2. Objectives :

The basic objectives of teaching mathematics at the senior secondary stage is to develop among students a sound analytical ability, deep logical interpretation with sharp thinking and application of mathematics into various other branches of science and humanities (Bio-Mathematics, Environmental Mathematics, Mathematical Economics). Developing problem-solving ability and to be able to formulate real-life situation, mathematically.

The mathematization of the concepts has been stressed upon rather than rote learning, at this stage. The proposed syllabus is an amalgamation of the present Bihar Syllabus and new NCERT-syllabus in a way that the broad headings given in the new NCERT-syllabus have been retained while the contents of both the syllabi have been incorporated keeping in mind. For example "chord of contact, equations of tangents and normals, condition of tangency of a line", have been included in the co-ordinate give a better understanding together with a tool to increase problem solving ability.

The present NCERT syllabus has been retained with few additions but no deletion, presuming the Class-XI. Examination will be internal assessment of the school and questions in the Board Examination would be asked from Class-XII portion of the syllabi. It may be proposed that twenty per cent (20%) of the total weightage be given on objective type questions and rest on "short answer" questions fully based on the syllabus with main focus being given on the application of mathematical concepts and ideas.

The teachers need to use more figures, sketches of various curves while delivering their lectures in the classes. This helps the students visualise the abstract ideas, thereby making the transition to abstraction easier. For the sake of convenience of teachers and students, the syllabus is presented in an explicit form.

COURSE-STRUCTURE

Class-XI

One Paper **Three Hours** **Max. Marks : 100**

Units		Marks
1.	Mathematical Logic, Sets and Functions	26
2.	Algebra	30
3.	Trigonometry	10
4.	Co-ordinate Geometry	14
5.	Elements of Calculus	08
6.	Statistics and Probability	12
		100

3. Outlines of the Syllabus (For Class-XI):

UNIT-I : MATHEMATICAL LOGIC, SETS & FUNCTIONS : ***(Periods-12)***

1. **Sets :** Sets and their representations, Finite & infinite sets, Empty sets, Equal sets, Subsets, Power sets, Universal sets, Venn diagrams, Operations on sets (Union, Intersection, Difference of sets), Complement of a set, Application of sets. De Morgan's Law, Intervals in the set of real numbers.
2. **Relations and Functions :** Ordered pairs, cartesian product of two sets, Number of elements in the cartesian product of two finite sets. Definition of a relation, function as a special kind of relation between two sets. Pictorial representation of a relation and function, Real-valued functions of a real variable. Domain, Co-domain and range of such functions, Different types of functions and their basic properties (Constant, identity, Polynomial, Modulus, Signum, Greatest-integer function), Injective, surjective and bijective functions Sum, Difference, Product of functions, Graphs of all such functions. Symmetry and transformation of graph of functions, understanding the graphs of $f(x+a)$, $f(x)+a$, $f(ax)$, $a,f(x)$, $-f(x)$, $f(|x|)$, $|f(x)|$ if the graph $f(x)$ is known. Basic properties of modulus, exponential and logarithmic functions. ***(Periods-15)***

3. **Mathematical Logic :** Statement, basic logical connectives (words/phrases). Use of Venn diagrams in logic, Negative operation, Compound statements and their negations. Concepts and understanding of quantifiers ("If and only if", "implies", "implied by", "and/or", "and", "or", "for all", "there exists") Validation of statements, Difference between contradiction, converse and contrapositive statements. ***(Periods-12)***
Truth tables, tautology, Duality, Algebra of statements, Applications of logic in solving simple problems. Kind of proofs; direct, contrapositive, by contradiction by counter example. Conditional and biconditional statements, valid arguments.

4. **Boolean Algebra :** Boolean algebra as an algebraic structure. Principle of duality, Boolean functions, Application of Boolean Algebra in Switching Circuit.***(Periods-04)***

UNIT-II : ALGEBRA

1. **Sequence and Series :** Definition of a sequence as a function, Example of finite and infinite sequences, general terms of an A.P., G.P. and H.P. Properties of A.P. and G.P. and their application. Concept of A.M., G.M. and H.M. and relation between them. Difference between a sequence and a series. Sum of the first n terms of an A.P., G.P. Sum of an infinite G.P. Sum of an Arithmeticogeometric series. Evaluation Σn, Σn^2 and Σn^3. Simple application of means, Inequalities. ***(Periods-12)***

2. **Complex numbers :** Need for complex numbers to be motivated by inability to solve every quadratic equation. Brief description of algebraic properties of complex numbers. Representation of complex numbers as points on Argand plane, polar representation. Statement of Fundamental theorem of Algebra, solution of Fundamental theorem of Algebra, solution of quadratic equations in the complex number system. Modulus and arguments of complex numbers. Triangle inequality, Square root of a complex number, cube root of unity. ***(Periods-10)***

3. **Quadratic equations and expressions :** Quadratic equations and expressions. Symmetric functions of roots, formation of quadratic equations with given roots, common roots, Extreme values of quadratic expressions. ***(Periods-08)***

4. **Permutation & Combination :** Fundamental Principle of counting. Concept of Factorial of non-negative integers. Permutations and combinations, Derivative of formulae and their connections, simple applications (including, permutations in groups and cyclic permutations). ***(Periods-10)***

5. **Principle of Mathematical Induction :** The need for mathematical induction. The principle of mathematical induction and simple applications. ***(Periods-04)***

6. **Binomial Theorem :** History, statement and proof of the bionimal theorem for positive integral indices. Pascal's triangles, general and middle term in binomial expansion, simple applications. ***(Periods-08)***

7. **Logarithm :** Definition with respect to a given base and natural base, properties and application to simple problems. ***(Periods-04)***

8. **Some important Infinite Series :** Binomial Theorem for negative and fractional indices exponential and logarithmic series with proper conditions on the variable and without proof, simple applications. ***(Periods-06)***

UNIT-III : TRIGONOMETRY ***(Periods-18)***

Positive and negative angle, Measuring angles in radians & in degrees and conversion from one measure to another. Definition of trigonometric functions. Trigonometric ratios of general angles. Effect of adding one or more right angles to the argument. Periodic functions, Periods of trigonometric functions, signs of trigonometric functions, Graphs of sine, cosine, tangent and their reciprocal functions. General

solutions of trigonometric equations. Compound angles. Multiple and submultiple angles. Transformation formula. Conditional identities.

Relation between sides and angles of a triangle. Area of triangle. circum-radius, in-radius and ex-radii and relation between them. Application to simple problems. De Moivre's theorem and application to simple problems. *(Periods-09)*

UNIT-IV : CO-ORDINATE GEOMETRY

1. **Straight lines :** Standard general equation of a straight line, Intersection of lines, Equation of bisectors of angle between two straight lines. Slope of a line and angle between two lines. Various forms of equations of a line, concurrency of three lines, concurrency of medians (centroid), angle-bisectors (incentre), altitudes (ortho-centre) and perpendicular-bisectors (circum-centre).
2. **Conic Sections :** Definition of a conic by focus directrix property, sections of a cone : circle, ellipse, parabola, hyperbola, a point, a straight line and pair of intersecting lines as a degenerated case of a conic section. Standard equations and simple properties of circle, parabola ellipse and hyperbola. Equation of tangent and normal. Locus of a point, simple problems. *(Periods-12)*
3. **Introduction of three dimensional geometry, cordinate axis and dimensional coord'nate, coordinates of a point - on plane, distance between two points and section formula.** *(Periods-18)*

UNIT-V : ELEMENTS OF CALCULUS

Recall Unit-1, Sections 3 (Real-valued functions of a single variable and their graphs). Concepts of limit & continuity. Derivative introduced as rate of change both as that of distance functions and geometrically, intuitive idea of limit and continuity. Definition of derivative, relate it to slope of tangent of the curve, Relation between continuity and differentiability. Derivative of sum, difference, product and quotient of a function, Derivative of polynomial and trigonometric functions. *(Periods-08)*

UNIT-VI : STATISTICS & PROBABILITY

1. **Statistics :** Measure of central tendency and dispersion, variance, mean deviation and standard deviation of ungrouped / grouped data. Analysis of frequency distributions with equal means but different variances and variance of combined distribution.

2. **Probability :** Random experiments, outcomes, sample spaces (set representation). Events : occurence of events, 'not', 'and' & 'or events, exhaustive events, mutually exclusive events. Axiomatic (set theorotic probability) Connections with the theories of earlier classes. Probability of an event, probability of 'not', 'and' & 'or' events. *(Periods-10)*

Note : Focus should be laid on formulation of problems related to real-life situations (like environments, travel etc.) and connections with other subjects of study.

✣

वर्ग- XII

विषय- गणित

यूनिट-1 : सम्बन्ध एवं फलन (Relation and Function)

1.1 **सम्बन्ध और फलन–** सम्बन्ध के प्रकार (प्रतिवर्तीय (Reflexive), सममीति (Symmetric), संक्राभी (Transitive), तुल्य संबंध, फलनों का संयोजन, प्रतिलोम फलन, द्वि-चर संक्रिया)।

1.2 **व्युत्क्रम त्रिकोणमितिय फलन–** प्रारंभिक अवधारणा एवं गुण, परिभाषा, परिसर, प्रांत, व्यापक और मुख्य मान, व्युत्क्रम त्रिकोणमितिय फलनों का आरेख और इनके प्रारंभिक गुण।