MIZORAM BOARD OF SCHOOL EDUCATION
AIZAWL – 796012

Dated Aizawl, the 25th November, 2026

N O T I C E

No.J.11017/1/2018-MBSE (Acad)/104 : It is hereby notified for the information of all concerned that Mizoram Board of School Education is introducing Applied Mathematics in lieu of Business Mathematics in the Commerce Stream at the Higher Secondary Stage.

The subject shall be offered to students of Class - XI with effect from the academic session 2027 - 2028 and to students of Class - XII with effect from the academic session 2028 - 2029. Accordingly, students of Class - XII shall continue to study Business Mathematics during the academic session 2027 - 2028.

The syllabus prescribed for Applied Mathematics, as enclosed herewith, and the textbooks recommended by the Board shall be followed accordingly.

The HSSLC Examination in Applied Mathematics shall be conducted in accordance with the syllabus prescribed for the subject, with effect from the HSSLC Examination, 2029, onwards, until further orders.

Enclo: As above

Sd/- SARAH LALENGZAMI PACHUAU
Secretary
Mizoram Board of School Education

Memo No.J.11017/1/2018–MBSE(Acad)/104 : Dated Aizawl, the 25th November, 2026
Copy to:-

1. The Commissioner & Secretary to the Govt. of Mizoram, School Education Department.
2. The Director of School Education, Govt. of Mizoram, for information.
3. The Controller of Examinations, MBSE.
4. Regional Officer, MBSE Regional Office, Lunglei.
5. All District Education Officers, for information with a request to inform all Principals of Higher Secondary Schools having Commerce stream under their jurisdiction.
6. System Administrator, MBSE, for uploading in the official website.
7. Guard files Nos.1&10

25/11/26
(DAVID LALALAWMIKIMA FANAI)
Director (Academic)
Mizoram Board of School Education

APPLIED MATHEMATICS SYLLABUS (Classes XI – XII)

CLASS – XI

UNIT – 1: NUMBERS, QUANTIFICATION AND NUMERICAL APPLICATIONS

1.1 Binary Numbers
- Introduction to Binary Number System
- Conversion of decimal numbers to binary system and vice-versa and its applications.

1.2 Indices, Logarithm and Antilogarithm
- Indices and its properties
- Common and Natural logarithm
- Laws of logarithms
- Logarithm and exponential as inverse operations
- Procedure of finding logarithm and antilogarithms of given number
- Applications of logarithms

Numbers in day-to-day life

1.3 Clocks
- Evaluate the angular value of a minute
- Measure of angle formed between two hands of clock at given time
- Calculation of the time for which hands of clock meet

1.4 Calendar
- Odd days in a month/ year/ century
- Decode the day for the given date

1.5 Time and Work
- Relationship between work and time
- Comparison of the work done by the individual / group w.r.t. time

1.6 Speed, Distance and Time
- The time taken/ distance covered from the given data.

1.7 Seating arrangement
- Creation of seating plan/ draft as per given conditions (Linear/circular).
- Locating the position of a person in a seating arrangement.

UNIT – 2: ALGEBRA

2.1 Introduction to Sets – Sets and their representation
- Set as well-defined collection of objects.
- Representation of a set in Roster form and Set builder form
- Different types of sets on the basis of number of elements in the set
- Differentiate between equal set and equivalent set

2.2 Subsets, Intervals as subsets

- Subsets
- Power set and its elements
- Universal Set
- Subset of real numbers as intervals

2.3 Venn Diagrams and Operations on Sets

- Concept of Venn diagram to understand the relationship between sets
- Problems using Venn diagram
- Operations on sets

Relations

2.4 Ordered pairs - Cartesian product of two sets

- Significance of specific arrangement of elements in a pair
- Cartesian product of two sets

2.5 Relations

- Expressing relation as a subset of Cartesian product
- Domain and range of a relation

Mathematical Logic

2.6 Mathematical Logic

- Logical problems involving odd man out, syllogism, blood relation and coding-decoding

Sequences and Series

2.7 Sequence and Series

- Differentiate between sequence and series

2.8 Arithmetic Progression

- Arithmetic mean (AM) of two positive numbers

2.9 Geometric Progression

- Introduction of Geometric Progression (GP)
- $n^{t\square}$ term of a GP
- sum of n terms and sum of infinite terms of a GP
- Problems based on applications of GP
- Geometric mean (GM) of two positive numbers
- Relation between AM and GM and related problems
- Application problems based on AP and GP

UNIT – 3: CALCULUS

Functions

3.1 Functions and their graphs

- Dependent and independent variables
- Definition of function using dependent and independent variable
- Domain, range and co-domain of a given function
- Types of functions
- Graphical representation of function

Limits, Continuity and Derivatives

3.2 Limits and continuity of functions

- Limit of a function
- Continuity of a function

3.3 Differentiation

- Instantaneous rate of change
- Finding the derivative of the functions

3.4 Algebra of derivatives

- Differentiation of addition, subtraction, multiplication and division of two or more functions
- Differentiation of a function of a function

UNIT – 4: PERMUTATIONS AND COMBINATIONS & PROBABILITY

Combinatorics

4.1 Combinatorics

- Factorial of a number
- Fundamental Principle of Counting
- Concept of Permutation
- Simple problems based on permutations
- Define combination
- Difference between permutation and combination
- Problems based on Combinations

Probability

4.2 Probability

- Random experiment and sample space with suitable examples
- Event and its types
- Concept of Probability
- Problems based on calculating probabilities in real life situations
- Concept of conditional probability

UNIT – 5: DESCRIPTIVE STATISTICS

Measures of Dispersion and Percentiles

5.1 Measures of Dispersion

- Meaning of dispersion in a data set
- Range, mean deviation, standard deviation and variance

5.2 Percentiles

- Concept of Percentile rank
- Calculate and interpret Percentile rank of scores in a given ungrouped data set.

Correlation

5.3 Correlation

- Concept of Correlation
- Karl Pearson's coefficient of Correlation for ungrouped data
- Spearman's Rank Correlation for ungrouped data

Regression

5.4 Regression

- Concept of Regression analysis
- Dependent and Independent variables
- Regression Coefficients
- Regression Equations
- Properties of Regression Equations

UNIT – 6: FINANCIAL MATHEMATICS

Interests and Annuities

6.1 Interest and Interest Rates

- Concept of Interest Rates
- Comparison between Nominal Interest Rate, Effective Rate and Real Interest Rate
- Practical applications of interest rate w.r.t simple and compound interest
- Concept of effective rate of interest

6.2 Annuities

- Meaning of Immediate Annuity, Annuity due and Deferred Annuity
- Future and present value of ordinary annuity, annuity due (up to 3 period)
- Concept of Annuity in real life situations

Tax and Utility Bills

6.3 Taxes and Utility Bills

- Concept of Income tax and GST w.r.t. tax new tax guidelines
- Utility bills and its various types – Electricity, Water and PNG Bills

UNIT – 7: COORDINATE GEOMETRY

Straight Lines

7.1 Straight lines

- Concept of slope of a line
- Various forms of equation of line

Circles and Parabola

7.2 Circles and Parabola

- Determination of the equations of circle and parabola as a locus of a point in a plane under certain conditions
- Different form of equations of a circle
- Solve problems based on applications of circle

Suggested Practicals using spreadsheet:

1. Visualizing Functions and their Properties: Plotting graphs of functions in GeoGebra to observe how coefficients change the graph's shape and to find out their domain and range graphically.
2. Understanding Derivatives: Constructing a tangent line to a curve in GeoGebra and observing its slope as the point moves and demonstrating the derivative as the instantaneous rate of change.
3. Personal Budgeting: Designing a comprehensive monthly budget tracker in a spreadsheet to manage income and expenditures using summation and percentage formulas.
4. Comparative Cost-Benefit Analysis: Building a decision-making model to identify the most economical purchase for a high-value product by comparing cost, shipping charges, tax and other hidden costs.
5. Descriptive Measures of Data: Using spreadsheet functions (e.g., AVERAGE, STDEV.P etc.) to compute the mean, median, mode, variance, and standard deviation of a raw dataset.
6. Interest Growth Analysis: Developing a comparative sheet for Simple vs. Compound Interest to track the growth of an investment over time.
7. Environmental & Economic Data Modelling: Analysing real-world datasets regarding local weather, inflation or AQI by generating and interpreting scatter plots, histograms, bar graphs etc. to identify correlations and seasonal trends.

CLASS – XII

UNIT-1: NUMBERS, QUANTIFICATION AND NUMERICAL APPLICATIONS

Numbers & Quantification

1.1 Modulo Arithmetic
- Define modulus of an integer
- Apply arithmetic operations using modular arithmetic rules

1.2 Congruence Modulo
- Define congruence modulo
- Apply the definition in various problems

1.3 Alligation and Mixture
- Understand the rule of alligation to produce a mixture at a given price
- Determine the mean price of a mixture
- Apply rule of allegation

1.4 Numerical Problems - Solve real life problems mathematically
- Boats and Streams (upstream and downstream)
- Distinguish between upstream and downstream
- Express the problem in the form of an equation
- Pipes and Cisterns
- Determine the time taken by two or more pipes to fill or empty the tank
- Races and Games
- Compare the performance of two players w.r.t. time, distance

1.5 Numerical Inequalities
- Describe the basic concepts of numerical inequalities
- Understand and write numerical inequalities

UNIT – 2: ALGEBRA

2.1 Matrices and types of matrices
- Define matrix
- Identify different kinds of matrices. Find the size / order of matrices

2.2 Equality of matrices, Transpose of a matrix, Symmetric and Skew symmetric matrix
- Determine equality of two matrices
- Write transpose of given matrix
- Define symmetric and skew symmetric matrix

2.3 Algebra of Matrices
- Perform operations like addition & subtraction on matrices of same order
- Perform multiplication of two matrices of appropriate order
- Perform multiplication of a scalar with matrix

2.4 Determinants

- Find determinant of a square matrix

2.5 Inverse of a matrix

- Define the inverse of a square matrix
- Apply properties of inverse of matrices

2.6 Solving system of simultaneous equations using matrix method and Cramer's rule

- Solve the system of simultaneous equations using
  i Cramer's Rule
  ii Inverse of coefficient matrix

- Formulate real life problems into a system of simultaneous linear equations and solve it using these methods

UNIT – 3: CALCULUS

Differentiation and its Applications

3.1 Derivatives up to second order

- Determine derivatives up to second order
- Understand differentiation of parametric functions and implicit functions

3.2. Application of Derivatives

- Determine the rate of change of various quantities

3.3 Marginal Cost and Marginal Revenue using derivatives

- Define marginal cost and marginal revenue
- Find marginal cost and marginal revenue

3.4 Increasing /Decreasing Functions

- Determine whether a function is increasing or decreasing
- Determine the conditions for a function to be increasing or decreasing

3.5 Maxima and Minima

- Determine critical points of the function
- Find the point(s) of local maxima and local minima and corresponding local maximum and local minimum values
- Find the absolute maximum and absolute minimum value of a function
- Solve applied problems related to optimization of cost, revenue and profit only.

Integration and its Applications

3.6 Integration

- Understand and determine indefinite integrals of simple functions as anti-derivative

3.7 Indefinite Integrals as family of curves

- Evaluate indefinite integrals of simple algebraic functions by method of:
  i. substitution
  ii. partial fraction
  iii. by parts

3.8 Definite Integrals as area under the curve

- Define definite integral as area under the curve
- Understand fundamental theorem of Integral calculus and apply it to evaluate the definite integral

3.9 Application of Integration

- Identify the region representing consumer surplus and producer surplus graphically
- Apply the definite integral to find consumer surplus-producer surplus

Differential Equations and Modeling

3.10 Differential Equations

- Recognize a differential equation
- Find the order and degree of a differential equation

3.11 Formulating and Solving Differential Equations

- Formulate differential equation
- Verify the solution of differential equation
- Solve simple differential equation using variable separable method only

UNIT – 4: PROBABILITY DISTRIBUTIONS

4.1 Probability Distribution

- Understand the concept of Random Variables and its Probability Distributions
- Find probability distribution of discrete random variable

4.2 Mathematical Expectation

- Apply arithmetic mean of frequency distribution to find the expected value of a random variable

4.3 Variance

- Calculate the Variance and S.D. of a random variable

4.4 Binomial Distribution

- Identify the Bernoulli Trials and apply Binomial Distribution
- Evaluate Mean, Variance and S.D of a binomial distribution

4.5 Poison Distribution

- Understand the conditions of Poisson Distribution
- Evaluate the Mean and Variance of Poisson distribution

4.6 Normal Distribution

- Understand normal distribution is a continuous distribution
- Evaluate value of standard normal variate
- Area relationship between Mean and Standard Deviation

UNIT – 5: INFERENTIAL STATISTICS

5.1 Population and Sample

- Define Population and Sample
- Differentiate between population and sample
- Define a representative sample from a population
- Differentiate between a representative and non- representative sample
- Draw a representative sample using simple random sampling
- Draw a representative sample using and systematic random sampling

5.2 Parameter and Statistics and Statistical Interferences

- Define Parameter with reference to Population
- Define Statistics with reference to Sample
- Explain the relation between Parameter and Statistic
- Explain the limitation of Statistic to generalize the estimation for population
- Interpret the concept of Statistical Significance and Statistical Inferences
- State Central Limit Theorem
- Explain the relation between Population-Sampling Distribution-Sample

5.3 t-Test (one sample t-test and for a small group sample)

- Define a hypothesis
- Differentiate between Null and Alternate hypothesis
- Define and calculate degree of freedom
- Test Null hypothesis and make inferences using t-test statistic for one group

UNIT – 6: TIME-BASED DATA

6.1 Time Series

- Identify time series as chronological data

6.2 Components of Time Series

- Distinguish between different components of time series

6.3 Time Series analysis for univariate data

- Solve practical problems based on statistical data and interpret the result

6.4 Secular Trend

- Understand the long-term tendency

6.5 Methods of Measuring trend

- Demonstrate the techniques of finding trend by different methods

UNIT – 7: FINANCIAL MATHEMATICS

7.1 Perpetuity, Sinking Funds

- Explain the concept of perpetuity and sinking fund
- Calculate perpetuity
- Differentiate between sinking fund and saving account

7.2 Valuation of Bonds

- Define the concept of valuation of bond and related terms.
- Calculate value of bond using present value approach

7.3 Calculation of EMI

- Explain the concept of EMI
- Calculate EMI using various methods

7.4 Compound Annual Growth Rate

- Understand the concept of Compound Annual Growth Rate
- Differentiate between Compound Annual Growth Rate and Annual Growth Rate
- Calculate Compound Annual Growth Rate

7.5 Linear method of Depreciation

- Define the concept of linear method of Depreciation
- Interpret cost, residual value and useful life of an asset from the given information
- Calculate depreciation

UNIT – 8: LINEAR PROGRAMMING

8.1 Introduction and related terminology

- Familiarize with terms related to Linear Programming Problem

8.2 Mathematical formulation of Linear Programming Problem

- Formulate Linear Programming Problem upto 3 non-trivial constraints

8.3 Different types of Linear Programming Problems

- Identify and formulate different types of LPP

8.4 Graphical method of solution for problems in two variables

- Draw the Graph for a system of linear inequalities involving two variables and to find its solution graphically

8.5 Feasible and Infeasible Regions

- Identify feasible, infeasible, bounded and unbounded regions

8.6 Feasible and infeasible solutions, optimal feasible solution

- Understand feasible and infeasible solutions
- Find optimal feasible solution

Practical: Use of spreadsheet

Graphs of an exponential function, demand and supply functions on Excel and study the nature of function at various points, maxima/minima, Matrix operations using Excel

Suggested practical using the spreadsheet

i) Plot the graphs of functions on excel and study the graph to find out the point of maxima/minima
ii) Probability and dice roll simulation
iii) Matrix multiplication and the inverse of a matrix
iv) Stock Market data sheet on excel
v) Collect the data on weather, price, inflation, and pollution analyze the data and make meaningful inferences
vi) Collect data from newspapers on traffic, sports activities and market trends and use excel to study future trends

List of Suggested projects (Class XI /XII)

i) Use of prime numbers in coding and decoding of messages
ii) Prime numbers and divisibility rules
iii) Logarithms for financial calculations such as interest, present value, future value, profit/loss etc. with large values)
iv) The cardinality of a set and orders of infinity
v) Comparing sets of Natural numbers, rational numbers, real numbers and others
vi) Use of Venn diagram in solving practical problems
vii) Fibonacci sequence: Its' history and presence in nature
viii) Testing the validity of mathematical statements and framing truth tables
ix) Investigating Graphs of functions for their properties
x) Visit the census site of India http://www.censusindia.gov.in/Census_Data_2001/Census_Data_Online/Language/State ment3.html Depict the information given there in a pictorial form
xi) Prepare a questionnaire to collect information about money spent by your friends in a month on activities like travelling, movies, recharging of the mobiles, etc. and draw interesting conclusions
xii) Check out the local newspaper and cut out examples of information depicted by graphs. Draw your own conclusions from the graph and compare it with the analysis given in the report
xiii) Analysis of population migration data – positive and negative influence on urbanization
xiv) Each day newspaper tells us about the maximum temperature, minimum temperature, and humidity. Collect the data for a period of 30 days and represent it graphically. Compare it with the data available for the same time period for the previous year
xv) Analysis of career graph of a cricketer (batting average for a batsman and bowling average for a bowler). Conclude the best year of his career. It may be extended for other players also – tennis, badminton, athlete

xvi) Vehicle registration data – correlating with pollution and the number of accidents

xvii) Visit a village near Delhi and collect data of various crops over the past few years from the farmers. Also, collect data about temperature variation and rain over the period for a particular crop. Try to find the effect of temperature and rain variations on various crops

xviii) Choose any week of your ongoing semester. Collect data for the past 10 – 15 years for the amount of rainfall received in Delhi during that week. Predict the amount of rainfall for the current year

xix) Weather prediction (prediction of monsoon from past data)

xx) Visit Kirana shops near your home and collect the data regarding the sales of certain commodities over a month. Try to figure out the stock of a particular commodity which should be in the store in order to maximize the profit

xxi) Stock price movement

xxii) Risk assessments by insurance firms from data

xxiii) Predicting stock market crash

xxiv) Predicting the outcome of an election – exit polls

xxv) Predicting mortality of infants