

Lesson Plan (2023-24)
January 2023 to May 2023
Name of the Assistant Professor- Dr. Amit Kumar
Subject- Mathematics

Class	B.A. 4 th Sem	B.A. 6 th Sem	B.A. 6 th Sem
Paper/ Month	Special Functions and Integral Transforms	Linear Algebra	Real and Complex Analysis
January Section – 1st	Series solution of differential equations: Power series method, Definitions of Beta and Gamma functions, Bessel equation and its solution: Bessel functions and their properties Convergence, Recurrence relations and generating functions, Orthogonality of Bessel functions.	Vector spaces, subspaces, Sum and Direct sum of subspaces, Linear span, Linearly Independent and dependent subsets of a vector space. Finitely generated vector space. Existence theorem for basis of a finitely generated vector space, Finite dimensional vector spaces, Invariance of the number of elements of basis sets, Dimensions, Quotient space and its dimension.	Jacobians, Beta and Gamma functions, Double and Triple integrals, Dirichlet's integrals, Change of order of integration in double integrals.
February Section- 2nd	Legendre and Hermite differential equations and their solutions: Legendre and Hermite's functions and their properties, Recurrence relations and generating functions. Orthogonality of Legendre and Hermite's polynomials. Rodrigues' Formula for Legendre and Hermite Polynomials. Laplace Integral Representation of Legendre polynomial.	Homomorphism and isomorphism of vector spaces, Linear transformations and linear forms on vector spaces, Vector space of all the linear transformations. Dual Spaces, Bidual spaces, annihilator of subspaces of finite dimensional vector spaces. Null space, Range space of a linear transformation. Rank and Nullity Theorem.	Fourier's series: Fourier expansion of piecewise monotonic functions, Properties of Fourier Coefficients, Dirichlet's conditions, Parseval's identity for Fourier series, Fourier series for even and odd functions. Half range series, Change of intervals.
March Section - 3rd	Laplace Transforms: Existence theorem for Laplace transform, Linearity of the Laplace transforms. Shifting theorems, Laplace transforms of derivatives and integrals. Differentiation and	Algebra of Linear Transformation, Minimal Polynomial of a linear transformation, Singular and non-singular linear transformations, Matrix of a linear transformation, Change of basis Eigen values and Eigen vectors of linear transformations.	Extended Complex Plane, Stereographic projection of complex numbers, continuity and differentiability of complex functions, Analytic functions, Cauchy-Riemann equations. Harmonic functions.

	<p>integration of Laplace transforms, Convolution theorem, Inverse Laplace transforms, convolution theorem, Inverse Laplace transforms of derivatives and integrals, Solution of ordinary differential equations using Laplace transform.</p>		
<p>April/ May Section -4th</p>	<p>Fourier transforms: Linearity property, Shifting, Modulation, Convolution theorem. Fourier transform of derivatives, Relations between Fourier transform and Laplace transform. Parseval's identity for Fourier transforms, Solution of differential equations using Fourier transforms.</p>	<p>Inner product space. Cauchy-Schwarz inequality. Orthogonal vectors. Orthogonal complements. Orthogonal sets and Basis, Bessel's inequality for finite dimensional vector spaces, Gram-Schmidt Orthogonalization process, Adjoint of a linear transformation - and its properties, Unitary linear transformations.</p>	<p>Mappings by elementary functions: Translation, Rotation, Magnification and Inversion, Conformal Mappings, Mobius transformations, Fixed points, Cross ratio, Inverse Points and Critical mappings.</p>