BIRLA INSTITUTE OF TECHNOLOGY AND SCIENCE, PILANI
Hyderabad Campus
INSTRUCTION DIVISION
FIRST SEMESTER 2016-2017
Course Handout

Date: 06/05/2016

Course Number **: PHY F413**
Course Title **: Particle Physics**
Instructor-in-Charge : Sarmistha Banik

Scope and Objective of the Course: During the course we study the elementary particles and the fundamental forces of interaction between them. Particle Physics would be done in an advanced level. We will also discuss the various breakthroughs and discoveries made in the field which completely changed the way we view our universe.

Text Book:

1. Quarks and Leptons: An Introductory Course in Modern Particle Physics by Francis Halzen & Alan D. Martin (H-M)

Reference Book:

1. Introduction to Elementary Particles by David Griffiths (G)

Course Plan:

Lecture	Content	Reference
1-2	Motivation; Natural Units and its use; Classification of Particles: Hadron, Leptons Quarks; The four fundamental interactions	H.M. – 1 G – 1
3-7	Symmetry & Groups -- Quark Model; Spin, Isospin & strangeness, Quark content of hadrons; SU(2), SU(3) groups and their role in particle physics; Evidence in support of quark model	H.M. – 2
8-14	Relativistic Kinematics, Energy-momentum relationship, 4-vectors notation, Klein-Gordon Equation and Dirac Equation, Concept of Antiparticle, Dirac and Weyl Spinor	H.M. – 3,5
15-20	Symmetries and Conservation Laws, Noether's Theorem, symmetries, properties of space-time, Conservation of Momentum, Energy etc; Charge conjugation (C), parity (P) and Time-reversal (T) symmetries; CP-violation and CPT theorem.	H.M. – 5 G – 4
21-28	Electrodynamics of spineless and spin 1/2 particles; Decay rate Scattering Cross-section, Mandelstum Variables Massless and Massive Propagators; Feynman Rules, Matrix Amplitude; Bhaba Scattering, Compton Scattering etc	H.M. – 4,6
29-30	Introduction to Loop correction and renormalization; Hadrons & Partons; Quantum Chromodynamics (Qualitative discussion)	H.M. – 7
31-38	Weak Interactions, Parity Violation -- V-A interaction; Nuclear beta decay, Interpretation of the Fermi constants, Muon and Pion Decay processes, Charged and Neutral Currents, Cabibo angles, Weak Mixing angles; CP violation in nature?	H.M. – 12 G – 9
39-42	Electroweak Interactions, Basic of E-W interaction; Concept of weak isospin and hypercharge;	H.M. – 13

Evaluation Scheme:

No.	Components	Duration	Weightage	Date	Nature of Component
1	Test I	60 mins	20%		Close Book
2	Test II	60 mins	20%		Open Book
3	Assignment		10%		Open Book
3	Seminar	30 mins	10%		NA
3	Comprehensive	180 mins	40%		Close Book

Chamber Consultation Hour: Weekdays 11-12 hours

Make-up Policy:

Make up will be given only to really genuine cases, *i.e.*

(i) Sickness leading to ***hospitalisation***,

(ii) Out-of-station with prior ***intimation*** and ***permission*** for students at least 60% attendance in class.

(iii) No make up for assignment and Seminar presentation.