



## Particle Physics (Course Handout)

PHY680A, Units: 3-0-0-0(9)

Prerequisite: Quantum Field Theory-I (PHY681)

Discussion Schedule: M-T-F

Time: 14:00-15:00

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### 1 Introduction to Particle Physics: (~ 3)

- Inventory of elementary particles, fundamental interactions and discoveries.
- Relativistic Kinematics (Scattering and decays).

### 2 Spontaneous symmetry breaking: (~ 7)

- Spontaneous breaking of global symmetries, Goldstone's theorem.
- Spontaneous breaking of local symmetries, Higgs mechanism etc.

### 3 Weak Interaction and electroweak theory: (~ 15)

- Parity violation,  $V - A$  theory, muon, pion and nuclear  $\beta$  decay processes.
- Charged and neutral current interactions, Cabibbo angle, Weak mixing angles,  $CP$  violation.
- Basics of electroweak interactions, Glashow-Weinberg-Salam model, Higgs phenomenology.

### 4 Strong Interactions: (~ 15)

- QCD Lagrangian, Perturbative QCD, Chiral Lagrangian etc.
- Structure of Hadrons, DGLAP equations, Factorization and parton model.

### Evaluation (Tentative):

Assignments-20%, Mid Sem-30%, End Sem-50%.

## References

- [1] [Aitchison & Hey](#), *Gauge Theories in Particle Physics*.
- [2] [Halzen & Martin](#), *Quarks and Leptons*.
- [3] [Palash B. Pal](#), *An Introductory Course of Particle Physics*.
- [4] [Schwartz](#), *Quantum Field Theory & the Standard Model*.
- [5] [Böhm, Denner, Joos](#), *Gauge Theories of the Strong & Electroweak Interaction*.