Under Graduate:(Mathematics)

PSO:

A student should get a relational understanding of mathematical concepts and concerned structures, and should be able to follow the patterns involved, mathematical reasoning. Enabling students to develop a positive attitude towards mathematics & Think in a critical manner and Know when there is a need for information, to be able to identify, locate, evaluate, and effectively use that information for the issue or problem at hand. Students Formulate and develop mathematical arguments in a logical manner and acquire good knowledge and understanding in advanced areas of mathematics, chosen by the student from the given courses. Understand, formulate and use quantitative models arising in social science.

Course Outcome: Part-I

CO1. **Set Theory**

The students become aware about Partial and Total Order Relation, Countability, Cardinality, Schoelder Bernistein Theorem, Cardinal and Ordinal Numbers and their Arithmetic, Axiom Choice and its Various Forms, Zorn's Lemma, Well Ordering Theorem.

CO2. **Algebra**

The students gathering the idea of the Group with Examples and Simple Properties,Subgroups, Generation of Groups, Cyclic Groups, Coset Decomposition, Lagrange's Theorem and its Consequences, Fermat's and Euler's Theorems, Homomorphism and Isomorphism, Normal Subgroups, Quotient Groups, Fundamental Theorem of Homomorphism, Permutation Groups, Cayley's Theorem, Introductionon Rings, Sub-rings, Integral Domains and Fields, Characteristics of a Ring.

CO3. **Matrices**

The students will be acquainted with the Symmetric, Skew-Symmetric, Hermitian and Skew-Hermitian Matrices, Elementary Operations on Matrices, Inverse of a Matrix, Linear Independence of row and column matrices, Rank of a Matrix, Eigen Values, Eigen Vectors and the Characteristic Equation of Matrices, System of Linear (both Homogeneous and Non-homogeneous) Equations, Theorems on Consistency of a system of linear equations

CO4. **Theory of Equations**

The students aware about General Properties of Polynomials and Equation, Fundamental theorem of Algebra, Descarte's Rule of Sign, Relation between roots and coefficients, Evaluations of Symmetric functions of roots of Cubic and Biquadratic, Transformation of Equations, Reciprocal Equations, Transformation of Cubic and Biquadratic.

CO5. **Analytical Geometry of Two Dimensions & Three Dimensions**

The students gathering the idea of General Equation of Second Degree, Tracing of Conics, system of Conics, Confocal Conics, Polar Equation of Conics, Equation of Chord, Tangent, Normal, Asymptote and Director Circle.

Equations of Plane and Straight Lines, Coplanarity, Shortest Distance, Volume of Tetrahedron, Sphere Radical Plane, Tangent Plane, Cone, Generating Line Condition for three mutually perpendicular generators, Central Conicoids, Normal and Conjugate Diameters of Ellipsoids and its properties.

CO6. Higher Trigonometry

Expertise of students about De Moivre's Theorem and its applications, Circular, Inverse Circular and Hyperbolic functions, Logarithmic of a Complex Quantity, Expansion of Trigonometric Functions, Gregory Series, Summation of Series, Resolution into Factors.

Course Outcome: Part-II (Honours)

CO1. Differential Calculus

Developments of the students skills about basic properties of limits, Continuous functions and classification of discontinuous, Differentiablity, Successive differentiation, Leibnitz's theorem, Maclaurin and Taylor series expansions, Partial differentiation, Euler's theorem, Tangents and normals, Curvature.

CO2. Integral Calculus

Basic idea of Integration of irrational algebraic functions and transcendental functions, Reduction formulae, Definite integrals, Quadrature, Rectification, Volumes and surfaces of solids of revolution. Continuity, Sequential Continuity, Properties of continuous function, Uniform continuity, Chain rule of differentiability, Mean value theorems and their geometrical interpretations, Darboux's intermediate value theorem for derivatives, Taylor's theorem with various forms of remainders. Maxima and minima of functions of two variables, Lagrange's multiplier method. Beta and Gamma functions, Double and triple integrals, Dirichlet's integrals, Change of order of integration in double integrals.

CO3. Sequence and Series

The students gather knowledge about sequence, Theorems on limits of sequences, Bounded and monotonic sequence, Cauchy's convergence criterion, Series of non-negative terms, Comparison test, Ratio tests, Raabe's test, Logarithmic test, Higher logarithmic test, Gauss test, Kummer test, Cauchy's condensation test, Demorgan and Bertrand test, Alternating series, Leibnitz's theorem, Absolute and conditional convergence

CO4. Modern Algebra

To give the concept regarding Ring, properties of ring, sub-ring, Characteristics of a ring, integral domain and field.

CO5. Differential Equations

The students gather knowledge about Linear equations and equations reducible to the linear form, Exact differential equations, First order higher degree equations solvable for x, y, p, Clairaut's form and singular solutions, Orthogonal trajectories, Linear differential equations with constant coefficients, Homogeneous, Linear, Ordinary differential equations, Linear differential equations of second order, Transformation of the equation by changing the dependent variable / the independent variable, Method of variations of Parameters, Ordinary, Simultaneous differential equations, Partial differential equations of the first order, Lagrange's solution, Some special types of equations which can be solved easily by methods other than the general methods, Charpit's method

CO6. Special Functions

To give the concept about Bessel's function, Legendre and Hermite polynomials and their properties, Recurrence relations and generating function, Orthogonality.

CO7. Laplace Transformations

To make students aware about Laplace Transformation, Linearity of the Laplace transformation, Existence theorem for Laplace transformation, Laplace transformation of derivatives and integrals, Shifting theorems, Differentiation and Integration of transforms, Convolution theorem, Solution of integral equations and systems of differential equations using Laplace transformation. Alternating series, Leibniz test, Absolute and Conditional convergence.

Course Outcome: Part-III (Honours)

CO1. Higher Analysis

To understand on Riemann integral, Integrability of continuous monotonic functions, The fundamental theorem of Integral calculus, Mean value theorems of integral calculus, Improper integrals and their convergence, Comparison tests, Abel's and Dirichlet's tests, Multiplication of series, Double series, Partial derivative and Differentiabilty of real valued function of two variables, Schwartz and Young's theorem, Implicit function theorem.

CO 2. Complex Variables

Develop the concept of Complex numbers as ordered pairs, Geometric representation of complex numbers, Stereographic projection, Continuity and differentiability of complex functions, Analytic functions, Cauchy Riemann Equations, Harmonic functions, Elementary functions and mapping by elementary functions, Mobius transformation, Fixed points, Cross ratio, Inverse points and critical mapping, conformal mapping

CO3. Metric Space

Study of Definition and examples of metric spaces, Neighborhoods, Limit points, Interior points, Open and closed sets, Closure and Interior, Boundary points, Subspace of a metric space, Cauchy sequence, Completeness, Cantor's intersection theorem, Contraction principal, Construction of real numbers as the completion of the incomplete metric space of rationals, Real numbers as a complete ordered field, Dense subsets, Baire and category theorem, Separable, Second countable and first countable spaces, Continuous function, Extension theorem, Uniform continuity, Isometry and homeomorphism, Equivalent metrices

CO4. Topological Spaces

The students will be able understand of Topological spaces including their union and intersection, Only definition and example of open set, closed set, closer, dense / subset, neighborhood, interior point, exterior point, boundary point, accumulation point, derived sets, base and subbase, relative topology.

CO5. Group Theory-II

The students will gather the concept of Automorphism, Inner automorphism, Automorphism groups and their computations, Accumulation point, Conjugancy relation, Normalizer, Counting principle and the class equation of a finite group, Centre group of prime order, Abelianizing of a group and its universal property, Sylow's theorems, Sylow's subgroup, Structure theorem for finite Abelian groups.

CO6. Ring Theory

The pupils will become familiar with Homomorphism, Ideals and quotient rings, Field of quotients of an integral domain, Euclidean rings, Polynomial rings, Polynomials over the rational field, the Einstein criterion, Polynomial rings over commutative rings, Unique factorization domain

CO7. Linear Spaces

The students will get knowledge about the concept Definition and examples of vector spaces, Subspace, Sum and direct sum of subspaces, Linear span, Linear dependence, independence and their basic properties, Basic of finite dimensional vector spaces, Existence theorem for bases, Invariance of the number of elements of a basis set, Dimension, Existence of complementary subspace of a finite dimensional vector space, Dimension of sum of subspaces, Quotient space and its dimension, Linear transformation and their representation as matrices, the algebra of linear transformation, the rank-nullity theorem, Change of basis, Dual space, Bidual space and natural isomorphism, Adjoint of a linear transformation, Eigenvalues and eigenvectors of a linear transformation, Diagonalisation, Annihilator of a subspace, Bilinear quadratic and Hermitian Forms. Inner product spaces, Schwarz inequality, Orthogonal vectors, Orthogonal complements, Orthogonal sets and basis, Bessel's inequality for finite dimensional spaces, Gram-Schmidt Orthogonalisation process. Modules, Submodules, Quotient modules, Homomorphism and isomorphism theorems

CO8. Statics

The students will become comfortable with Resultant of coplanar forces, Equilibrium of forces, Principal of virtual work for a system of coplanar forces and its converse, Stable, unstable and neutral equilibrium, Conditions of stability, Energy test for stability, Catenary and string.

CO9. Dynamics.

The students will become acquainted with Rectilinear motion, Simple harmonic motion, Motion under Inverse square law, Hooke's law, Central forces, differential equation of motion (Polar and pedal equation), Planetary motion, inverse square law, Kepler's laws, D'Alembert's principle, the general equation of motion of a rigid body, Motion of the centre of inertia and motion relative to the Centre of inertia, Motion about a fixed axis, the Compound pendulum.

CO10. Vector Analysis

The students will become familiar with Scalar and vector product of three and four vectors, reciprocal system of vectors, Vector differentiation, Gradient, divergence and curl, Vector integration, theorems on Gauss, Green, Stoke's and problems based on these.