MATHEMATICS (XI-XII)
(Code No. 041)
Session – 2021-22

The Syllabus in the subject of Mathematics has undergone changes from time to time in accordance with growth of the subject and emerging needs of the society. Senior Secondary stage is a launching stage from where the students go either for higher academic education in Mathematics or for professional courses like Engineering, Physical and Biological science, Commerce or Computer Applications. The present revised syllabus has been designed in accordance with National Curriculum Framework 2005 and as per guidelines given in Focus Group on Teaching of Mathematics 2005 which is to meet the emerging needs of all categories of students. Motivating the topics from real life situations and other subject areas, greater emphasis has been laid on application of various concepts.

Objectives

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

- 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 gender biases.
- to develop reverence and respect towards great Mathematicians for their contributions to the field of Mathematics.

COURSE STRUCTURE
CLASS XI (2021-22)
TERM - I

One Paper

90 Minutes   **Max Marks: 40**

No.	Units	Marks
I.	Sets and Functions	11
II.	Algebra	13
III.	Coordinate Geometry	6
IV.	Calculus	4
V.	Statistics and Probability	6
	Total	40
	Internal Assessment	10
	Total	**50**

*No chapter-wise weightage. Care to be taken to cover all the chapters.

Unit-I: Sets and Functions

1.   **Sets**

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

2.   **Relations & 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 (R x R only).Definition of relation, pictorial diagrams, domain, co-domain and range of a relation. Function as a special type of relation. 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, signum, exponential, logarithmic and greatest integer functions, with their graphs.

Unit-II: Algebra

1.	**Complex Numbers and Quadratic Equations**

Need for complex numbers, especially $\sqrt{-1}$, to be motivated by inability to solve some of the quardratic equations. Algebraic properties of complex numbers. Argand plane. Statement of Fundamental Theorem of Algebra, solution of quadratic equations (with real coefficients) in the complex number system.

2.	**Sequence and Series**

Sequence and Series. Arithmetic Progression (A. P.). Arithmetic Mean (A.M.) Geometric Progression (G.P.), general term of a G.P., sum of n terms of a G.P., infinite G.P. and its sum, geometric mean (G.M.), relation between A.M. and G.M.

Unit-III: Coordinate Geometry

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 and normal form. General equation of a line. Distance of a point from a line.

Unit-IV: Calculus
1.	**Limits**
 Intuitive idea of limit. Limits of polynomials and rational functions trigonometric, exponential and logarithmic functions
Unit-V: Statistics and Probability
1.	**Statistics**

Measures of Dispersion: Range, mean deviation, variance and standard deviation of ungrouped/grouped data.

INTERNAL ASSESSMENT	10 MARKS
Periodic Test	5 Marks
Mathematics Activities: Activity file record +Term end assessment of one activity & Viva 5 Marks	

Note: For activities NCERT Lab Manual may be referred

One Paper   **Max Marks: 40**

No.	Units	Marks
I.	Sets and Functions (Cont.)	8
II.	Algebra (Cont.)	11
III.	Coordinate Geometry (Cont.)	9
IV.	Calculus (Cont.)	6
V.	Statistics and Probability (Cont.)	6
	Total	40
	Internal Assessment	10
	Total	**50**

Unit-I: Sets and Functions

1. **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 sin2x + cos2x = 1, for all x. Signs of trigonometric functions. Domain and range of trigonometric functions and their graphs. Expressing sin (x±y) and cos (x±y) in terms of sinx, siny, cosx & cosy and their simple applications. Deducing identities like the following:

$$\tan(x \pm y) = \frac{\tan x \pm \tan y}{1 \mp \tan x \tan y} \ , \cot(x \pm y) = \frac{\cot x \cot y \mp 1}{\cot y \pm \cot x}$$

$$\sin\alpha \pm \sin\beta = 2\sin\frac{1}{2}(\alpha \pm \beta)\cos\frac{1}{2}(\alpha \mp \beta)$$

$$\cos\alpha + \cos\beta = 2\cos\frac{1}{2}(\alpha + \beta)\cos\frac{1}{2}(\alpha - \beta)$$

$$cos\alpha - cos\beta = -2sin\frac{1}{2}(\alpha + \beta)sin\frac{1}{2}(\alpha - \beta)$$

Identities related to sin2x, cos2x, tan2 x, sin3x, cos3x and tan3x.

Unit-II: Algebra

1. **Linear Inequalities**

Linear inequalities. Algebraic solutions of linear inequalities in one variable and their representation on the number line. Graphical solution of linear inequalities in two variables. Graphical method of finding a solution of system of linear inequalities in two variables.

2**. Permutations and Combinations**

Fundamental principle of counting. Factorial *n.* (n!) Permutations and combinations, formula for ^nP_r and ^nC_r, simple applications.

Unit-III: Coordinate Geometry

1. Conic Sections

Sections of a cone: circles, ellipse, parabola, hyperbola. Standard equations and simple properties of parabola, ellipse and hyperbola. Standard equation of a circle.

2. Introduction to Three-dimensional Geometry

Coordinate axes and coordinate planes in three dimensions. Coordinates of a point. Distance between two points and section formula.

Unit-IV: Calculus

1. Derivatives

Derivative introduced as rate of change both as that of distance function and geometrically. Definition of Derivative, relate it to scope of tangent of the curve, derivative of sum, difference, product and quotient of functions. Derivatives of polynomial and trigonometric functions.

Unit-V: Statistics and Probability

1. Probability

Random experiments; outcomes, sample spaces (set representation). Events; occurrence of events, 'not', 'and' and 'or' events, exhaustive events, mutually exclusive events, Probability of an event, probability of 'not', 'and' and 'or' events.

INTERNAL ASSESSMENT	10 MARKS
Periodic Test	5 Marks
Mathematics Activities: Activity file record +Term end assessment of one activity & Viva 5 Marks	

Note: For activities NCERT Lab Manual may be referred

- Please refer the guidelines given under XII Mathematics Syllabus:

CLASS-XII
MATHEMATICS (2021-22)
TERM - I

One Paper

90 minutes   **Max Marks: 40**

No.	Units	Marks
I.	Relations and Functions	08
II.	Algebra	10
III.	Calculus	17
V.	Linear Programming	05
	Total	40
	Internal Assessment	10
	Total	50

Unit-I: Relations and Functions

1.   Relations and Functions

Types of relations: reflexive, symmetric, transitive and equivalence relations. One to one and onto functions.

2.   Inverse Trigonometric Functions

Definition, range, domain, principal value branch.

Unit-II: Algebra

1.   Matrices

Concept, notation, order, equality, types of matrices, zero and identity matrix, transpose of a matrix, symmetric and skew symmetric matrices. Operation on matrices: Addition and multiplication and multiplication with a scalar. Simple properties of addition, multiplication and scalar multiplication. Non-commutativity of multiplication of matrices, Invertible matrices; (Here all matrices will have real entries).

2.   Determinants

Determinant of a square matrix (up to 3 x 3 matrices), minors, co-factors and applications of determinants in finding the area of a triangle. Adjoint and inverse of a square matrix. 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

Continuity and differentiability, derivative of composite functions, chain rule, derivative of inverse trigonometric functions, derivative of implicit functions. Concept of exponential and logarithmic functions.

Derivatives of logarithmic and exponential functions. Logarithmic differentiation, derivative of functions expressed in parametric forms. Second order derivatives.

2.   Applications of Derivatives

Applications of derivatives: increasing/decreasing functions, tangents and normals, 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-V: Linear Programming

1.   Linear Programming

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

INTERNAL ASSESSMENT	10 MARKS
Periodic Test	5 Marks
Mathematics Activities: Activity file record +Term end assessment of one activity & Viva 5 Marks	

Note: For activities NCERT Lab Manual may be referred

One Paper

Max Marks: 40

No.	Units	Marks
III.	Calculus	18
IV.	Vectors and Three-Dimensional Geometry	14
VI.	Probability	8
	Total	40
	Internal Assessment	10
	Total	50

Unit-III: Calculus

1. Integrals

Integration as inverse process of differentiation. Integration of a variety of functions by substitution, by partial fractions and by parts, Evaluation of simple integrals of the following types and problems based on them.

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

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

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

2. Applications of the Integrals

Applications in finding the area under simple curves, especially lines, parabolas; area of circles /ellipses (in standard form only) (the region should be clearly identifiable).

3. Differential Equations

Definition, order and degree, general and particular solutions of a differential equation. Solution of differential equations by method of separation of variables, solutions of homogeneous differential equations of first order and first degree of the type: $\frac{dy}{dx} = f(y/x)$. Solutions of linear differential equation of the type:

$$\frac{dy}{dx} + py = q, \text{where p and q are functions of x or constant.}$$

Unit-IV: Vectors and Three-Dimensional Geometry
1. Vectors

Vectors and scalars, magnitude and direction of a vector. Direction cosines and direction ratios of a vector. 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. Definition, Geometrical Interpretation, properties and application of scalar (dot) product of vectors, vector (cross) product of vectors.

2. Three - dimensional Geometry

Direction cosines and direction ratios of a line joining two points. Cartesian equation and vector equation of a line, coplanar and skew lines, shortest distance between two lines. Cartesian and vector equation of a plane. Distance of a point from a plane.

Unit-VI: Probability
1. Probability

Conditional probability, multiplication theorem on probability, independent events, total probability, Bayes' theorem, Random variable and its probability distribution.

INTERNAL ASSESSMENT	10 MARKS
Periodic Test	5 Marks
Mathematics Activities: Activity file record +Term end assessment of one activity & Viva	5 Marks

Note: For activities NCERT Lab Manual may be referred

Assessment of Activity Work:

In first term any 4 activities and in second term any 4 activities shall be performed by the student from the activities given in the NCERT Laboratory Manual for the respective class (XI or XII) which is available on the link : http://www.ncert.nic.in/exemplar/labmanuals.html a record of the same may be kept by the student. A term end test on the activity is to be conducted.

The weightage are as under:

- The activities performed by the student in each term and record keeping
  : 3 marks
- Assessment of the activity performed during the term end test and Viva-voce
  : 2 marks

Prescribed Books:

1) Mathematics Textbook for Class XI, NCERT Publications
2) Mathematics Part I - Textbook for Class XII, NCERT Publication
3) Mathematics Part II - Textbook for Class XII, NCERT Publication
4) Mathematics Exemplar Problem for Class XI, Published by NCERT
5) Mathematics Exemplar Problem for Class XII, Published by NCERT
6) Mathematics Lab Manual class XI, published by NCERT
7) Mathematics Lab Manual class XII, published by NCERT