New Alipore College

Department of Mathematics

Three-year B.Sc. in Mathematics (Honours)

1st Semester Honours

Sl. No.	Paper	Course Out Come
1	Core Course-1 Calculus, Geometry & Vector Analysis	After completion of the course, students learn the techniques to compute limits, derivatives and integrals of a function and also the applications of vector algebra in real life problems. The knowledge of Geometry (2 Dimension and 3 Dimension) will help the students to compare 2D shapes and 3D objects as well as an understanding that 3D objects compose our environments and are all around us.
2	Core Course-2 Algebra	Learning algebra helps to develop one's critical thinking skills, that includes problem solving, logic, patterns and reasoning.

2nd Semester Honours

Sl. No.	Paper	Course Out Come
1	Core Course-3 Real Analysis	Learn the fundamental properties of the real numbers that underpin the formal development of real analysis.Also get an idea of the theory of sequence, series &continuity.
2	Core Course-4 Group Theory-I	Students learn to extend group structure to finite permutation groups and also to generate groups under given specific conditions. Students acquire the knowledge on algebra of logic.

3rd Semester Honours

Sl. No.	Paper	Course Out Come
1.	Core Course-5 Theory of Real Functions	On successful completion of this course, students will be able to compute and analysis limits, continuity& differentiabilityof functions.
2	Core Course-6 Ring Theory & Linear Algebra-I	This subject enables the students to acquire knowledge about various topics under ring theory and to use the axioms that define a ringand also to know the basic properties of rings arising from these axioms. Students learn the correspondence between the set of ideals and the set of all congruences on a ring. They learn to compute and use eigenvectors and eigen values & also Cayley-Hamilton theorem and its use in finding the inverse of a matrix.

3	Core Course-7 ODE & Multivariate Calculus-I	They will learn to classify ODEs. Students will also learn to visualize and manipulate ODEs in numerical, and symbolic form. Students will understand the concepts of existence and uniqueness of solutions. Students get the idea on maximal and normal property of the gradient, tangent planes, optimization problems and also to help themto develop the ability to solve problems using multivariate calculus.
4.	Skill Enhancement Course-A C Programming Language	Students get the complete knowledge of C language and they will be able to develop logics which will help them to create programs, applications in C

4th Semester Honours

Sl. No.	Paper	Course Out Come
1.	Core Course-8 Riemann Integration & Series of Functions	They learn about theory and applications of Riemann Integration of bounded real valued functions, integrability of sum, scalar multiple, product, quotient, modulus of Riemann integrable functions and properties. They also gets knowledge on convergence of improper integrals, power series& it's convergence and sum of Fourier series.
2	Core Course-9 PDE & Multivariate Calculus-II	Learn to formulate physical problems as PDEs and understand analogies between mathematical descriptions of different (wave) phenomena in physics and engineering. They also learn to classify PDEs and apply analytical methods and interpret the solutions. Learn the concept of upper sum, lower sum, upper integral, lower-integral, the double integral and also the computational techniques to determine volume and surface area by multiple integrals.
3	Core Course-10 Mechanics	Students get the knowledge on the parameters defining the motion of mechanical systems and their degrees of freedom. They learn on the study of the interaction of forces between solids in mechanical systems,Centre of mass and inertia of mechanical systems and applications of mechanics.
4.	Skill Enhancement Course-B Scientific computing with SageMath/ R	After completion of the course students are able to install and read data files in R/ SageMath. They will also learn to perform various operations and apply the common functions to manipulate and analyze data using basic R/SsgeMath.

5th Semester Honours

Sl. No.	Paper	Course Out Come
1.	Core Course-11 Probability & Statistics	They will be able to calculate probabilities using Conditional probability, rule of total probability and Bayes' theorem. They will also be able to explain the concept of random variable, the probability distributions and to analyze statistical data.
2	Core Course-12 Group Theory-II & Linear Algebra-II	Learn the applications of factor groups to automorphism groups, external direct product and its properties, Inner product spaces, dual spaces and diagonalization of symmetric matrices,
3	Discipline Specific Elective- A (1) Bio Mathematics	At the end of the course, students should have an enhanced knowledge and understanding of mathematical modeling and statistical methods in the analysis of biological systems, be better able to assess biological inferences that rest on mathematical and statistical arguments.
4.	Discipline Specific Elective- B (1) Linear Programming& Game Theory	Students will learn the techniques for modelling and solving many real-world operational problems. They will linear the inequalities and convex sets, primal simplex method, duality, integer programming and the two-person zero sum problems/ matrix games.

6th Semester Honours

Sl. No.	Paper	Course Out Come
1.	Core Course-13 Metric Space & Complex Analysis	They will understand and learn the concept of a metric space and be able to recognize standard examples. Be familiar with the fundamental notions of continuity, convergence and compactness. Students will be able to identify curves and regions in the complex plane defined by simple expressions, basic properties of complex integration and having the ability to compute such integrals. They learn when a function is analytic.
2	Core Course-14 Numerical Methods	Students learn to derive numerical methods for various mathematical operations and tasks, such as interpolation, differentiation, integration, the solution of linear and nonlinear equations, and the solution of differential equations.
3	Core Course-14 Practical Numerical Methods Lab	They learn to compute the values of any mathematical task with the help of the numerical methods like, interpolation, differentiation, integration, the solution of linear and nonlinear equations and the solution of differential equations with the help of computer software programming.
4	Discipline Specific Elective- A (2) Mathematical Modelling	The course provides rigorous instruction in fundamental mathematical concepts and skills presented in the context of real-world applications. Students also learn about power series solution of Bessel'sequationandLegendre'sequation,Laplacetransformandinversetransform.
5	Discipline Specific Elective- B (2) Point Set Topology	Students learn about an intense foundation in fundamental concepts of point-set topology. They learn about Topological spaces, basis and sub-basisfor a topology, countability, connected spaces and the concept of compactness in metric space.

Three-year B.Sc. in Mathematics (General)

Sl. No.	Semester	Paper	Course Out Come
1	1st Semester	Core Course-1A Mathematics-CC1/GE1 [Algebra-I, Differential Calculus-I, Differential Equation-I, Coordinate Geometry]	Learning algebra helps to develop one's critical thinking skills, that includes problem solving, logic, patterns and reasoning. They will also be able to solve second order and higher order linear differential equations, to compute derivativesand itsapplications. The knowledge of Geometry (2 Dimension and 3 Dimension) will help the students to compare 2D shapes and 3D objects as well as an understanding that 3D objects compose our environments and are all around us.
2	2nd Semester	Core Course-1B Mathematics- CC2/GE2 [Differential Calculus-II, Differential Equation-II, Vector Algebra, Discrete Mathematics]	They learn about convergence and divergence of Infinite series of constant terms, Mean value theorems, application of principle of maxima and minima for a function in single variable in geometrical and physical problems. They also learn about solution of linear homogeneous and non-homogeneous equations with constant coeffcients. Students learn about vector operations and its applications in Geometry & Mechanics.Principle of Mathematical Induction, Application of Congruences.
3	3rd Semester	Core Course 1C Mathematics- CC3/GE3 [Integral Calculus, Numerical Methods, Linear Programming]	They learn to evaluate definite integrals, Improper Integrals. Students also learn to derive numerical methods for various mathematical operations and tasks, such as interpolation, integration, the solution of linear and nonlinear equations, techniques for modelling and solving many real-world operational problems. They will linear about convex sets, primal simplex method, duality.
4.		Skill Enhancement Course-1 (SEC A) C Programming Language	The study will provide complete knowledge of C language. Students will be able to develop logics which will help them to create programs, applications in C. Also by learning the basic programming constructs they can easily switch over to any other language in future.

5.	4th Semester	Core Course 1D Mathematics- CC4/GE4 [Algebra-II, Computer Science & Programming, Probability & Statistics]	Students will learn about Group Theory, Ring, Field, Concept of Vector space over a Field and Eigen Values & Eigen Vectors. The study will provide complete knowledge on Computer generations and computer anatomy, number syatems, concepts on different programming languages and Algorithms & FlowCharts. They will be able to calculate probabilities using Conditional probability, rule of total probability and Bayes' theorem. They will also be able to explain the concept of random variable, the probability distributions and to analyze statistical data.
6.		Skill Enhancement Course 2-(SEC B) Mathematical Logic	After completion of the course students are expected to be able to: Analyze logical propositions via truth tables
7.	5th Semester	Skill Enhancement Course-3 (SEC A) Object Oriented Programming in C++	They learn to demonstrate an understanding of algorithms in the problem-solving process, identify the necessary properties of good problem-solving techniques, Create and analyze algorithms for solving simple problems.
8.		Discipline Specific Elective-1A Particle Dynamics	They understand and use basic terms for the description of the motion of particles, vector functions and the fundamental laws of Newtonian mechanics.
9.	6th Semester	Skill Enhancement Course-4 (SEC B) Boolean Algebra	They learn to use truth tables and laws of identity, distributive, commutative and domination. They learn to compute sum of products and product of sum expansions and convert boolean expressions to logic gates and vice-versa.
10.		Discipline Specific Elective-1B (DSE B) Mathematical Finance	Students will learn to demonstrate understanding of concepts relating to functions and annuities,employ methods related to these concepts in a variety of financial applications. They also apply logical thinking to problem solving in contextand use appropriate technology to aid problem solving.