CURRICULUM PLAN 2022-23 (Odd Semester)

B. Sc. (HONS.) PHYSICS, Semester V

Name of Teacher: Prof. Pushpa Bindal

Name of Paper & Code	Allocation of Lectures	Month wise schedule followed by the Department	Tutorial/Assignment/ Presentation etc.
PAPER –DSE: ADVANCED MATHEMATICAL PHYSICS-I			
Unit 1 **Linear Vector Spaces Abstract Systems:** Binary Operations and Relations. Introduction to Groups and Fields. Vector Spaces and Subspaces. Linear Independence and Dependence of Vectors. Basis and Dimensions of a Vector Space. Change of basis. Homomorphism and Isomorphism of Vector Spaces. Linear Transformations. Algebra of Linear Transformations. Non-singular Transformations. Representation of Linear Transformations by Matrices.	12 lectures	Jul-Aug	Problems on Vector Spaces and Linear Transformations
Unit 2 **Matrices, Addition and Multiplication of Matrices:** Null Matrices. Diagonal, Scalar and Unit Matrices. Upper- Triangular and Lower-Triangular Matrices. Transpose of a Matrix. Symmetric and Skew-Symmetric Matrices. Conjugate of a Matrix. Hermitian and Skew-Hermitian Matrices. Singular and Non-Singular matrices. Orthogonal and Unitary Matrices. Similar Matrices. Trace of a Matrix. Inner Product.	8 lectures	Aug-September	Problems on matrices, Assignment
Unit 3 **Eigen-values and Eigenvectors:** Finding Eigen –values and Eigen vectors of a Matrix. Diagonalization of Matrices. Properties of Eigen-values and Eigen Vectors of Orthogonal, Hermitian and Unitary Matrices. Cayley-Hamiliton Theorem (Statement only). Finding inverse of a matrix using Cayley-Hamiltion Theorem. Use of Matrices in Solving ordinary second order differential equations and Coupled Linear Ordinary Differential Equations of first order.	10 lectures	September	Problems on matrices, Assignment

Functions of a Matrix.			
Unit 4 **Cartesian Tensors:** Transformation of Co-ordinates and fundamentals of Tensors. Einstein's Summation Convention. Relation between Direction Cosines. Algebra of Tensors: Sum, Difference and Product of Two Tensors. Contraction. Quotient Law of Tensors. Symmetric and Anti-symmetric Tensors. Invariant Tensors: Kronecker and Alternating Tensors. Association of Anti-symmetric Tensor of Order Two and Vectors.	8Lectures	**Sep-**October	Related Problems& numericals.
Unit 5 **Applications of Cartesian Tensors:** Vector Calculus using Cartesian Tensors: Scalar and Vector Products of 2, 3, 4 vectors. Gradient, Divergence and Curl of Tensor Fields. Tensor notation of Laplacian operator. Proof of Vector Identities involving scalar and vector products and vector identities involving Del operator using Tensor notation. Isotropic Tensors (Definition only). Tensorial Character of Physical Quantities. Moment of Inertia Tensor. Stress and Strain Tensors: Symmetric Nature. Elasticity Tensor. Generalized Hooke's Law.	12 lectures	Oct-November	Related numericals. Internal Assesssment
Unit 6 **General Tensors:** Transformation of Co-ordinates. Contravariant & Covariant Vectors. Contravariant, Covariant and Mixed Tensors. Kronecker Delta and Permutation Tensors. Algebra of Tensors. Sum, Difference & Product of Two Tensors. Contraction. Quotient Law of Tensors. Symmetric and Anti-symmetric Tensors. Metric Tensor in cartesian, cylindrical, spherical coordinates.	10 lectures	November	Related numericals. Internal Assesssment