Flavour physics

TIFR, Winter (Feb-May) 2014

1. Introduction:

A brief history of particle physics How to read the Review of Particle Properties (Particle Data Group)

2 . The unordered flavour:

Muon energy loss, muon decay, Fermi theory

3. The strange flavour:

Decays of K mesons and branching fractions, decay constants, form factors Quark mixing, GIM mechanism, tau-theta puzzle K-Kbar mixing, CP violation, direct vs indirect CPV

4. CP violation:

Standard Model Lagrangian, CKM matrix Neutral meson mixing and decay CPV through decay, mixing and interference

5. The flavours of beauty and charm:

Decays of B mesons for CKM magnitudes, semileptonic decays, radiative decays Unitarity triangles, determination of CKM phases beta, gamma, alpha, beta_s Decays of D mesons

6. Some added flavours:

Top physics, charmonia and bottomonia Looking for new physics in data, rare decays, FCNC decays, New Physics indications Some useful techniques: angular distributions, effective operators and operator product expansion Special topics

Pre-requisites:

At least one completed course in Particle Physics Familiarity with calculating (at least) tree-level Feynman diagrams

Main reference books:

- 1. Review of Particle Properties (PDG)
- 2. "CP violation", Bigi and Sanda: available in Indian edition
- 3. "CP violation", Branco, Lavoura and Silva
- 4 . The Babar Physics book