

MATHEMATICS

REVISED SYLLABUS FOR HIGHER SECONDARY COURSE (CLASS–XII) ASSAM STATE SCHOOL EDUCATION BOARD (DIV–II)

Rationale:

Mathematics serves as a cornerstone for logical reasoning and abstract analysis, providing the essential framework for science, technology, and the social sciences. At the higher secondary level, the curriculum is designed to bridge the gap between theoretical concepts and practical application, empowering students to investigate, evaluate, and reason through a quantitative lens.

This updated curriculum prioritizes conceptual clarity and creative inquiry, positioning mathematics as an essential instrument for navigating daily life. In alignment with the **National Education Policy (NEP 2020)**, the syllabus incorporates project-based and experiential learning to foster a deeper, more hands-on understanding of the subject.

Objectives

The broad objectives of teaching Mathematics at senior school stage intend to help the pupil:

- ❖ To acquire knowledge and critical understanding, particularly by way of motivation and visualization, of basic concepts, terms, principles, symbols and mastery of underlying processes and skills.
- ❖ To feel the flow of reasons while proving a result or solving a problem.
- ❖ To apply the knowledge and skills acquired to solve problems and wherever possible, by more than one method.
- ❖ To develop positive attitude to think, analyze and articulate logically.
- ❖ To develop interest in the subject by participating in related competitions.
- ❖ To acquaint students with different aspects of mathematics used in daily life.
- ❖ To develop an interest in students to study mathematics as a discipline.
- ❖ To develop awareness of the need for national integration, protection of environment, observance of small family norms, removal of social barriers, elimination of sex biases.
- ❖ To develop reverence and respect towards great Mathematicians for their contributions to the field of Mathematics.
- ❖ To Consolidate the understanding of core principles and their logical links.
- ❖ To build advanced reasoning and critical thinking skills.
- ❖ To apply mathematical tools to solve practical, cross-disciplinary challenges.
- ❖ To support independent inquiry and creative exploration.
- ❖ To highlight both the practical utility and the inherent beauty of mathematics.
- ❖ To ready students for university-level studies and specialized professional paths.

Syllabus for Mathematics, Class-XII

One Paper

Time: Three Hours

Total Marks 100

Scheme of Evaluation: Total Marks – 100 (Theory: 80 + Project: 20)

Unit-wise Distribution of Marks and Periods:

Sl. No.	Units	Marks	No. of Periods
I	Relations and Functions	8	16
II	Algebra	10	24
III	Calculus	35	88
IV	Vectors and Three - Dimensional Geometry	16	40
V	Linear Programming	5	10
VI	Probability	6	12
APPENDIX	1. Proofs in Mathematics		
	2. Mathematical Modelling		
Project Work		20	20
Total		100	200

Unitwise Distribution of Course contents:

Unit-I: 1. RELATIONS AND FUNCTIONS

Marks-04

Periods-08

- Types of relations:** Reflexive, symmetric, transitive and equivalence relations. Types of function, composition of functions and invertible function.
- Inverse Trigonometric Functions:** Marks-04 Periods-08
Definition, range, domain, principal value branches. Graphs of inverse trigonometric functions. Elementary properties of inverse trigonometric functions.

Unit-II: ALGEBRA

1. Matrices:

Marks-04

Periods-10

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). Invertible matrices, proof of uniqueness of inverse if it exist.

2. Determinants:

Marks-06

Periods-14

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.

Consistency, inconsistency and number of solutions of system of linear equations by example, solving system of linear equations in two or three variables (having unique solution) using inverse of a matrix.

Unit-III: CALCULUS

1. Continuity and Differentiability :

Marks-08

Periods-22

Continuity and differentiability, derivative of composite functions, chain rule, derivatives of inverse trigonometric functions, derivative of implicit function. Concept of exponential and logarithmic functions and their derivatives. Logarithmic differentiation. Derivative of functions expressed in parametric forms. Second order derivatives.

2. Application of Derivatives: **Marks-09** **Periods-22**
 Applications of derivatives : Rate of change, increasing/decreasing functions, 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).

3. Integrals: **Marks-09** **Periods-22**
 Integration as inverse process of differentiation. Integration of a variety of functions by substitution, by partial fractions and by parts.

Evaluation of integrals of the type -

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

$$\int \sqrt{a^2 \pm x^2} dx, \int \sqrt{ax^2 + bx + c} dx \text{ and } \int \sqrt{x^2 - a^2} dx \text{ and problems based on them}$$

Fundamental Theorem of Calculus (without proof). Basic properties of definite integrals and evaluation of definite integrals.

4. Applications of the Integrals: **Marks-04** **Periods-10**
 Applications in finding the area under simple curves, especially lines, arcs of circles/ parabolas/ ellipses (in standard form only).

5. Differential Equations: **Marks-05** **Periods-12**
 Definition, order and degree, general and particular solutions of a differential equation. Solution of differential equations by method of separation of variables, solution of homogeneous differential equations of first order and first degree. Solutions of linear differential equation of the type:

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

Unit-IV: VECTORS AND THREE-DIMENSIONAL GEOMETRY

1. Vectors: **Marks-09** **Periods-22**
 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.

2. Three-dimensional Geometry: **Marks-07** **Periods-18**
 Direction cosines and direction ratios of a line joining two points. Cartesian and vector equation of a line, Angle between two lines, skew lines, shortest distance between two lines.

Unit-V: LINEAR PROGRAMMING **Marks-05** **Periods-10**
 Introduction, related terminology such as constraints, objective function, optimization, graphical method of solution for problems in two variables, feasible and infeasible regions (bounded or unbounded), feasible and infeasible solution, optimal feasible solution.

Unit-VI: PROBABILITY **Marks-06** **Periods-12**
 Multiplication theorem on probability. Conditional probability, independent events, total probability, Baye's theorem. Random variable and its probability distribution.

Appendix

1. Proofs in Mathematics:
 Through a variety of examples related to mathematics and already familiar to the learner, bring out different kinds of proofs: direct, contrapositive, by contradiction, by counter-example.

2. Mathematical Modeling:
 Modeling real-life problems where many constraints may really need to be ignored (continuing from Class XI). However, now the models concerned would use techniques/ results of matrices, calculus and linear programming.

Project Work (Marks : 20, Periods : 10)

Objectives:

- Apply mathematical concepts to practical situations.
- Encourage exploration and creativity.
- Develop logical presentation and communication skills.

Structure of the Project:

- 1) Cover Page (title, student and school details).
- 2) Acknowledgement and Certificate.
- 3) Objective / Aim.
- 4) Theoretical Background.
- 5) Materials or Tools Used.
- 6) Procedure and Observations.
- 7) Calculations, Graphs, Tables, Charts etc.
- 8) Results and Discussion.
- 9) Conclusion.
- 10) Learning Outcomes.
- 11) Bibliography.

Suggested Topics:

Unit 1: Relations & Functions and Inverse Trigonometric Functions

1. Types of relations and functions and their uses.
2. Concepts of inverse trigonometric functions and their graphical representation.
3. Using functions and their inverses to create and decode secret codes.

Unit 2: Algebra (Matrices & Determinants)

1. Applications of matrices and determinants in real-life problems.
2. Cryptography using matrices and determinants.

Unit 3: Calculus

1. Derivatives and their applications.
2. Integrals and their applications.
3. Role of calculus in business and economics.
4. Area under a curve using integrals.
5. Finding maximum and minimum values (e.g., volume) using derivatives.
6. Differential equations in biology and population studies.

Unit 4: Vectors & Three-dimensional Geometry

1. Vectors and their types.
2. Applications of vectors and three-dimensional geometry in physics.
3. Applications of shortest distance in space geometry.

Unit 5: Linear Programming

1. Linear programming in resource management.
2. Maximization and minimization in linear programming.

Unit 6: Probability

1. Applications of conditional probability in different fields.
2. Use of Bayes' theorem and total probability in real-life situations.

Note: Teachers may also assign other project topics that are relevant, practical and appropriate to their students' interests and local context.

Marking Scheme for Project Work:

Sl. No.	Criteria	Marks
1	Relevance of the Topic	3
2	Mathematical Content and Understanding	6
3	Presentation and Creativity	3
4	Viva-Voce	8
Total		20

Role of the Teacher:

- Guide and supervise students in topic selection and execution.
- Encourage conceptual clarity and originality.
- Monitor progress and ensure authenticity of work.
- Evaluate on understanding, accuracy, and presentation.

Conclusion:

The Class XII Mathematics curriculum provides a harmonious integration of theoretical depth and practical utility. By fostering both creative inquiry and analytical rigor, the syllabus ensures that students perceive mathematics not merely as a set of rules, but as a vibrant and indispensable tool for navigating the modern world.

- Recommended textbooks**
1. Mathematics, Part-I published by NCERT
 2. Mathematics, Part-II published by NCERT
 3. Ganit, Pratham Khanda, published by ASSEB, Div-II
 4. Ganit, Dwitiya Khanda, published by ASSEB, Div-II
