CURRICULUM PLAN of Prof. Rachana Kumar
(Odd Semester, 2023-24)

B. Sc. (H) Physics, I Year

Semester-I

I)   **Name of the Paper: – DSC-I: Mathematical Physics-I (UPC 222211101),**
       3 Periods per week

Contents	Allocation of Lectures	Month wise schedule to be followed	Tutorial/Assignment/ Presentation etc.
Unit 2, Vector Differential Calculus: Functions of more than one variable, Partial derivatives, chain rule for partial derivatives. Scalar and vector fields, concept of directional derivative, the vector differential operator ∇, gradient of a scalar field and its geometrical interpretation. Divergence and curl of a vector field and their physical interpretation. Laplacian operator. Vector identities.	About 8 lectures	3rd week of August, 2023	• Introductory classes • Syllabus Overview and pattern discussion • Reference Books • Classes Problem solving
Unit 3, Vector Integral Calculus: Integrals of vector-valued functions of single scalar variable. Multiple integrals, Jacobian, Notion of infinitesimal line, surface and volume elements. Line, surface and volume integrals of vector fields. Flux of a vector field. Gauss divergence theorem, Green's and Stokes' Theorems (no proofs) and their applications	~12 lectures	Last week of August -September	• Course progression • Related Problems • Assignment • Home Register overview • Student's difficulties • Google classroom group formation for study material
Unit 1, Ordinary Differential Equations: First order differential equations of degree one and those reducible to this form, Exact and Inexact equations, Integrating Factor, Applications to physics problems	16 lectures	October	• Classes, Problem solving • Assignment

Higher order linear homogeneous differential equations with constant coefficients, Wronskian and linearly independent functions. Non-homogeneous second order linear differential equations with constant coefficients, complimentary function, particular integral and general solution, Determination of particular integral using method of undetermined coefficients and method of variation of parameters, Cauchy-Euler equation, Initial value problems. Applications to physics problems			
Unit 2, Vector Algebra: Transformation of Cartesian components of vectors under rotation of the axes, Introduction to index notation and summation convention. Product of vectors - scalar and vector product of two, three and four vectors in index notation using δii and εiii (as symbols only – no rigorous proof of properties). Invariance of scalar product under rotation transformation.	5 Lectures	First two weeks of November	• Course progression • Related Problems • Assignment • Home Register overview • Student's difficulties • Class test
Unit 3, Probability Distributions: Discrete and continuous random variables, Probability distribution functions, Binomial, Poisson and Gaussian distributions, Mean and variance of these distributions.	4 Lectures	Third week of November	• Classes • Related Problems and applications. • Practice Register checking • Class test • Previous Year's Question Papers discussion
Unit 1, Functions: Plotting elementary functions and their combinations, Interpreting the graphs of functions using the concepts of calculus, Taylor's series expansion for elementary functions.	2 Lectures	Last week of November-till 1st week of December 2023, dispersal of classes	• Derivations • Revision session • Student's difficulties • Internal Assessment finalization and sharing with students