Syllabus for Particle Physics

Paper Code - CTPH 106D

1. Introduction
(a) fundamental particles and their searches
(b) Accelerators and colliders
(c) Basic interactions
(d) Relativity, antiparticles
(e) Rotation, Isospin, Addition of Angular momentum

2. **Decays and Scattering**
(a) Conservation laws in decays and scattering
(b) Feynman Diagrams and amplitudes for processes involving electromagnetic, strong and weak interactions
c) Cross-section and decay widths

3. **Symmetries**
Discrete Symmetries
(a) Charge Conjugation (C) , Parity (P) and Time reversal (T)
(b) Transformation of spinor bilinears under C, P, T
(c) CP Violation in Kaon system
(d)CPT invariance and its consequences

Gauge Symmetries
(a) U(1), SU(2) and SU(3) local gauge invariance
(b) Yang Mills Lagrangian

Symmetry Breaking
(a) explicit and spontaneous
(b) Goldstone Theorem
(c) Higgs Mechanism

4. Standard Model of electroweak interactions
(a) Gauge , Fermion and Higgs interactions
(b) Spontaneous symmetry breaking and masses of particles
(c) Yukawa interactions, Fermion masses, CKM Matrix
(d) Physical processes involving charged and neutral current

Quantum chromodynamics
(a) Production of hadrons in electron positron scattering
(b) Deep inelastic scattering
(c) Parton Model and Bjorken scaling

Books:
1. Gauge theory of elementary particles

by Ta-Pei Cheng and Ling-Fong Li (Authors), Clarendon Press, Oxford

2. Quarks and Leptons: An Introductory Course on Modern Particle Physics
by Francis Halzen and Alan D. Martin (Authors), John Wiley & Sons

3. PARTICLE PHYSICS
by B. R. Martin and G. Shaw (Authors), John Wiley & Sons

4. Gauge Theory of Weak Interactions
by Walter Greiner and Berndt Müller (Author), Springer

5. Gauge Theories of Strong , Weak and electromagnetic Interactions
by Chris Quigg (Author), Princeton University Press

6. Gauge Field Theories
by Stefan Pokorski (Author), Cambridge University Press

7. An Introductory Course of Particle Physics
by Palash Baran Pal (Author), CRC press

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