

# **Mathematics**

## **Class ( XI-XII )**

### **Objectives**

1. To consolidate the Mathematical knowledge and skills acquired at matriculation level.
2. To impart concepts and knowledge of the topics which will help the students to study mathematics at graduation and higher levels.
3. To develop the students to understand various concepts like Matrices, Differentiation, Integration and use them in solving real life problems.
4. To develop analytical thinking and mathematical reasoning among students.
5. To develop the capacity in students to use mathematical skills with modern technological devices such as Calculators, Computers etc.
6. To prepare the students for various state and national level entrance examinations.
7. To develop logical thinking among students.
8. To develop social values like patience, tolerance, co-operation and habit of hardwork through mathematical modeling and mathematical projects.

# **Mathematics**

## **Class XI**

In the class XI the curriculum of Mathematics includes study of sets, relation and functions, Trigonometric functions, Principal of Mathematical Induction, Complex Numbers, Quadratic equations, Linear inequalities, Permutations & combination, Binomial Theorem, Sequence and Series, Straight Lines, Conic Sections, Introduction to three dimensional Geometry, Limits and derivatives, Mathematical Reasoning, Statics and Probability.

### **Set**

The students of Class XI are expected to understand the concept of Sets, equal sets, subsets, power set, universal set and operations on sets. They will be able to apply the knowledge about sets in solving practical problems.

### **Relations and Functions**

The students will learn about relations, functions and domain, co-domain and Range of functions.

### **Trigonometric Functions**

The students will learn about, Trigonometric functions, Identities, Addition-Subtraction formulae, 'A, B' and C, D formulas, Trigonometric ratios of multiple and sub-multiple angles, General solutions of Trigonometric equations, Simple application of Sine and Cosine Formulas, Simple problems of Height and distances.

### **Logarithm**

The students will learn about logarithm of a number, Laws of Logarithm and application of logarithm in simplifying problems.

### **Principle of Mathematical Induction**

The student will be able to apply the Principle of Mathematical Induction in solving Mathematical statements involving natural numbers.

### **Complex Number and Quadratic Equations**

The students are expected to learn about complex numbers, Argand Plane, Operation on complex number and polar representation of complex number. They will be able to find out square root of complex number and cube roots of unity and their properties. They will be able to solve practical problems.

### **Linear inequalities**

Students will be able to learn linear inequalities, their algebraic and graphical solutions and apply them in different situations.

### **Sequence and Series**

The students will be able to learn A.P., G.P. and mixed sequences, their  $n^{\text{th}}$  term, sum upto  $n$  terms and their application in higher studies. They will also learn about special series  $\Sigma n$ ,  $\Sigma n^2$ ,  $\Sigma n^3$ .

### **Permutation and Combination**

Students of XI class will learn about Fundamental principle of counting, basic formulas of Permutation and Combination and their simple application.

### **Binomial Theorem**

They will learn statement and proof of Binomial Theorem for positive, integral index and its applications. Binomial Theorem for any index and its simple application.

## **Co-ordinate Geometry**

1. **Straight Lines** : Students are expected to learn about equation of straight line in different forms (Slope – Intercept form, one point form, two point form, normal form, intercept form) and perpendicular distance of a point from a line.
2. **Conic Section** : They will be able to learn about equations of circle, parabola, hyperbola, ellipse.
3. **Introduction to three-dimensional geometry** : The students will learn co-ordinate axis and co-ordinate planes in three dimensions, distance between two point and section formula.

## **Calculus**

### **Limit Continuity and Derivatives**

Concept of Limit at a point of Algebraic, Trigonometric, exponential and logarithmic functions, continuity of a function and concept of derivative and derivatives of simple functions.

### **Mathematical Reasoning**

Students will learn about basic facts of mathematical reasoning, statements.

### **Statistics**

They will be able to understand dispersion, mean deviation, variance and standard deviation of ungrouped/grouped data.

## **Probability**

They will learn about probability of events involving 'not' 'and' and 'or' events. They will learn about simple space.

## **Appendix**

1. They will learn some important topics as in Appendix :
  - (i) Infinite Geometric Series.
  - (ii) Experimental and Logarithmic series.
  
2. **Mathematical Modelling**

They will be able to focus on modeling problems related to real life (like environment travel etc.)

# Mathematics

## Class XII

### Unit - I

#### 1. Functions

The students of 10+2 class will be able to apply concept of functions, continuity and limits of functions.

#### 2. Inverse Trigonometric Functions

Students will be able to understand concept of inverse functions, inverse trigonometric functions, principal value branches and graphs of inverse trigonometric functions.

### Unit – II

#### Algebra

#### 1. Matrices

At the +2 stage students will be able to understand concept, notation, order of matrices, types of matrices, Addition, Scalar multiplication, multiplication, elementary row and column operations, Invertible matrices and proof of uniqueness of Inverse, if it exists.

#### 2. Determinants

They will be able to understand determinant of square matrix (upto  $3 \times 3$  matrices), properties of determinants, minors, cofactors, Application of determinants in finding area, solution of linear equations having two or three variables and solution of linear equations using inverse of a matrix.

## Unit – III

### Calculus

#### 1. **Continuity and Differentiability**

Students will be able to understand relation between continuity and differentiability. They will be able to find out derivative of composite functions, inverse Trigonometric functions, implicit functions, exponential and logarithmic functions, derivative of functions expressed as parametric functions. Second order derivatives, Rolle's and Lagrange's mean value theorems (without proof) and their geometric interpretations.

#### 2. **Application of Derivatives**

Students will be able to apply the differentiation in Rate of change, increasing/decreasing functions, Tangents and Normals, Maxima and Minima (1<sup>st</sup> derivative and 2<sup>nd</sup> derivative Tests) approximation problems from real life situations.

#### 3. **Integration**

They will be able to apply and use methods of Integration through formulas (Inverse of Differentiation) by substitution partial fractions and by parts and standard formulas for Integration.

They will also learn definite integral, Integral as a limit of a sum, Fundamental theorem of calculus (without proof).

#### 4. **Application of the Integrals**

They will be able to apply integration in finding areas under curves and area enclosed between two curves.

5. **Differential Equations**

Students are expected to understand concept of differential equation, general and particular solution of differential equation, formation of differential equation, solution of differential equations by method of separation of variables, Homogeneous differential equations of first order and first degree and solution of linear differential equation.

**Unit – IV**

**Vectors and Three-Dimensional Geometry**

1. **Vectors**

Students will learn concept of vectors, scalars, magnitude and direction of vectors. Direction cosines of vectors. Components of vectors, Addition and multiplication of a vector by a scalar, scalar (dot) product of vectors, projection of a vector on a line and vector (cross) product of vectors.

2. **Three Dimensional Geometry**

They will learn direction cosines/ratio of line segments, Cartesian and Vector equation of a line, coplanar and skew lines, shortest distance between two lines, Cartesian and vector 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 – V**

3. **Linear Programming**

They will be able to understand concept of linear programming, different types of linear programming problems, mathematical formulation and graphical solution of linear programme problems in two variables feasible and infeasible regions and solutions, optional feasible solution.

## **Unit – VI**

### **Probability**

#### **1. Probability**

They will be able to learn multiplication theorem on probability, conditional probability, independent events, Baye's theorem, probability distribution, mean and variance of random variable, Bernoulli Trials and Binomial distribution.

## **Appendix**

#### **1. Proofs in mathematics**

They will learn different types of proofs, direct, contrapositive, by contradiction etc.

#### **2. Mathematical Modeling**

Mathematical Modeling using techniques/results of matrices, calculus and linear programming.

## Evaluation For Secondary Stage

### (Mathematics)

At Senior Secondary stage (+1, +2) the evaluation techniques will be applied as follows:-

1. **Class Room Discussion** : The teacher will discuss different topics to evaluate the general performance of students.
2. **Assignments** : The performance of students will be evaluated through home and class room assignments.
3. **Projects** : Mathematical modeling and mathematical projects will be undertaken to evaluate the performance of students.
4. **Periodical Tests** : Periodical and Terminal tests will be held having
  - i) Object type Questions 40%
  - ii) Essay type 60%
5. **Oral Test** : Oral tests will be given to evaluate understanding of Formulas, Definitions and Concepts.