

Course Structure: Topics in Mathematical Physics (Offered in MStat Course, ISI)

Compulsory topics:

1) Variational Principle and its applications:

Lagrangian and Hamiltonian formalisms of Classical mechanics

Canonical transformation and Poisson bracket

Hamiltonian operator in Quantum Mechanics with simple problem solving

Classical Electrodynamics (Maxwell's equations from VP)

2) Matrix Mechanics

Concept of operator and examples

Commutation algebra

Matrix representation in Quantum Mechanics and applications

3) Relativistic Physics:

Relativistic Dynamics

Relativistic Electrodynamics

Relativistic Quantum Mechanics

4) Statistical Physics:

Distributions in Quantum Statistics (Maxwell-Boltzmann, Bose-Einstein and Fermi-Dirac Statistics)

Bayesian Methods and Fisher Matrix Analysis in Physics (Cosmology/ Many body physics etc.)

Optional topics (any one between the two):

5) Tensors and General Relativity:

Tensor algebra and tensor calculus

Applications to General Relativity

Lagrangian and Hamiltonian formalism of General Relativity (basics only)

Simple applications to Astrophysical objects (black hole solutions etc.)

6) Group Theory and applications:

Symmetry and groups: Discrete and continuous groups

Simple groups in Particle Physics

