

Mathematics

BSM 1: Algebra - I and Calculus - I

Number of teaching hours – 78

UNIT	Content	Hours Allotted
I	Unit 1:- Matrices: Symmetric and Skew Symmetric matrices, Algebra of Matrices; Row and column reduction, Echelon form, Rank of a matrix; Inverse of a matrix by elementary operations; Solution of system of linear equations; Criteria for existence of non-trivial solutions of homogeneous system of linear equations. Solution of non-homogeneous system of linear equations. Eigen values and Eigen vectors of square matrices, real symmetric matrices and their properties, reduction of such matrices to diagonal form, Cayley-Hamilton theorem, inverse of matrices by Cayley-Hamilton theorem.	30
II	Unit 2:- Polar Co-ordinates: Polar coordinates, angle between the radius vector and tangent. Angle of Intersection of curves (polar forms), pedal equations. Derivative of an arc in Cartesian, parametric and polar forms, curvature of plane curve-radius of curvature formula in Cartesian, parametric and polar and pedal forms- center of curvature.	48
III	Unit 3:- Successive Differentiation: nth Derivative of $(ax + b)^m$, $\log(ax + b)$, e^{ax} , $e^{ax} \sin(bx + c)$, $e^{ax} \cos(bx + c)$, $\sin(bx + c)$, $\cos(bx + c)$. Leibnitz theorem (with proof) and applications.	
IV	Unit 4:- Function of two and three variables: continuity, partial derivatives EULERS Theorem, maxima and minima (Two variables).	

Statements of Course Outcomes (COs)

By the end of the course, the student will be able to

CO-1	Evaluating solution of system of linear equations using rank of a matrix, Eigen values , Eigen vectors and inverse of matrices.
CO-2	Understanding the concept of polar co-ordinates
CO-3	Analysing the concept of successive differentiation
CO-4	Understanding the concept of function of two and three variables

Mathematics

BSM 2: Algebra – II and Calculus – II

Number of teaching hours – 78

UNIT	Content	Hours Allotted
I	Unit 1:- Groups: Definition of a group with examples and properties, Problems there on, Subgroups, center of groups, order of an element of a group, order of a group, cyclic groups, Coset decomposition, Lagrange's theorem and its consequences. Fermat's theorem and Euler's theorem.	30
II	Unit 2:- Theory of plane Curves: Asymptotes, envelopes, singular points, cusp, node, and conjugate points.	32
III	Unit 3:- Mean value Theorems: Continuity and differentiability (Definitions only). Theorems on derivatives: Rolle's Theorem, Lagrange's mean value theorem and Cauchy mean value theorem. Taylor's and Maclaurin's series (problems only).	
IV	Unit 4:- L'Hospital's rule: Statement of L' Hospital's rule and problems there on.	
V	Unit 5:- Integral calculus: Recapitulation of Algebraic rational and irrational functions and rational functions involving trigonometric functions and definite integrals. Reduction Formulae for $\int \sin^n x, \int \cos^n x, \int \tan^n x, \int \cot^n x, \int \sec^n x, \int \operatorname{cosec}^n x, \int \sin^m x \cos^m x dx$ with definite limit. Differentiation under the integral sign by Leibnitz rule.	16

Statements of Course Outcomes (COs)

By the end of the course, the student will be able to

CO-1	Understanding and analyzing the concept of groups.
CO-2	Evaluating the theory of plane curves.
CO-3	Understanding and analyzing mean value theorems.
CO-4	Understanding and applying L'Hospital's rule
CO-5	Remembering and evaluating the basics and problems of integral calculus

Mathematics

BSM 3: Algebra - III and Differential Equations - I

Number of teaching hours – 78

UNIT	Content	Hours Allotted
I	Unit 1:- Group Theory: Normal Subgroups, definition, examples and standard theorems on normal subgroups. Quotient groups, Homomorphism, isomorphism and fundamental theorem of homomorphism of groups.	30
II	Unit 2:- Ordinary Differential Equation: Definition of an ordinary differential equation, its order and degree. Classification of solutions. Solution of first degree and first order equations. (1) Variable separable (2) Homogeneous and reducible to homogeneous form. (3) Linear and Bernoulli's form (4) Exact equations and reducible to exact form with standard I.F. Necessary and sufficient condition for the equation to be exact. Equations of first order and higher degree. Solvable for p, Solvable for x (singular solutions), Solvable for y (singular solutions) and Clairaut's equation. Orthogonal trajectories. Second and higher order linear differential equations with constant co-efficient, complementary functions, Particular integral, standard types, Cauchy-Euler differential equations. Simultaneous differential equations with constant co-efficient (two variables).	48

Statements of Course Outcomes (COs)

By the end of the course, the student will be able to

CO-1	Remembering and analyzing concept of group theory.
CO-2	Understanding and evaluating concept of ordinary differential equation.

Mathematics

BSM 4: Differential Equations - II and Analysis

Number of teaching hours – 78

UNIT	Content	Hours Allotted
I	Unit 1:- Ordinary Linear Differential Equations: Solution of ordinary second order linear differential equation with variable coefficients by the methods: 1. When a part of complementary function is given, 2. Changing the independent variable, 3. Changing the dependent variable, 4. When a first integral is given (exact equation), 5. Variation of parameters	30
II	Unit 2:- Sequence of Real Numbers: Definition of a sequence, limits of a sequence, algebra of limit of a Sequence-Convergent, Divergent and Oscillatory sequence problems there on. Bounded sequence; every convergent sequence is bounded-converse is not true, Monotonic Sequence and Their properties, Cauchy's sequence.	48
III	Unit 3:- Infinite Series: Definition of convergent, divergent and oscillatory of series - standard properties and results, Geometric and Hyper geometric series. Cauchy's criterion (statement only). Tests of convergence of series - comparison tests - D'Alemberts Ratio test - Raabe's test - Cauchy's root test. The Integral test - Absolute Convergence and Leibnitz's test for alternating series.	

Statements of Course Outcomes (COs)

By the end of the course, the student will be able to

CO-1	Remembering and evaluating the advanced problems of ordinary linear differential equations.
CO-2	Understanding and analyzing the concept of sequence of real numbers.
CO-3	Understanding and analyzing the concept of infinite series.