Applied Mathematics

Grade XI-XII

Secondary School Education prepares students to explore future career options after graduating from the school. Mathematics is an important subject helps students to choose various fields of their choices. Mathematics is widely used in higher studies in the field of Economics, Commerce, Social Sciences and many other. It has been observed that the syllabus of Mathematics meant for Science subjects may not be appropriate for the students pursuing Commerce or Social Science-based subjects in university education. By keeping this in mind, one more elective course in Mathematics syllabus is developed for Sr. Secondary classes with an aim to provide students relevant experience in Mathematics which can be used in the fields other than Physical Sciences.

This course is designed to develop substantial mathematical skills and methods needing in other subject areas. Topics covered in two years aim to enable students to use mathematical knowledge in the field of business, economic and social sciences. It aims to promote appreciation of mathematical power and simplicity for its countless applications in diverse fields. The course continues to develop mathematical language and symbolism to communicate and relate everyday experiences mathematically. In addition, it reinforces the logical reasoning skills of formulating and validating mathematical arguments, framing examples, finding counter examples. It encourages students to engage in mathematical investigations and to build connections within mathematical topics and with other disciplines. The course prepares students to use algebraic methods as a means of representation and as a problem-solving tool. It also enables students to interpret two dimensional geometrical figures using algebra and to further deduce properties of geometrical figures in coordinate system. The course content will help students to develop sound understanding of descriptive and inferential statistics which they can use to describe and analysis a give set of data and to further make meaningful inferences out of it. Data based case studies from the field of business, economics, psychology, education, biology and census data will be used to appreciate the power of data in contemporary society.

It is expected that the subject is taught connecting concepts to the application in various fields. The objectives of the course areas are as follows:

Objectives:

a) To develop an understanding of basic mathematical and statistical tools and their applications in the field of commerce (business/ finance/economics) and social sciences;
b) To model real world experiences/problems into mathematical expressions using numerical/algebraic/graphical representation;
c) To make sense from the data by organizing, representing, interpreting, analysing, and to make meaningful inferences from the real-world situations;
d) To develop logical reasoning skills and apply the same in simple problem solving;

e) To reinforce mathematical communication by formulating conjectures, validating logical arguments and testing hypothesis;

f) To make connections between Mathematics and other disciplines.

Grade XI

One Paper Each) Total Period–240 (35 Minutes

Three Hours Max Marks: 80

No.	Units	No. of Periods	Marks
I.	Numbers, Quantification and Numerical Applications	20	09
II.	Algebra	35	10
III.	Mathematical Reasoning	15	06
IV.	Calculus	30	10
V.	Probability	30	10
VI.	Descriptive Statistics	35	12
VII	Basics of Financial Mathematics	55	18
VIII	Coordinate Geometry	20	05
	Total	240	80
	Internal Assessment		20

Unit I Numbers, Quantification and Numerical Applications

- Prime Numbers, Encryptions using Prime Numbers
- Binary Numbers
- Complex Numbers (Preliminary idea only)
- Indices, Logarithm and Antilogarithm
- Laws and properties of logarithms
- Simple applications of logarithm and antilogarithm
- Numerical problems on averages, calendar, clock, time, work and distance, mensuration, seating arrangement

Unit II Algebra

- Sets
- Types of sets
- Venn diagram
- De Morgan's laws
- Problem solving using Venn diagram

- Relations and types of relations
- Introduction of Sequences, Series
- Arithmetic and Geometric progression
- Relationship between AM and GM
- Basic concepts of Permutations and Combinations
- Permutations, Circular Permutations, Permutations with restrictions
- Combinations with standard results

Unit III Mathematical and Logical Reasoning

- Mathematically acceptable statements
- Connecting words/ phrases in Mathematical statement 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 Mathematics
- Problems based on logical reasoning (coding-decoding, odd man out, blood relation, syllogism etc)

Unit IV Calculus

- Introducing functions
- Domain and Range of a function
- Types of functions (Polynomial function; Rational function; Composite function; Logarithm function; Exponential function; Modulus function; Greatest Integer function, Signum function)
- Graphical representation of functions
- Concept of limits and continuity of a function
- Instantaneous rates of change
- Differentiation as a process of finding derivative
- Derivatives of algebraic functions using Chain rule
- Tangent line and equations of tangents

Unit V Probability

- Random experiment, sample space, events, mutually exclusive events
- Independent and Dependent Events
- Law of Total Probability
- Bayes' Theorem

Unit VI Descriptive Statistics

- Types of data (raw data, univariate data, bivariate and multi-variate data)
- Data on various scales (nominal, ordinal, interval and ratio scale)
- Data representation and visualization
- Data interpretation (central tendency, dispersion, deviation, variance, skewness and kurtosis)
- Percentile rank and quartile rank
- Correlation (Pearson and Spearman method of correlation)
- Applications of descriptive statistics using real time data

Unit VII Basics of Financial Mathematics

- Interest and interest rate
- Accumulation with simple and compound interest
- Simple and compound interest rates with equivalency
- Effective rate of interest
- Present value, net present value and future value
- Annuities, calculating value of regular annuity
- Simple applications of regular annuities (up to 3 period)
- Tax, calculation of tax and simple applications of tax calculation in Goods and service tax, Income Tax
- Bills, tariff rates, fixed charge, surcharge, service charge
- Calculation and interpretation of electricity bill, water supply bill and other supply bills

(Comparing interest rates on various types of savings; calculating income tax; electricity bills, water bill; service surcharge using realistic data)

Unit VIII Coordinate Geometry

- Straight Line
- Circles
- Parabola
  (only standard forms and graphical representation on two-dimensional plane)

Practical: Use of spread sheet

Calculating average, interest (simple and compound), creating pictographs, drawing pie chart, bar graphs, calculating central tendency; visualizing graphs (straight line, circles and parabola using real time data)

Suggested practical using spread sheet

1. Plot the graph of functions on excel; study the nature of function at various points, drawing lines of tangents;
2. Create budget of income and spending;
3. Create compare sheet of price, features to buy a product;
4. Prepare best option plan to buy a product by comparing cost, shipping charges, tax and other hidden cost;
5. Smart purchasing during sale season;
6. Prepare a report card using scores of last four exams and compare the performance;
7. Collect the data on weather, price, inflation, and pollution. Sketch different types of graphs.