CS- 504: Mathematical Physics-II

THEORY   Marks: 100

Differential Equations

Classification: Ordinary and Partial, Order and Degree, Linear and Nonlinear, Homogenous and Non-homogeneous. Solution: Explicit and Implicit, Number of Arbitrary Constants.

(2 Lectures)

Linear Ordinary Differential Equations

First order:- (1) Separable Equations, Initial Value Problem. (2) Exact Equations, Integrating Factor. (3) Linear Equations Lagrange's Method of Variation of Parameters.

(8 Lectures)

Second order:- Homogeneous Equations with Constant Coefficients. Wronskian and General Solution. Statement of Existence and Uniqueness Theorem for Initial Value Problems. Solution of Non-homogeneous Equations by D Operator Method. Particular Integral. Methods of Undetermined Coefficients and Variation of Parameters. Equations Reducible to those with Constant Coefficients. Bemoulli and Euler Equations

(16 Lectures)

Coupled Differential Equations:- Solution by Method of Elimination

(2 Lectures)

Calculus of Variations

Variational Calculus: Variational Principle, Euler's Equations and its application to Simple Problems. Geodesics. Concept of Lagrangian. Generalized Coordinates Definition of Canonical Momenta. Euler-Lagrange's Equations of Motion and its Applications to Simple Problems: (e.g. simple pendulum and one dimensional harmonic oscillator). Definition of Canonical Momenta. Canonical Pair of Variables. Definition of Generalized Force. Definition of Hamiltonian (Legendre Transformation). Hamilton's Principle. Poisson Brackets and their Properties Lagrange Brackets and their Properties

(14 Lectures)

Constrained Maxima and Minima. Lagrange's Method of Undetermined Multipliers and its Application to Simple Problems in Physics.

(6 Lectures)