Lesson Plan (2022-23)

September to December-2022

Name of the Assistant Professor- Dr. Amit Kumar

Subject- Mathematics

Class	B.A. 1st Sem	B.A. 3rd Sem	B.A. 3rd Sem	B.C.A. 3rd Sem
Paper/ Month	**Algebra**	**Advanced Calculus**	**Partial Differential Equations**	**Computer Oriented Numerical Methods**
September (Section – 1st)	Symmetric , Skew – symmetric, Hermitian and Skew - Hermitian matrices, Elementary operations on matrices, Rank of a matrix, Inverse of a matrix, Linear dependence and independence of rows and columns of matrices, Row rank and column rank of a matrix, Eigen values, eigen vectors and the characteristic equation of a matrix, Minimal polynomial of a matrix, Cayley Hamilton theorem and its use in finding inverse of a matrix.	Continuity, Sequential continuity, properties of continuous functions, Uniform continuity, Chain rule of differentiability. Mean value theorems; Rolle's theorem and Lagrange's mean value theorem and their geometrical interpretations. Taylor's theorem with various form of remainders, Darboux intermediate value theorem for derivatives, Indeterminate forms.	Partial differential equations : Formation , order and degree, Linear and non - linear partial differential equations of the first order : Complete Solution, Singular solution, General solution, Solution of Lagrange's linear equations, Charpit's general method of solution. Compatible systems of first order equations, Jacobi's method.	Computer Arithmetic: Floating - point representation of numbers, arithmetic operations with normalized floating - point numbers and their consequences, significant figures. Error in number representation - inherent error, truncation, absolute, relative, percentage and round - off error. Iterative Methods: Bisection, False position, Newton - Raphson method. Iteration method, discussion of

				convergence, Bairstow's method.
October (Section – 2ⁿᵈ)	Applications of matrices to a system of linear (Both homogeneous and non - homogeneous) equations. Theorems on consistency of a system of linear equations. Unitary and Orthogonal Matrices, Bilinear and Quadratic forms.	Limit and continuity of real valued functions of two variables. Partial differentiation. Total differentials; Composite functions and implicit functions. Change of variables. Homogeneous functions and Euler's theorem on homogeneous functions. Taylor's theorem for functions of two variables.	Linear partial differential equations of second and higher orders , Linear and non - linear homogeneous and non - homogeneous equations with constant coefficients , Partial differential equation with variable coefficients reducible to equations with constant coefficients , their complimentary functions and particular Integrals, Equations reducible to linear equations with constant coefficients.	Solution of simultaneous linear equations and ordinary differential equations: Gauss-Elimination methods, pivoting, Ill - conditioned equations, refinement of solution. Gauss - Seidal iterative method, Euler method, Euler modified method, Taylor - series method, Runga - Kutta methods, Predictor - Corrector methods.
November (Section – 3ʳᵈ)	Relations between the roots and coefficients of general polynomial equation in one variable. Solutions of polynomial equations having conditions on roots. Common roots and multiple roots.	Differentiability of real valued functions of two variables. Schwarz and Young's theorem. Implicit function theorem. Maxima, Minima and saddle points of two variables. Lagrange's method of multipliers.	Classification of linear partial differential equations of second order, Hyperbolic , parabolic and elliptic types,	Interpolation and Approximation: Polynomial interpolation: Newton, Lagranges, Difference tables , Approximation of functions by Taylor Series .

	Transformation of equations.		Reduction of second order linear partial differential equations to Canonical (Normal) forms and their solutions , Solution of linear hyperbolic equations , Monge's method for partial differential equations of second order .	Chebyshev polynomial: First kind, Second kind and their relations, Orthogonal properties.
December (Section – 4th)	Nature of the roots of an equation. Descarte's rule of signs. Solutions of cubic equations (Cardan's Method). Biquadratic equations and their solutions.	Curves: Tangents, Principal normals , Binormals, Serret - Frenet formulae . Locus of the centre of Curvature, Spherical curvature, Locus of centre of spherical curvature, Involutes, Evolutes, Bertrand curves. Surfaces: Tangent planes, one parameter family of surfaces, Envelopes.	Cauchy's problem for second order partial differential equations. Characteristic equations and characteristic curves of second order partial differential equation , Method of separation of variables : Solution of Laplace's equation , Wave equation (one and two dimensions) , Diffusion (Heat) equation (one and two dimension) in Cartesian coordinate system .	Numerical Differentiation and integration: Differentiation formulae based on polynomial fit, pitfalls in differentiation, Trapezoidal and Simpson Rules, Gaussian Quadrature .