

Lesson Plan April –June (2021-2022)

Name of the Assistant Professor- Dr. Amit Kumar **Subject-** Mathematics

Month	B.A. (2nd Sem) Subject – Ordinary Differential Equations	B.A. (4th Sem) Subject – Sequences and Series	B.A.(6th Sem) Subject – Real & Complex Analysis
April	Geometrical meaning of a differential equation, Exact differential equations, integrating factors, First order higher degree equations solvable for x, y, p. Lagrange's equations, Clairauts equations, Equations reducible to Clairaut's form, Singular solutions. Orthogonal trajectories in Cartesian coordinates and polar coordinates,	Boundedness of the set of real numbers, least upper bound, greatest lower bound of a set neighbourhoods, interior points, isolated points, limit points, open sets, closed set, interior of a set, closure of a set in real numbers and their properties. Bolzano-Weierstrass theorem. Open covers. Compact sets and Heine-Borel Theorem.	Jacobians, Beta and Gamma functions, Double and Triple integrals, Dirichlet's integrals Change of order of integration in double integrals.
May	Self orthogonal family of curves, Linear differential equations with constant coefficients, Homogeneous linear ordinary differential equations, Equations reducible to homogeneous. Linear differential equations of second order. Reduction to normal form. Transformation of the equation by changing the dependent variable/ independent variable. Solution by operators of non-homogeneous linear differential equations. Reduction of order of a differential equation. Method of variations of parameters. Method of undetermined coefficients.	Sequence: Real sequences and their convergence, Theorems on limits of sequence, Bounded and monotonic sequences, Cauchy's sequence, Cauchy general principle of convergence, Subsequences, Subsequential limits. Infinite Series : Convergence and divergence of infinite series, Comparison tests of positive terms infinite series, Cauchy's general principle of convergence of series, Convergence and divergence of geometric series. Hyper Harmonic series or p-series. Infinite series D'Alembert's Ratio test, Raabe's test, Logarithmic test, de Morgan and Bertrand's test, Cauchy's nth root test, Gauss Test, Cauchy's integral test. Cauchy's condensation test.	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. Extended Complex Plane, Stereographic projection of complex numbers, continuity and differentiability of complex functions, Analytic functions, Cauchy-Riemann equations. Harmonic functions.

June	Ordinary simultaneous differential equations. Solution of simultaneous differential equations involving operators (d/dx) or t (d/dt) etc. Simultaneous equation of the form $dx/P=dy/Q=dz/R$. Total differential equations. Condition for $Pdx + Qdy + Rdz = 0$ to be exact. General method of solving $Pdx + Qdy + Rdz = 0$ by taking one variable constant. Method of auxiliary equations.	Alternating series Leibnitz's test, absolute and conditional convergence Arbitrary series: Abel's lemma, Abel's test, Dirichlet's test, Insertion and removal of parenthesis, re-arrangement of terms in a series, Dirichlet's theorem, Riemann's Re-arrangement theorem. Pringsheim's theorem (statement only) Multiplication of series, Cauchy product of series, (definitions and examples only), Convergence and absolute convergence of infinite d	Mappings by elementary functions: Translation, Rotation, Magnification and Inversion, Conformal Mappings, Mobius transformations. Fixed points, Cross ratio, Inverse Points and Critical mappings.
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Month	April	May	June
BCA (2nd Sem) Subject-Mathematical Foundations	Propositions and logical operators, Truth tables and propositions generated by a set. Equivalence and implications, Laws of logic, Mathematical system, Proposition over a universe, Mathematical induction, Quantifiers.	Addition and multiplication of matrices, Laws of matrix algebra, Singular and non singular matrices, Inverse of a matrix, Rank of a matrix, Rank of the product of two matrices, System of linear equations, i.e. $AX = O$ and $AX = B$. Characteristic equations of a square matrix, Cayley-Hamilton Theorem, Eigen values and eigen vectors, Eigen values and Eigen vectors of symmetric, skew-symmetric, Hermitian and skew-Hermitian matrices, Diagonalization of a square matrix.	Binary operations on a non empty set, Groups, Subgroups, Normal Subgroups, Cosets, Factor groups, Rings, Sub rings, Ideals, Factor rings, Prime ideals, Minimal ideal, Fields, direct product of groups, Isomorphism of groups and rings (definitions and examples only).

