

SYLLABUS OF PATHA BHAVANA AND SIKSHA SATRA, VISVA-BHARATI

WITH EFFECT FROM 2025

CLASS – XI

SEMESTER – I

SUBJECT: MATHEMATICS NUMBER OF CLASS-90

UNIT-I: SETS AND FUNCTIONS [Full Marks: 20]

Number of Class-40

1. Sets Sets and their representations, Empty set, Finite and Infinite sets, Equal sets, Subsets, Subsets of the set of real numbers especially intervals (with notations). Power set. Universal set. Venn diagrams. Union and Intersection of sets. Difference of sets. Complement of a set. Properties of Complement sets.

2. Relations and Functions Ordered pairs. Cartesian product of sets, Number of elements in the Cartesian product of two finite sets. Cartesian product of the set of reals with itself (up to $R \times R \times R$). Definition of relation, pictorial diagrams, domain, co-domain and range of a relation. Function as a special kind of relation from one set to another. Pictorial representation of a function, domain, co-domain and range of a function. Real valued functions, domain and range of these functions, constant, identity, polynomial, rational, modulus, exponential, logarithmic, signum and greatest integer functions with their graphs. Sums, difference, product and quotients of functions.

3. Trigonometric Functions Positive and negative angles, Measuring angles in radians and in degrees and conversion from one measure to another. Definition of trigonometric functions with the help of unit circle. Truth of the identity $\sin^2 A + \cos^2 A = 1$, for all A. Signs of trigonometric functions, domain, range and sketch their graphs.

Expressing $\sin(A \pm B)$ and $\cos(A \pm B)$ in terms of $\sin A$, $\cos A$, $\sin B$ and $\cos B$.

Deducing identities like the following:

$$\tan(A + B) = \frac{\tan A + \tan B}{1 - \tan A \tan B} \qquad \tan(A - B) = \frac{\tan A - \tan B}{1 + \tan A \tan B}$$

$$\sin A + \sin B = 2 \sin \frac{A+B}{2} \cos \frac{A-B}{2}. \quad \cos A + \cos B = 2 \cos \frac{A+B}{2} \cos \frac{A-B}{2}.$$

$$\sin A - \sin B = 2 \cos \frac{A+B}{2} \sin \frac{A-B}{2}. \quad \cos A - \cos B = -2 \sin \frac{A+B}{2} \sin \frac{A-B}{2}$$

Identities related to $\sin 2A$, $\cos 2A$, $\tan 2A$, $\sin 3A$, $\cos 3A$ and $\tan 3A$.

General solutions of trigonometric equations of the type $\sin \theta = \sin \alpha$, $\cos \theta = \cos \alpha$ and $\tan \theta = \tan \alpha$.

UNIT-II: ALGEBRA [Full Marks: 12]**Number of Classes: 24**

1. Complex Numbers and Quadratic Equations Need for complex numbers, especially $\sqrt{-1}$, to be motivated by inability to solve some of the quadratic equations. Algebraic properties of complex numbers. Argand plane, polar representation of complex numbers, modulus, argument. solution of quadratic equation in complex number system.

2. Linear Inequalities Linear inequalities. Algebraic solutions of linear inequalities in one variable and modulus function and their representation on the number line. Graphical solution of linear inequalities in two variables.

3. Permutations and Combinations Fundamental principle of counting. Factorial n ($n!$). Permutations and combinations, derivation of formulae for $n P_r$ ($n \geq r$) and $n C_r$ ($n \geq r$) their connections, simple applications.

UNIT-III: CALCULUS [Full Marks: 8]**Number of Class: 16**

1. Limits and Derivatives Intuitive idea of limit. Limits of polynomials and rational functions, trigonometric, exponential, and logarithmic functions. Derivative introduced as rate of change both as that of distance function and geometrically. Definition of derivative, relate it to slope of tangent of the curve, derivative of sum, difference, product and quotient of functions. Derivatives of polynomial, exponential and trigonometric functions

Number of Remedial Class: 10

CLASS – XI
SEMESTER – II
SUBJECT: MATHEMATICS NUMBER OF CLASS-90

UNIT-I: ALGEBRA [Full Marks: 20]

Number of Class: 40

1. **Principle of Mathematical Induction** Process of the proof by induction motivating the application of method by looking at natural numbers as the least inductive subset of real numbers. The principle of mathematical induction and simple applications.
2. **Binomial theorem** History, Statement, and proof of the binomial theorem for positive integral indices. Pascal's Triangle, General and middle term in Binomial expansion, Simple applications.
3. **Sequence and series** Sequence and series. Arithmetic Progression (A.P.), Arithmetic Mean (A.M.), Geometric Progression (G.P.), Geometric Mean (G.M.) relation between A.M. & G.M., Arithmetic-Geometric Progression Series (AGP series), infinite G.P. and its sum, Summation of first n-terms of series $\sum n$, $\sum n^2$ and $\sum n^3$.

Unit-II COORDINATE GEOMETRY (2D) [Full Marks: 14]

Number of Class: 28

1. **Straight lines** Brief recall of two-dimensional geometry from earlier classes. Slope of a line and angle between two lines. Various forms of equations of a line: Parallel to Axis, Point-slope form, slope-intercept form, two-point form, intercept form, distance of a point from a line.
2. **Conic sections** Sections of a Cone: circle, ellipse, parabola, hyperbola, a point, a straight line and a pair of intersecting lines as a degenerated case of conic section; Standard equation of circle, general equation of circle, Standard equations and simple properties of Parabola, Ellipse and Hyperbola.

UNIT-III PROBABILITY AND STATISTICS [Full Marks: 6]

Number of Class: 12

1. **Statistics** Measures of dispersion: Range, mean deviation, variance and standard deviation of ungrouped/ grouped data
2. **Probability** Random experiments, outcomes, Sample spaces (set representation), Events: Occurrence of events, 'not', 'and' and 'or' events, exhaustive events, mutually exclusive events, Axiomatic (set theoretic) probability, connections with other theories of earlier classes. Probability of an event, probability of 'not', 'and' and 'or' events.

Number of Remedial Class: 10

DISTRIBUTION OF MARKS**CLASS-XI SUBJECT: MATHEMATICS SEMESTER – I****FULL MARKS: 40+10(INTERNAL ASSESMENT)**

GROUP-A (FULL MARKS-20)			
UNIT	TOPICS	MARKS	DISTRIBUTION OF MARKS
UNIT-I SETS AND FUNCTIONS	1. SETS 2. RELATIONS AND FUNCTIONS 3. TRIGONOMETRIC FUNCTIONS	20	$MCQ - 4 \times 1 = 4$ $SATQ - 4 \times 2 = 8$ $LATQ - 2 \times 4 = 8$
GROUP-B (FULL MARKS-20)			
UNIT-II ALGEBRA	1. COMPLEX NUMBERS AND QUADRATIC EQUATIONS 2. LINEAR INEQUALITIES 3. PERMUTATIONS AND COMBINATIONS	12	$MCQ - 2 \times 1 = 2$ $SATQ - 3 \times 2 = 6$ $LATQ - 1 \times 4 = 4$
UNIT-III CALCULUS	1. LIMITS AND DERIVATIVES	8	$MCQ - 2 \times 1 = 2$ $SATQ - 1 \times 2 = 2$ $LATQ - 1 \times 4 = 4$

CLASS-XI SUBJECT: MATHEMATICS SEMESTER – II**FULL MARKS: 40+10(INTERNAL ASSESMENT)**

GROUP-A (FULL MARKS-20)			
UNIT	TOPICS	MARKS	DISTRIBUTION OF MARKS
UNIT-I ALGEBRA	1. PRINCIPLE OF MATHEMATICAL INDUCTION 2. BINOMIAL THEOREM 3. SEQUENCE AND SERIES	20	$MCQ - 4 \times 1 = 4$ $SATQ - 4 \times 2 = 8$ $LATQ - 2 \times 4 = 8$
GROUP-B (FULL MARKS-20)			
UNIT-II COORDINATE GEOMETRY (2D)	1. STRAIGHT LINES 2. CONIC SECTIONS	14	$MCQ - 2 \times 1 = 2$ $SATQ - 4 \times 2 = 8$ $LATQ - 1 \times 4 = 4$
UNIT-III PROBABILITY AND STATISTICS	1. PROBABILITY 2. STATISTICS	6	$MCQ - 2 \times 1 = 2$ $LATQ - 1 \times 4 = 4$

SYLLABUS OF PRE-DEGREE EXAMINATION, VISVA BHARATI

CLASS – XII

SEMESTER – I

SUBJECT: MATHEMATICS

NUMBER OF CLASS-90

UNIT-I: RELATIONS AND FUNCTIONS [Full Marks: 8]

Number of Class: 16

1. Relations and functions Types of relations: reflexive, symmetric, transitive and equivalence relations. One to one and onto functions. Composite functions; Inverse of a function. Binary Operations

2. Inverse Trigonometric Functions Definition, range, domain, principal value branches. Graphs of inverse trigonometric functions Elementary properties of inverse trigonometric functions.

UNIT-II: ALGEBRA [Full Marks:12]

Number of Class: 24

1. Matrices Concept, notation, order, equality, types of matrices, zero matrix, transpose of a matrix, symmetric and skew symmetric matrices. Addition, multiplication, and scalar multiplication of matrices. Simple properties of addition, multiplication, and scalar multiplication. Non- commutativity of multiplication of matrices and existence of non-zero matrices whose product is the zero matrix (restrict to square matrices of order 2). Concept of elementary row and column operations. Invertible matrices and proof of the uniqueness of inverse, if it exists; (Here all matrices will have real entries). Consistency, inconsistency, and number of solutions of system of linear equations by examples; Solving system of linear equations in two or three variables (having unique solution) using inverse of a matrix.

2. Determinants Determinant of a square matrix (up to 3×3 matrices), properties of determinants, minors, cofactors, and applications of determinants in finding the area of a triangle. Adjoint and inverse of a square matrix. Cramer's Rule and its applications.

UNIT-III: CALCULUS [Full Marks: 14]

Number of Class: 28

1. Continuity and Differentiability Continuity and differentiability, derivative of composite functions, chain rule, derivatives of inverse trigonometric functions, derivative of implicit functions, concept of exponential and logarithmic functions to the base e. Logarithmic functions as inverse of exponential functions.

Derivatives of logarithmic and exponential functions. Logarithmic differentiation, derivative of functions expressed in parametric forms. L' Hospital's rule (statement only) and applications. Second order derivatives.

Rolle's Theorem and Lagrange's Mean Value Theorem (statement only). Their geometric interpretation and elementary applications.

2. Applications of Derivatives Applications of derivatives, Rate of Change; increasing/ decreasing functions, tangents and normals, approximation, maxima and minima (first derivative test motivated geometrically and second derivative test given as a provable tool). Simple problems (that illustrate basic principles and understanding of the subject as well as real-life situations).

UNIT-IV: PROBABILITY [Full Marks: 6]

Number of Class:12

Probability Multiplication theorem on probability, conditional probability, independent events, total probability, Bayes' theorem, Random variable, and its probability distribution, mean and variance of random variable

Number of Remedial Class: 10

CLASS – XII

SEMESTER – II

SUBJECT: MATHEMATICS

UNIT-I: VECTORS AND THREE-DIMENSIONAL GEOMETRY [Full Marks: 16] Number of Class:32

I. Vectors Vectors and scalars, magnitude, and direction of a vector. Direction Cosines/ratios of vectors. Types of vectors (equal, unit, zero, parallel and collinear vectors).

Position vector of a point, negative of a vector, components of a vector, addition of vectors, multiplication of a vector by a scalar, position vector of a point dividing a line segment in a given ratio.

Scalar (dot) product of vectors, projection of a vector on a line. Vector (cross) product of vectors. Scalar triple product. vector equation of a line, vector equation of a plane

2. Three - dimensional Geometry Direction cosines/ ratios of a line joining two points. Cartesian equation of a line, coplanar and skew lines, cartesian equation of a plane. Angle between (i) two lines, (ii) two planes, (iii) a line and a plane. Distance of a point from a plane.

UNIT-II: LINEAR PROGRAMMING PROBLEMS [Full Marks: 4]

Number of Class: 8

1. Linear Programming Introduction, definition of related terminology such as constraints, objective function, optimization, different types of linear programming (L.P.) problems, mathematical formulation of L.P. problems, graphical method of solution for problems in two variables, feasible and infeasible regions, feasible and infeasible solutions, optimal feasible solutions (up to three non-trivial constraints).

UNIT-III INTEGRAL CALCULUS [Full Marks: 20]

Number of Class: 40

1. Integrals Integration as inverse process of differentiation. Integration of a variety of functions by substitution, by partial fractions and by parts, only simple integrals of the type to be evaluated.

$$\int \frac{dx}{x^2 \pm a^2} ; \quad \int \frac{dx}{\sqrt{x^2 \pm a^2}} ; \quad \int \frac{dx}{\sqrt{a^2 - x^2}} ;$$

$$\int \frac{dx}{ax^2 + bx + c} ; \quad \int \frac{dx}{\sqrt{ax^2 + bx + c}} ; \quad \int \frac{px + q}{ax^2 + bx + c} dx ;$$

$$\int \frac{px + q}{\sqrt{ax^2 + bx + c}} dx ; \quad \int \sqrt{a^2 \pm x^2} dx ; \quad \int \sqrt{x^2 - a^2} dx ;$$

$$\int \sqrt{ax^2 + bx + c} dx ; \int (px + q)\sqrt{ax^2 + bx + c} dx ; \int \frac{dx}{a + b \cos x} ; \int \frac{dx}{a + b \sin x}$$

Definite integrals as a limit of a sum, Fundamental properties of definite integrals and evaluation of

Theorem of Calculus (without proof). Basic definite integrals.

2. Applications of the Integrals Applications in finding the area under simple curves, especially lines, areas of circles/ parabolas/ellipses (in standard form only). Area under the curve $y = \sin x$, $y = \cos x$, area between the two above said curves (the region should be clearly identifiable).

3. Differential Equations Definition, order and degree, general and particular solutions of a differential equation. Formation of differential equation whose general solution is given. Solution of differential equations by method of separation of variables, homogeneous differential equations of first order and first degree. Exact equation and solution by inspection. Idea of integrating factors. Solutions of linear differential equation of the type:

$$\frac{dy}{dx} + Py = Q \text{ where } P \text{ and } Q \text{ are functions of } x \text{ and}$$

$$\frac{dx}{dy} + Px = Q, \text{ where } P \text{ and } Q \text{ are functions of } y.$$

Number of Remedial Class: 10

DISTRIBUTION OF MARKS**CLASS – XII SEMESTER – I SUBJECT: MATHEMATICS****FULL MARKS: 40+10(INTERNAL ASSESMENT)**

GROUP-A (FULL MARKS-20)			
UNITS		MARKS	DISTRIBUTION OF MARKS
UNIT-I: RELATIONS AND FUNCTIONS	1. RELATIONS AND FUNCTIONS 2. INVERSE TRIGONOMETRIC FUNCTIONS	8	$MCQ - 2 \times 1 = 2$ $SATQ - 1 \times 2 = 2$ $LATQ - 1 \times 4 = 4$
UNIT-II: ALGEBRA	1. MATRICES 2. DETERMINANTS	12	$MCQ - 2 \times 1 = 2$ $SATQ - 3 \times 2 = 6$ $LATQ - 1 \times 4 = 4$
GROUP-B (FULL MARKS-20)			
UNIT-III: CALCULUS	1.CONTINUITY AND DIFFERENTIABILITY 2. APPLICATIONS OF DERIVATIVES	14	$MCQ - 2 \times 1 = 2$ $SATQ - 4 \times 2 = 8$ $LATQ - 1 \times 4 = 4$
UNIT-IV: PROBABILITY	PROBABILITY	6	$MCQ - 2 \times 1 = 2$ $LATQ - 1 \times 4 = 4$

CLASS – XII SEMESTER – II SUBJECT: MATHEMATICS**FULL MARKS: 40+10(INTERNAL ASSESMENT)**

GROUP-A (FULL MARKS-20)			
UNIT	TOPICS	MARKS	DISTRIBUTION OF MARKS
UNIT-I: VECTORS AND THREE- DIMENSIONAL GEOMETRY	I. VECTORS 2. THREE - DIMENSIONAL GEOMETRY	16	$MCQ - 4 \times 1 = 4$ $SATQ - 4 \times 2 = 8$ $LATQ - 1 \times 4 = 4$
UNIT-II	LINEAR PROGRAMMING PROBLEMS	4	$LATQ - 1 \times 4 = 4$
GROUP-B (FULL MARKS-20)			
UNIT-III INTEGRAL CALCULUS	1. INTEGRALS: 2. APPLICATIONS OF THE INTEGRALS 3. DIFFERENTIAL EQUATIONS	20	$MCQ - 4 \times 1 = 4$ $SATQ - 4 \times 2 = 8$ $LATQ - 2 \times 4 = 8$