

# SEWNARAWAN RAMESWAR FATEPURIA COLLEGE

## Department of Mathematics

**Name of the Programme: B.Sc. (Programme/General) in Mathematics**

### **Programme Specific Outcome (PSO) and Course Outcome(CO)**

Mathematics is an indispensable tool for much of science and engineering. It provides the basic language for understanding the world and lends precision to scientific thought. The mathematics program at University of Kalyani aims to provide a foundation for pursuing research in Mathematics as well as to provide essential quantitative skills to those interested in related fields. The current focus in higher education is to shift from Teacher-centric approach to learner centric approach. For this as one of the aims, UGC has introduced the learning outcomes-based curriculum framework for undergraduate education. The learning outcomes-based curriculum framework for B.Sc. (Programme.) Mathematics is prepared keeping this in view. The framework is expected to provide a student with knowledge and skills in mathematics along with generic and transferable skills in other areas that help in personal development, employment and higher education in the global world. The programme-learning outcomes and course learning outcomes have been clearly specified to help prospective students, parents and employers understand the nature and extent of the degree programme; to maintain national and international standards, and to help in student mobility.

Each unit of this syllabus i.e. course has been formulated for some specific outcomes which are as follows

- [1].It develops a greater global awareness of mathematics and mathematical sciences and prepares to face the problems in future.
- [2].It develops and provides an effective way of building mental discipline.
- [3].It develops and helps to have analytical thinking which generates to the ability to investigate to know the truth about the world around us.
- [4].Financial mathematics can help the students to create the money in a legal way.
- [5].Geometry, Algebra, Calculus can help the students to understand the most complicated problems of modern scientific worlds.
- [6].It develops the problem-solving skill.
- [7].It helps to understand the computer programming and computer technology.
- [8].After the completion of these courses the students will acquire skills in thinking more logically in Mathematics, as well as they will understand the importance of C programming.

## SEMESTER-I

Course Code	Course Title	Course Credit	Full Marks	Course Outcome
UG B.Sc-G-CC-T-01	Algebra & Analytical Geometry	6	75	<p>This course will enable the students to</p> <ul style="list-style-type: none"> <li>▪ Transform the co-ordinate system especially by Rotation of axes, thus reducing different second-degree equations to their corresponding simplest forms and also classify the conics using the discriminant.</li> <li>▪ Become familiar with the polar equations of conics &amp; their tangents and normal.</li> <li>▪ Learn about equivalent classes and cardinality of a set.</li> <li>▪ Use modular arithmetic and basic properties of congruences.</li> <li>▪ Recognize the mathematical objects that are groups, and classify them as abelian and permutation groups, etc.</li> <li>▪ Rank of a matrix and how to solve system of linear equations.</li> <li>▪ Become familiar with polynomial ,nature of roots of an equation ,relation between roots and coefficients ,cardan's method .</li> <li>▪ Employ De Moivre's theorem in a number of applications to solve numerical problems.</li> </ul>

## SEMESTER-II

Course Code	Course Title	Course Credit	Full Marks	Course Outcome
UG B.Sc-G-CC-T-02	Calculus & Differential equation	6	75	<p>This course will enable the students to</p> <ul style="list-style-type: none"> <li>▪ Become familiar with limit and continuity by using <math>\epsilon - \delta</math> definition</li> <li>▪ Learn first and second and higher derivative tests for relative extrema and apply the knowledge in problems in business, economics and life sciences.</li> <li>▪ Application of derivative on real valued function like Rolle's , Lagrange's ,Cauchy ,Taylor's theorems. Also maximum value and minimum value of a function using derivative .</li> <li>▪ Reduction formula of integration .</li> <li>▪ Learn first and second and higher derivative tests for relative extrema and apply the knowledge in problems in business, economics and life sciences.</li> <li>▪ Sketch curves in a plane using its mathematical properties in the different coordinate systems of reference over cross-sectional areas.</li> <li>▪ Learn basics of differential equations and mathematical modelling</li> <li>▪ Formulate differential equations for various mathematical models.</li> </ul>

## SEMESTER-III

Course Code	Course Title	Course Credit	Full Marks	Course Outcome
UG B.Sc-G-CC-T-03	Theory of Real Analysis	6	75	<p>This course will enable the students to</p> <ul style="list-style-type: none"> <li>▪ Become familiar with properties of <math>\mathbb{R}</math>.</li> <li>▪ Idea of countable sets ,uncountable sets</li> <li>▪ Bounded set ,unbounded sets , suprema and infima .</li> <li>▪ Become familiar with interior point ,limit point ,open sets ,closed sets derived sets and their properties .</li> <li>▪ Know about sequence ,bounded sequence , convergent sequence , monotonic sequence and properties .</li> <li>▪ Infinite series ,series of positive terms ,alternating series and their convergence criterion .</li> </ul>
UG B.Sc-G-SEC-T-1A	Logic & Sets	2	50	<p>This course will enable the students to</p> <ul style="list-style-type: none"> <li>▪ Explain and apply basic notions of symbolic logic.</li> <li>▪ Define proposition and argument.</li> <li>▪ Explain propositional connectives.</li> <li>▪ Explain and exemplify truth value status of a proposition.</li> <li>▪ Use truth tables and laws of identity, distributive, commutative, and domination.</li> <li>▪ Compute sum of products and product of sum expansions.</li> <li>▪ Become familiar with set ,Venn diagram</li> <li>▪ operations on sets : Union ,Intersection , Difference ,Symmetric difference etc.</li> <li>▪ Relation , equivalence relation , partitions</li> </ul>
UG B.Sc-G-SEC-T-1B	Vector Calculus	2	50	<p>The course will enable the students to</p> <ul style="list-style-type: none"> <li>▪ Become familiar with dot product ,cross product ,Differentiation ,partial differentiation of vector.</li> <li>▪ Application of derivative : Gradient ,Divergence ,Curl with application .</li> <li>▪ Become familiar with vector integration (line ,surface ,volume) and their application : Green's ,Stoke's theorem</li> </ul>

## SEMESTER-IV

Course Code	Course Title	Course Credit	Full Marks	Course Outcome
UG B.Sc-G-CC-T-04	Linear Programming Problem & Game Theory	6	75	<p>The course will enable the students to</p> <ul style="list-style-type: none"><li>▪ Learn about the graphical solution of linear programming problem with two variables.</li><li>▪ Learn about the relation between basic feasible solutions and extreme points. Understand the theory of the simplex method used to solve linear programming problems.</li><li>▪ Learn about two-phase and big-M methods to deal with problems involving artificial variables.</li><li>▪ Learn about the relationships between the primal and dual problems.</li><li>▪ Solve transportation and assignment problems.</li><li>▪ Apply linear programming method to solve two-person zero-sum game problems.</li></ul>
UG B.Sc-G-SEC-T-2A	Graph Theory	2	50	<p>This course will enable the students to</p> <ul style="list-style-type: none"><li>▪ Understand the basics of graph theory and learn about social networks, Eulerian and Hamiltonian graphs, diagram tracing puzzles and knight's tour problem.</li><li>▪ Learn about the applications of graph theory in the study of shortest path algorithms.</li></ul>
UG B.Sc-G-SEC-T-2B	Operating System (Linux)	2	50	<p>This course will enable the students to the student should be able to: Identify and use UNIX/Linux utilities to create and manage simple file processing operations, organize directory structures with appropriate security, and develop shell scripts to perform more complex tasks.</p>

## SEMESTER-V

Course Code	Course Title	Course Credit	Full Marks	Course Outcome
UG B.Sc-G-DSE-T-1A	Group theory & Linear algebra	6	75	<p>The course will enable the students to</p> <ul style="list-style-type: none"> <li>▪ Analyse the subgroups of cyclic groups and classify subgroups of cyclic groups.</li> <li>▪ Explain the significance of the notion of cosets, normal subgroups and Quotient groups.</li> <li>▪ Understand the basics of Vector space ,Linear combination of vectors ,Linear span ,Linear independence ,Basis and dimension of subspace</li> <li>▪ Eigen value and eigen vector .</li> <li>▪ Become familiar with Linear transformation and its matrix representation ,rank and nullity .</li> </ul>
UG B.Sc-G-DSE-T-1B	Complex Analysis	6	75	<p>The course will enable the students to</p> <ul style="list-style-type: none"> <li>▪ Learn the significance of differentiability of complex functions leading to the understanding of Cauchy–Riemann equations.</li> <li>▪ Learn some elementary functions and valuate the contour integrals.</li> <li>▪ Understand the role of Cauchy–Goursat theorem and the Cauchy integral formula.</li> <li>▪ Expand some simple functions as their Taylor and Laurent series, classify the nature of singularities, find residues and apply Cauchy Residue theorem to evaluate integrals.</li> </ul>
UG B.Sc-G-SEC-T-3A	Theory of Probability	2	50	<p>The course shall enable students to</p> <ul style="list-style-type: none"> <li>▪ Learn about probability density and moment generating functions.</li> <li>▪ Know about various univariate distributions such as Bernoulli, Binomial, Poisson, gamma and exponential distributions.</li> <li>▪ Learn about distributions to study the joint behavior of two random variables. Measure the scale of association between two variables, and to establish a formulation helping to predict one variable in terms of the other, i.e., correlation and linear regression.</li> </ul>
UG B.Sc-G-SEC-T-3B	Boolean Algebra	2	50	<p>The course will enable the students to</p> <ul style="list-style-type: none"> <li>▪ Understand the basics of Boolean algebra ,ordered sets ,map between ordered sets ,Latices as ordered sets ,product and homeomorphisms</li> <li>▪ Convert Boolean expressions to logic gates and vice-versa.</li> <li>▪ Switching circuits and applications .</li> </ul>

## SEMESTER-VI

Course Code	Course Title	Course Credit	Full Marks	Course Outcome
UG B.Sc-G-DSE-T-2A	Dynamics of a Particle	6	75	<p>After completion of this course, the students will be able to learn and explain different concepts on Mechanics:</p> <ul style="list-style-type: none"> <li>▪ Coplanar forces in general, An arbitrary force system in space: Moment of a force about an axis, Varignon's theorem. Resultant force and resultant couple, Equilibrium in the presence of sliding Friction force, Virtual work, Stability of equilibrium: Conservative force field, Kinematics of a particle, Newton laws of motion and law of gravitation, Problems in particle dynamics, Motion of a projectile in a resisting medium.</li> </ul>
UG B.Sc-G-DSE-T-2B	Numerical Methods	6	75	<p>The course will enable the students to</p> <ul style="list-style-type: none"> <li>▪ Learn some numerical methods to find the zeroes of nonlinear functions of a single variable and solution of a system of linear equations, up to a certain given level of precision.</li> <li>▪ Know about methods to solve system of linear equations, such as Gauss–Jacobi, Gauss–Seidel and SOR methods.</li> <li>▪ Interpolation techniques to compute the values for a tabulated function at points not in the table.</li> <li>▪ Applications of numerical differentiation and integration to convert differential equations into difference equations for numerical solutions.</li> </ul>
UG B.Sc-G-SEC-T-4A	Programming in 'C'	2	50	<p>After completion of this paper, student will be able to</p> <ul style="list-style-type: none"> <li>▪ Understand and apply the programming concepts of C which is important to mathematical investigation and problem solving.</li> <li>▪ Learn about structured data-types in C and learn about applications in factorization of an integer and understanding Cartesian geometry and Pythagorean triples.</li> <li>▪ Use of containers and templates in various applications in algebra. Use mathematical libraries for computational objectives.</li> <li>▪ Represent the outputs of programs visually in terms of well formatted text and plots.</li> <li>▪ Understand and apply the programming in solving numerical problems .</li> </ul>
UG B.Sc-G-SEC-T-4B	Programming in Python	2	50	<p>After completion of this paper, student will be able to</p> <ul style="list-style-type: none"> <li>• Describe the basics of the Python programming language.</li> <li>• Install Python and write your first program.</li> <li>• Use variables to store, retrieve and calculate information.</li> <li>• Utilize core programming tools such as functions and loops.</li> <li>▪ Understand and apply the programming in solving numerical problems .</li> </ul>