COURSE STRUCTURE
CLASS XI (2019-20)

One Paper   **Total Period–240 [35 Minutes Each]**

Three Hours   **Max Marks: 80**

No.	Units	No. of Periods	Marks
I.	Sets and Functions	60	23
II.	Algebra	70	30
III.	Coordinate Geometry	40	10
IV.	Calculus	30	05
V.	Mathematical Reasoning	10	02
VI.	Statistics and Probability	30	10
	Total	240	80
	Internal Assessment		20

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

Unit-I: Sets and Functions

1.   Sets   (20) Periods

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.Difference of sets. Complement of a set. Properties of Complement.

2.   Relations & Functions   (20) Periods

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 (upto R x R x R).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. Sum, difference, product and quotients of functions.

3. Trigonometric Functions   (20) Periods

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 $\sin 2x + \cos 2x = 1$, 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:

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

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

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

$$- \qquad = -2\frac{1}{2}(+)\frac{1}{2}(-)$$

Identities related to sin2x, cos2x, tan2 x, sin3x, cos3x and tan3x. General solution of trigonometric equations of the type siny = sina, cosy = cosa and tany = tana.

Unit-II: Algebra

1. Principle of Mathematical Induction   (10) Periods

Process of the proof by induction, motivating the application of the method by looking at natural numbers as the least inductive subset of real numbers.The principle of mathematical induction and simple applications.

2. Complex Numbers and Quadratic Equations   (15) Periods

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 and polar representation of complex numbers.Statement of Fundamental Theorem of Algebra, solution of quadratic equations (with real coefficients) in the complex number system.Square root of a complex number.

3.   Linear Inequalities   **(15) Periods**

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.

4.   Permutations and Combinations   **(10) Periods**

Fundamental principle of counting.Factorialn. (n!) Permutations and combinations, derivation ofFormulae forn and n and their connections, simple applications.

5.   Binomial Theorem   **(10) Periods**

History, statement and proof of the binomial theorem for positive integral indices.Pascal's triangle, General and middle term in binomial expansion, simple applications.

6.   Sequence and Series   **(10) Periods**

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. Formulae for the following special sums.

$$k, \quad k \text{ and} \quad k$$

Unit-III: Coordinate Geometry

1.   Straight Lines   **(10) Periods**

Brief recall of two dimensional geometry from earlier classes. Shifting of origin. 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.Equation of family of lines passing through the point of intersection of two lines.Distance of a point from a line.

2.   Conic Sections   **(20) Periods**

Sections of a cone: circles, ellipse, parabola, hyperbola, a point, a straight line and a pair of intersecting lines as a degenerated case of a conic section. Standard equations and simple properties of parabola, ellipse and hyperbola.Standard equation of a circle.

3.   **Introduction to Three-dimensional Geometry**   **(10) Periods**

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

Unit-IV: Calculus

1.   **Limits and Derivatives**   **(30) Periods**

Derivative introduced as rate of change both as that of distance function and geometrically.Intuitive idea of limit.Limits of polynomials and rational functions trigonometric, exponential and logarithmic functions.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: Mathematical Reasoning

1.   **Mathematical Reasoning**   **(10) Periods**

Mathematically acceptable statements. Connecting words/ phrases - consolidating the understanding of "if and only if (necessary and sufficient) condition", "implies", "and/or", "implied by", "and", "or", "there exists" and their use through variety of examples related to real life and Mathema tics. Validating the statements involving the connecting words, difference among contradiction, converse and contrapositive.

Unit-VI: Statistics and Probability

1.   **Statistics**   **(15) Periods**

Measures of Dispersion: Range, Mean deviation, variance and standard deviation of ungrouped/grouped data. Analysis of frequency distributions with equal means but different variances.

2.   **Probability**   **(15) Periods**

Random experiments; outcomes, sample spaces (set representation). Events; occurrence of events, 'not', 'and' and 'or' events, exhaustive events, mutually exclusive events, Axiomatic (set theoretic) probability, connections with other theories of earlier classes. Probability of an event, probability of 'not', 'and' and 'or' events.

MATHEMATICS

QUESTION PAPER DESIGN

CLASS – XI (2019-20)

Time : 3Hours   **Max. Marks: 80**

S. No.	Typology of Questions	Very Short Answer-Objective type (VSA) (1 Mark)	Short Answer-I (SA) (2 Marks)	Long Answer-I (SA) (4 Marks)	Long Answer (LA) (6 Marks)	Total Marks	% Weightage
1	Remembering: Exhibit memory of previously learned material by recalling facts, terms, basic concepts, and answers.	4	1	1	1	16	20
2	Understanding: Demonstrate understanding of facts and ideas by organizing, comparing, translating, interpreting, giving descriptions, and stating main ideas	6	2	3	1	28	35
3	Applying: Solve problems to new situations by applying acquired knowledge, facts, techniques and rules in a different way.	6	2	1	1	20	25
4	Analysing : Examine and break information into parts by identifying motives or causes. Make inferences and find evidence to support generalizations Evaluating: Present and defend opinions by making judgments about information, validity of ideas, or quality of work based on a set of criteria. Creating: Compile information together in a different way by combining elements in a new pattern or proposing alternative solutions	4	1	1	1	16	20
	Total	20x1 =20	6x2 =12	6x4=24	4x6=24	80	100

QUESTION-WISE BREAK-UP

Type of Question	Mark per Question	Total No. of Questions	Total Marks
VSA	1	20	20
SA	2	6	12
LA I	4	6	24
LA II	6	4	24
Total		36	80

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 weightage to different form of questions and typology of questions same.**

Choice(s):

There will be no overall choice in the question paper.

INTERNAL ASSESSMENT	20 MARKS
PeriodicTests (Best 2 out of 3 tests conducted)	10 Marks
Mathematics Activities	10 Marks

However, 33% internal choices will be given

Note: Please refer the guidelines given under XII Mathematics Syllabus: