

**Fourth year of Five Years integrated M.Sc (Physics)
M.Sc. – IV, Semester – VIII**

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MP 404 : Nuclear and particle Physics	3	2	0	5

- **Nuclear Reactions:** (08 Hours)
Conservation laws, isospin, reaction cross section, coulomb scattering, nuclear scattering, scattering cross section, optical model, compound nucleus, direct reactions, resonance reactions, neutron physics.
- **Particle Accelerators and Detectors** (05 Hours)
Electrostatic accelerators, cyclotron, synchrotron, linear accelerators, colliding beam accelerators, gas-filled counters, scintillation detectors, semiconductor detectors.
- **Preview of Particle Physics** (02 Hours)
Historical Introduction, Classification and Natural Units
- **Relativistic Kinematics** (02 Hours)
Lorentz transformations, Four Vectors, Energy and momentum, Collisions.
- **Symmetries and Quarks** (04 Hours)
Symmetries, Groups, Conservation laws, Spin and Angular Momentum, Addition of angular momentum, Flavour symmetries, Parity, Charge conjugation, CP Violation, Time reversal and the CPT Theorem.
Mesons, Baryons hadron masses and colour factor.
- **BOUND STATES** (04 Hours)
The schrodinger equation for the central potential, Hydrogen atom, Fine structure, Lamb shift, Hyperfine structure, Positronium, quarkonium, Light quark mesons, Baryon masses and magnetic moment.
- **FEYNMAN CALCULATION** (05 Hours)
Life time and cross section, Golden Rule, The Feynman rules for toy theory, lifetime scattering, Higher order diagrams.
- **QUANTUM ELECTRODYNAMICS** (06 Hours)
Solution of Dirac equation, Bilinear Covariants, Photons, Feynman rules for QED, Cross sections and lifetimes Renormalizations, Electron-quark interactions Hadron productions in e^+e^- scattering, Electron proton Scattering, The parton model and Bjorken Scaling.
- **QUANTUM CHROMODYNAMICS** (06 Hours)
Feynman rules for QCD, Quark-quark interaction, Pair annihilation in QCD, Asymptotic freedom, Application of QCD

(Total Contact Time (Theory) : 42 Hours)

BOOKS RECOMMENDED :

1.	K. S. Krane	<i>Introductory Nuclear Physics,</i>	John Wiley (1988).	1988
2.	F. Halzen and A. D. Martin	<i>Quarks and Lepton</i>	John Wiley	1984
3.	D.H. Perkins	<i>Introduction to high energy physics-4th Edn</i>	Cambridge University Press	2000
4.	Griffiths D.	<i>Introduction to Elementary Particles</i>	Harper & Row Publication	1987
5.	Burcham W. E. and Jobes M.	<i>Nuclear and Particle Physics</i>	Addison Wesley	1995