Class: B.Sc.	Year: First	Semester: First
Faculty: Naveen Mehra	Subject: Mathematics	Teaching Period(Duration): Each lecture is of 45 minutes
Session: 2022-23		Course Title: Matrices, Trigonometry and Differential Calculus

Part-A
Matrices

Unit	Topics	No. of Lectures
I	Matrix introduction, matrix operations with their properties, symmetric, skew-symmetric, Hermitian and skew- Hermitian matrices, idempotent, nilpotent, involuntary, orthogonal and unitary matrices, singular and non-singular matrices, elementary operations on matrices, adjoint and inverse of a matrix, singular and non-singular matrices, negative integral powers of a non-singular matrix, Trace of a matrix.	12
II	Rank of a matrix, elementary transformations of a matrix and invariance of rank through elementary transformations, normal form of a matrix, elementary matrices, rank of the sum and product of two matrices, inverse of a non-singular matrix through elementary row transformations, equivalence of matrices.	11
III	Solutions of a system of linear equations, condition of consistency and nature of the general solution of a system of linear non-homogeneous equations.	9

Part-B
Trigonometry

Unit	Topics	No. of Lectures
IV	Trigonometric or circular and hyperbolic function of complex variable together with their inverses, De Moivre's Theorem and its applications, Euler's theorem, relation between trigonometric and hyperbolic function, Exponential function of a complex variable, Logarithms of complex variable, Properties of logarithmic function, Separation into real and imaginary parts	10
V	Gregory's series, Value of π by different series, Summation of Trigonometric series by C+iS method based on Arithmetic Progression, Geometric Progression, Logarithms and Binomial expansions, Summation of Trigonometric series by difference method.	10

Part-C
Differential Calculus

Unit	Topics	No. of Lectures
VI	Functions of one variable, Limit of a function (ϵ-δ Definition), Continuity of a function, Properties of continuous functions, Intermediate value theorem, Classification of discontinuities, Differentiability of a function, Jacobians, maxima and minima of singe variable function, Rolle's Theorem, Mean value theorems and their geometrical interpretations, Applications of mean value theorems.	11
VII	Successive Differentiation, n^{th} Differential coefficient of functions, Leibnitz Theorem, Taylor's Theorem, Maclaurin's Theorem, Taylor's and Maclaurin's series expansions.	10
VIII	Geometrical meaning of tangent, Definition and equation of Tangent, Tangent at origin, Angle of intersection of two curves, Definition and equation of Normal, Cartesian sub tangent and subnormal, Tangents and normals of polar curves, Angle between radius vector and tangent, Perpendicular from pole to tangent, Pedal equation of curve, Polar sub tangent and polar subnormal, Derivatives of arc (Cartesian and polar formula).	12
IX	Curvature, Radius of curvature, Cartesian, Polar and pedal formula for radius of curvature, Tangential polar form, Centre of curvature, Asymptotes of algebraic curves, Methods of finding asymptotes, Parallel asymptotes, existence and classification of singular points, points of inflection.	11

Course outcomes:

CO1: The programme outcome is to give foundation knowledge for the students to understand basics of mathematics including applied aspect for developing enhanced quantitative skills and pursuing higher mathematics and research as well.

CO2: By the time students complete the course they will have wide ranging application of the subject and have the knowledge of matrices and basics of differentiation.

CO3: The student will be able to sum the trigonometric series of real and complex numbers and separate the trigonometric function in form of A+iB.

CO4: The main objective of the course is to equip the student with necessary analytic and technical skills. By applying the principles of differentiation, he learns to solve a variety of practical problems in science and engineering.

CO5: The student is equipped with standard concepts and tools at an intermediate to advance level that will serve him well towards taking more advance level course in mathematics.