3. 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. 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 which is to meet the emerging needs of all categories of students. Motivating the topics from real life problems and other subject areas, greater emphasis has been laid on applications of various concepts.

The curriculum at Secondary stage primarily aims at enhancing the capacity of students to employ Mathematics in solving day-to-day life problems and studying the subject as a separate discipline. It is expected that students should acquire the ability to solve problems using algebraic methods and apply the knowledge of simple trigonometry to solve problems of heights and distances. Carrying out experiments with numbers and forms of geometry, framing hypothesis and verifying these with further observations form inherent part of Mathematics learning at this stage. The proposed curriculum includes the study of number system, algebra, geometry, trigonometry, mensuration, statistics, graphs and coordinate geometry etc.

The teaching of Mathematics should be imparted through activities which may involve the use of concrete materials, models, patterns, charts, pictures, posters, games, puzzles and experiments.

OBJECTIVES

The broad objectives of teaching of Mathematics at secondary stage are to help the learners to:

- consolidate the Mathematical knowledge and skills acquired at the upper primary stage;
- acquire knowledge and understanding, particularly by way of motivation and visualization, of basic concepts, terms, principles and symbols and underlying processes and skills.
- develop mastery of basic algebraic skills;
- develop drawing skills;
- feel the flow of reasons while proving a result or solving a problem.
- apply the knowledge and skills acquired to solve problems and wherever possible, by more than one method.
- to develop positive ability to think, analyze and articulate logically;
- 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 necessary skills to work with modern technological devices such as calculators, computers etc;

- to develop interest in mathematics as a problem-solving tool in various fields for its beautiful structures and patterns, etc;
- to develop reverence and respect towards great Mathematicians for their contributions to the field of Mathematics.
- to develope 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.

General Instructions

- As per CCE guidelines, the syllabus of Mathematics for classes IX and X has been divided termwise.
- The units specified for each term shall be assessed through both formative and summative assessments.
- In each term, there will be two formative assessments, each carrying 10% weightage.
- The summative assessment in term I will carry 30% weightage and the summative asssessment in the II term will carry 30% weightage.
- Listed laboratory activities and projects will necessarily be assessed through formative assessments.

Course Structure
Class IX

First Term		Marks : 90
UNITS		**MARKS**
I.	NUMBER SYSTEM	17
II.	ALGEBRA	25
III.	GEOMETRY	37
IV.	CO-ORDINATE GEOMETRY	06
V.	MENSURATION	05
	TOTAL (THEORY)	**90**

UNIT I : NUMBER SYSTEMS

1. REAL NUMBERS **(18) Periods**

Review of representation of natural numbers, integers, rational numbers on the number line. Representation of terminating / non-terminating recurring decimals, on the number line through successive magnification.

Rational numbers as recurring/terminating decimals.

Examples of nonrecurring / non terminating decimals such as $\sqrt{2}$, $\sqrt{3}$, $\sqrt{5}$ etc. Existence of non-rational numbers (irrational numbers) such as $\sqrt{2}$, $\sqrt{3}$ and their representation on the number line. Explaining that every real number is represented by a unique point on the number line and conversely, every point on the number line represents a unique real number.

Existence of $\sqrt{x}$ for a given positive real number x (visual proof to be emphasized).

Definition of nth root of a real number.

Recall of laws of exponents with integral powers. Rational exponents with positive real bases (to be done by particular cases, allowing learner to arrive at the general laws.)

Rationalization (with precise meaning) of real numbers of the type (& their combinations)

$\frac{1}{a + b\sqrt{x}}$ & $\frac{1}{\sqrt{x} + \sqrt{y}}$ where x and y are natural number and a and b are integers.

UNIT II : ALGEBRA

1. POLYNOMIALS (23) Periods

Definition of a polynomial in one variable, its coefficients, with examples and counter examples, its terms, zero polynomial. Degree of a polynomial. Constant, linear, quadratic and cubic polynomials; monomials, binomials, trinomials. Factors and multiples. Zeros/roots of a polynomial / equation. State and motivate the Remainder Theorem with examples and analogy to integers. Statement and proof of the Factor Theorem. Factorization of $ax^2 + bx + c$, $a \neq 0$ where a, b and c are real numbers, and of cubic polynomials using the Factor Theorem.

Recall of algebraic expressions and identities. Further verification of identities of the type $(x + y + z)^2 = x^2 + y^2 + z^2 + 2xy + 2yz + 2zx$, $(x \pm y)^3 = x^3 \pm y^3 \pm 3xy\,(x \pm y)$, $x^3 \pm y^3 = (x \pm y)\,(x^2 \pm xy + y^2)$,

$x^3 + y^3 + z^3 - 3xyz = (x + y + z)\,(x^2 + y^2 + z^2 - xy - yz - zx)$ and their use in factorization of polymonials. Simple expressions reducible to these polynomials.

UNIT III : GEOMETRY

1. INTRODUCTION TO EUCLID'S GEOMETRY (6) Periods

History - Geometry in India and Euclid's geometry. Euclid's method of formalizing observed phenomenon into rigorous mathematics with definitions, common/obvious notions, axioms/postulates and theorems. The five postulates of Euclid. Equivalent versions of the fifth postulate. Showing the relationship between axiom and theorem, for example:

(Axiom) 1. Given two distinct points, there exists one and only one line through them.

(Theorem) 2. (Prove) Two distinct lines cannot have more than one point in common.

2. LINES AND ANGLES (10) Periods

1. (Motivate) If a ray stands on a line, then the sum of the two adjacent angles so formed is 180° and the converse.
2. (Prove) If two lines intersect, the vertically opposite angles are equal.
3. (Motivate) Results on corresponding angles, alternate angles, interior angles when a transversal intersects two parallel lines.
4. (Motivate) Lines, which are parallel to a given line, are parallel.
5. (Prove) The sum of the angles of a triangle is 180°.
6. (Motivate) If a side of a triangle is produced, the exterior angle so formed is equal to the sum of the two interior opposite angles.

3. TRIANGLES (20) Periods

1. (Motivate) Two triangles are congruent if any two sides and the included angle of one triangle is equal to any two sides and the included angle of the other triangle (SAS Congruence).
2. (Prove) Two triangles are congruent if any two angles and the included side of one triangle is equal to any two angles and the included side of the other triangle (ASA Congruence).
3. (Motivate) Two triangles are congruent if the three sides of one triangle are equal to three sides of the other triangle (SSS Congruene).
4. (Motivate) Two right triangles are congruent if the hypotenuse and a side of one triangle are equal (respectively) to the hypotenuse and a side of the other triangle.
5. (Prove) The angles opposite to equal sides of a triangle are equal.
6. (Motivate) The sides opposite to equal angles of a triangle are equal.
7. (Motivate) Triangle inequalities and relation between 'angle and facing side' inequalities in triangles.

UNIT IV : COORDINATE GEOMETRY

1. COORDINATE GEOMETRY (9) Periods

The Cartesian plane, coordinates of a point, names and terms associated with the coordinate plane, notations, plotting points in the plane, graph of linear equations as examples; focus on linear equations of the type $Ax + By + C = 0$ by writing it as $y = mx + c$.

UNIT V : MENSURATION

1. AREAS (4) Periods

Area of a triangle using Hero's formula (without proof) and its application in finding the area of a quadrilateral.