CBSE CLASS XII
MATHEMATICS (Code No. 041)

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 likeEngineering, Physical and Bioscience, Commerce or Computer Applications. The present revised syllabus has been designed in accordance with National Curriculum Framework 2005 and as per guidelines given in FocusGroup 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 XII (2017-18)

One Paper (Time: 3 hrs.)

Max Marks: 100

Units		No. of Periods	Marks
I.	Relation and Function	30	10
II.	Algebra	50	13
III.	Calculus	80	44
IV.	Vector and three – Dimensional Geometry	30	17
V.	Linear Programming	20	06
VI.	Probability	30	10
	TOTAL	**240**	**100**

Unit-I: Relations and Functions

1. Relations and Functions (15 Periods)

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 (15 Periods)

Definition, range, domain, principal value branch. Graphs of inverse trigonometric functions.

Elementary properties of inverse trigonometric functions.

Unit-II: Algebra

1. Matrices (25 Periods)

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 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).

2. Determinants (25 Periods)

Determinant of a square matrix (up to 3 x 3 matrices), properties of determinants, minors, co-factors 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 examples, 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 (20 Periods)

Continuity and differentiability, derivative of composite functions, chain rule, derivatives 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. Rolle's and Lagrange's Mean Value Theorems(without proof) and their geometric interpretation.

2. Applications of Derivatives (10 Periods)

Applications of derivatives: rate of change of bodies, increasing/decreasing functions, tangents and normals, use of derivatives in 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).

3. Integrals (20 Periods)

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 basedon them.

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

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

$\int \sqrt{ax^2+bx+c}\,dx$,
$\int (px+q)\sqrt{ax^2+bx+c}\,dx$

Definite integrals as a limit of a sum, Fundamental Theorem of Calculus (without proof).Basic Properties of definite integrals and evaluation of definite integrals.

4. Applications of the Integrals (15 Periods)

Applications in finding the area under simple curves, especially lines, circles/parabolas/ellipses (in standard form only), Area between any of the two above said curves (the region should be clearly identifiable).

5. Differential Equations (15 Periods)

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 ofseparation of variables solutions of homogeneous differential equations of first order and first degree. Solutions of linear differential equation of the type:

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

$\frac{dy}{dx} + px = q, where\, p\, and\, q\, are\, functions\, of\, y\, or$ Constants.

Unit-IV:Vectors and Three-Dimensional Geometry

1. Vectors (15 Periods)

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, scalar triple product of vectors.

2. Three - dimensional Geometry (15 Periods)

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.Angle between (i) two lines, (ii) two planes, (iii) a line and a plane.Distance of a point from a plane.

Unit-V: Linear Programming

1. Linear Programming (20 Periods)

Introduction, 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(bounded and unbounded), feasible and infeasible solutions, optimal feasible solutions (up to three non-trivial constraints).

Unit-VI: Probability

1. Probability (30 Periods)

Conditional probability, multiplication theorem on probability, independent events, total probability, Bayes' theorem, Random variable and its probability distribution, mean and variance of random variable. Repeated independent (Bernoulli) trials and Binomial distribution.

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

MATHEMATICS (CODE - 041)
QUESTION PAPER DESIGN CLASS - XII (2017-18)

Time 3 Hours (Max. Marks: 100)

Typology of Questions:

1. Remembering: (knowledge based simple recall questions, to know specific facts, terms, concepts, principles, or theories, Identify, define, or recite, information)
VSA (1 mark) : 2 questions
SA (2 marks) : 2 questions

LA-I (4 marks) : 2 questions
LA-II (6 marks) : 1 questions
Total Questions : 7 questions
Total Marks : 20 Marks
% Weightage: 20%

2. Understanding: (Comprehension - to be familiar with meaning and to understand conceptually, interpret, compare, contrast, explain, paraphrase information)
VSA (1 mark) : 1 question
SA (2 marks) : 3 questions
LA-I (4 marks) : 4 questions
LA-II (6 marks) : 2 questions
Total Questions : 10 questions
Total Marks : 35 Marks
% Weightage: 35%

3. Application: (Use abstract information in concrete situation, to apply knowledge to new situations, Use given content to interpret a situation, provide an example, or solve a problem)
VSA (1 mark) : 1 question
SA (2 marks) : 0 questions
LA-I (4 marks) : 3 questions
LA-II (6 marks) : 2 questions
Total Questions : 6 questions
Total Marks : 25 Marks
% Weightage: 25%

4. High Order Thinking Skills: (Analysis & Synthesis: Classify, compare, contrast, or differentiate between different pieces of information, Organize and/or integrate unique pieces of information from a variety of Sources.
VSA (1 mark) : 0 question
SA (2 marks) : 3 questions
LA-I (4 marks) : 1 questions
LA-II (6 marks) : 0 question

Total Questions : 4 questions
Total Marks : 10 Marks
% Weightage: 10%

5. Evaluation: (Appraise, judge, and/or justify the value of worth of a decision or outcome, or to predict outcomes based on values)
VSA (1 mark) : 0 question
SA (2 marks) : 0 question
LA-I (4 marks) : 1 question (value based)
LA-II (6 marks) : 1 question
Total Questions : 2 questions
Total Marks : 10 Marks
% Weightage: 10%

Question-wise break-up

Type of Question	Marks per question	Total no. of questions	Total Marks
VSA	**1**	**4**	**4**
SA	**2**	**8**	**16**
LA-I	**4**	**11**	**44**
LA-II	**6**	**6**	**36**
Total		**29**	**100**

1. No chapter wise weightage. Care to be taken to cover all the chapters.
2. Suitable internal variations may be made for generating various templates keeping the overall weightageto different form of questions and typology of questions same.

Choice(s): There will be no overall choice in the question paper. However, 30% internal choices will be given in 4 marks and 6 marks questions.