegrations

* Radioactive decay law; activity, average life, half-life
* Carbon-14 dating principle.
* β decay, spontaneous fission, α and γ decay: simple theory, orders of magnitude.

3. Electron–proton elastic scattering

* Probing the structure of the proton
* Rutherford and Mott scattering
* Form factors
* Relativistic electron–proton elastic scattering

4. Deep inelastic scattering

* Electron–proton inelastic scattering
* Inelastic scattering at low Q2
* Deep inelastic scattering
* Electron–quark scattering
* The quark–parton model

5. Particles and symmetries

* Discreet symmetries, violations of parity
* Quantum numbers and their conservation
* Notion of quark
* The Standard Model (qualitative introduction)
* Panorama of contemporary experiences

6. Quantum Chromodynamics (QCD)

* The local gauge principle
* From QED to QCD
* Colour and QCD
* The quark–gluon vertex
* Gluons
* QCD in electron–positron annihilation
* Hadron–hadron collisions

7. The weak interaction

* The weak charged-current interaction
* Parity conservation in QED
* Parity violation in nuclearβ-decay
* Chiral structure of the weak interaction
* The W-boson propagator
* Helicity in pion decay

8. Electroweak unification

* Properties of the W bosons
* The weak interaction gauge group
* Electroweak unification
* Decays of the Z
* The Z resonance

9. The Higgs boson and standard model

* The need for the Higgs boson
* Particle masses
* The Higgs mechanism
* The Standard Model Higgs
* Properties of the Higgs boson
* The discovery of the Higgs boson
* The standard model of elementary particles

**Bibliography**

1. Thomson, M. Modern particle physics*.* Cambridge University Press (2013).
2. Kane Michael E. G. Modern Elementary Particle Physics, Cambridge University Press (2017).
3. Fayyazuddin & Riazuddin. A modem introduction to particle physics, World Scientific Publishing (2000).