Department of Mathematics

Course Outcomes F.Y.B.Sc. Semester-I

Course Code	Units	Course Outcomes
USMT101 (Calculus-I)	UNIT I Real Number System UNIT II Sequences UNIT III **First order First degree Differential equations**	Students will be able to: 1. Define real number system and order properties and properties of real numbers. 2. Define intervals and neighborhood and its properties. 3. Prove that Arithmetic Mean > Geometric Mean 4. Prove some simple inequalities by using AM>GM 5. Apply Hausdroff property to find disjoint neighbourhood of two distinct real numbers. 6. Apply Archimedean property. 7. Define different types of sequence. 8. Discuss the behaviour of the geometric sequence and series. 9. Prove properties of convergent and divergent sequence. 10. Verify the given sequence in convergent and divergent by using behaviour of Monotonic sequence. 11. Explain sub sequences and upper and lower limits of a sequence. 12. The portion on first order, first degree differentials prepares learner to get solutions of so many kinds of problems in all subjects of Science and also prepares learner for further studies of differential equations and related fields.
		Students will be able to: 1. Explain statements and logic and various methods of proof. 2. Define a set and explain the basic concept of set theory such as union, intersection and complement. 3. Define relations, equivalence relations and determine if a relation is an equivalence relation and find the corresponding equivalence class.

USMT102 (Algebra-I)	UNIT I Integers and Divisibility UNIT II Functions and Equivalence Relation UNIT III Polynomials	4. Define functions. 5. State Well-ordering property. 6. Prove binomial theorem for non-negative exponents and apply it find coefficients of terms in the expansion. 7. Explain the various properties of integers and algebra of polynomials and determine the roots of a given polynomial and vice-versa. 8. Define prime numbers. Prove Euclid's lemma and fundamental theorem of arithmetic. 9. Define congruence modulo relation and state its properties.

Course Outcomes F.Y.B.Sc. Semester-II

Course Code	Units	Course Outcomes
USMT201 (Calculus-II)	UNIT I Limits and Continuity UNIT II Differentiability of functions UNIT III Applications of Differentiability	Students will be able to: 1. Define limit and continuity and sequential continuity and limits of real valued functions. 2. Define discontinuous functions and removable discontinuity. 3. State and prove algebra of limits, continuous functions and differentiability. 4. State and prove properties of continuous functions. 5. Define differentiation at a point and an open set. 6. Apply chain rule to find derivative of composite functions. 7. Determine local maxima, local minima, stationary points using second derivative test. 8. Define higher order derivatives and various methods to find derivatives.
USMT202	UNIT I **Preliminary Counting**	Students will be able to: 1. Define permutation and combination and basic results on permutation. 2. Define recurrence relation and obtain recurrence relation in counting problems. 3. Solve homogeneous and non-homogeneous

(Discrete Mathematics)	UNIT II **Advanced Counting** UNIT III **Permutations and Recurrence relation**	recurrence relation using various methods. 4. Define finite, countable and uncountable sets. 5. State and prove various principles of preliminary counting. 6. State and prove binomial and multinomial theorem. 7. Define circular permutations. Solve problems using the various formulae. 8. State and prove principal of inclusion and exclusion and apply it to solve problems. 9. Define derangement

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Course Outcomes S.Y.B.Sc. Semester-III

Course Code	Units	Course Outcomes
USMT301 (Calculus-III)	UNIT I Infinite Series UNIT II Riemann Integration UNIT III Applications of Integration and Improper Integrals	Students will be able to: 1. Know what is meant by infinite series & its convergence 2. Learn methods for knowing convergence/ divergence of some basis series. 3. Apply divergence test to determine divergence of an infinite series 4. Define Upper/Lower Riemann sums and state its properties. 5. Evaluate Upper/Lower integrals. 6. Define Riemann integral on a closed and bounded interval. 7. State and prove algebra of Riemann integrals.. 8. Prove Fundamental theorem of integral calculus, Mean Value theorem. 9. Evaluate Integration by parts. 10. Define Improper integrals-type 1 and type 2. 11. Define Beta and gamma functions and state their properties. 12. Explain the relationship between beta and gamma functions. 13. Find Area between curves, finding volumes by slicing, volumes of solids of revolution-Disks and Washers, Cylindrical Shells, Lengths of plane curves, Areas of surfaces of revolution
		Students will be able to: 1. Formulate the equation of lines and planes. 2. Define matrices, types of matrices, invertible matrices. 3. Express system of linear equations in matrix form; perform elementary row operations, Gaussian elimination. 4. Define elementary and invertible matrices. Perform elementary row operations to convert a

USMT302 (Linear Algebra-I)	UNIT I System of Linear Equations and Matrices UNIT II Vector Spaces UNIT III Determinants	given matrix to row echelon form to find rank of a matrix. 5. Define Vector Space, Define subspace, subspace test, Explain the properties of subspace 6. Linear span, linear independence and linear dependence, basis. 7. Determine dimension of a vector space. 8. Define determinant. 9. Use determinant to evaluate area and volume. 10. Explain linear dependence and independence using concept of determinants.

Course Code	**Units**	**Course Outcomes**
USMT303 (Ordinary Differential Equations)	UNIT I Higher Order Linear Differential Equations UNIT II System of First Order Differential Equations UNIT III Numerical Solutions of Ordinary Differential Equations	Students will be able to: 1. Explain the concept of differential equation. 2. Classify the differential equations with respect to their order and linearity. 3. Explain the meaning of solution of a differential equation. 4. Find solution of higher-order linear differential equations. 5. Express the basic existence theorem for higher-order linear differential equations. 7. Solve the homogeneous linear differential equations with constant coefficients. 8. Apply the method of undetermined coefficients to solve the non-homogeneous linear differential equations with constant coefficients. 9. Use the method "variations of parameters" to find to solution of higher-order linear differential equations with variable coefficients. 10. Solve the Cauchy-Euler equations. 11. Solve systems of linear differential equations. 12. Determine the type of linear differential equation systems.

		13. Use the operator method to solve linear systems with constant coefficients. 14. Find numerical Solution of initial value problem of first order ordinary differential equation using: (i) Taylor's series method, (ii) Picard's method for successive approximation and its convergence, (iii) Euler's method and error estimates for Euler's method, (iv) Modified Euler's Method, (v) Runge-Kutta method of second order and its error estimates, (vi) Runge-Kutta fourth order method.

Course Outcomes S.Y.B.Sc. Semester-IV

Course Code	Units	Course Outcomes
USMT401 (Calculus-IV)	UNIT I Functions of Several Variables UNIT II Differentiation UNIT III Applications	Students will be able to: 1. Define the Euclidean inner product and Euclidean norm function in and find distance between two points. 2. Define open ball, open set and determine whether the given set is open set. 3. Define scalar and vector valued functions and explain the basic results on limits and continuity of such functions. 4. Evaluate partial and directional derivative and prove mean value theorem. 5. Define differentiability over a scalar field, total derivative, gradient, partial derivatives, higher order derivatives and chain rule for differentiability. 6. State and prove sufficient condition for equality of mixed partial derivative. 7. Define differentiability over vector fields. 8. Evaluate Jacobian matrix. 9. Find maxima, minima, stationary points using

		second derivative test in vector fields.
USMT402 (Linear Algebra-II)	UNIT I Linear Transformation and Matrices UNIT II Inner Product Spaces UNIT III Eigen values, eigen vectors, diagonalizable matrix	Students will be able to: 1. Define linear transformations, kernel and image of a linear transformation and rank nullity theorem. 2. Define linear isomorphism, inverse of a linear isomorphism. 3. Given a linear transformation find the corresponding matrix representation. 4. Define dot product and inner product and general inner product space. 5. Define orthogonal and orthonormal sets. 6. Find orthonormal basis using Gram-Schmidt orthogonalisation process. 7. Define and eigenvalues and eigenvectors of a linear transformation of a vector space into itself and of square matrices. 8. Define Eigen spaces. Algebraic and geometric multiplicity of an eigenvalue. 9. Define characteristic polynomial. Properties of characteristic polynomials, Cayley-Hamilton Theorem and use it for applications. 10. diagonalise a matrix.

Course Code	**Units**	**Course Outcomes**
USMT403 (Numerical Methods)	Unit I Solutions of algebraic and transcendental equations Unit II Interpolation, Curve fitting, Numerical integration Unit III Solutions of linear system of Equations and eigen value problems	Students will be able to: 1. Demonstrate understanding of common numerical methods and how they are used to obtain approximate solutions to otherwise intractable mathematical problems. 2. Apply numerical methods to obtain approximate solutions to mathematical problems. 3. Derive numerical methods for various mathematical operations and tasks, such as interpolation, differentiation, integration, the solution of linear and nonlinear equations, and the solution of differential equations. 4. Analyse and evaluate the accuracy of common numerical methods.