

SEWNARAWAN RAMESWAR FATEPURIA COLLEGE

Department of Mathematics

Name of the Programme: B.Sc. (Major) in Mathematics

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

Semester- I , II , III , IV

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. With the maturing of the Indian industry, there is a large demand for people with strong analytical skills and broad-based background in the mathematical sciences. 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. (Major) 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.

The curriculum for B.Sc. (Major) Mathematics is prepared keeping in mind the needs and aspirations of students in mathematics as well as the evolving nature of mathematics as a subject. The course learning outcomes and the programme learning outcomes specify the knowledge, understanding, skills, attitudes and values that a student completing this degree is expected to know. The qualification of B.Sc.(Major) Mathematics is awarded to a student who can demonstrating the attainment of these outcomes. Mathematics is usually described as the abstract science of number, quantity and space along with their operations. The scope of Mathematics is very broad and it has a wide range of applications in natural sciences, engineering, economics and social sciences. B.Sc. (Major) Mathematics Programme aims at developing the ability to think critically, logically and analytically and hence use mathematical reasoning in everyday life. Pursuing a degree in mathematics will introduce the students to a number of interesting and useful ideas in preparations for a number of mathematics careers in education, research, government sector, business sector and industry. The B.Sc. (Major) Mathematics programme covers the full range of mathematics, from classical Calculus to Modern Cryptography, Information Theory, and Network Security. The course lays a structured foundation of Calculus, Real & Complex analysis, Abstract Algebra, Differential Equations (including Mathematical Modelling), Number Theory, Graph Theory, and C++ Programming exclusively for Mathematics. An exceptionally broad range of topics covering Pure & Applied Mathematics: Linear Algebra, Metric Spaces, Statistics, Linear Programming, Numerical Analysis, Mechanics and Biomathematics cater to varied interests and Department of Mathematics, University of Kalyani.

SEMESTER-I

Course Code	Course Title	Course Credit	Full Marks	Course Outcome
UG MATH- M-T-01	Calculus & Analytical Geometry	6	75	<p>This course will enable the students to</p> <ul style="list-style-type: none"> ▪ Learn first and second and higher derivative tests for relative extrema and apply the knowledge in problems in business, economics and life sciences. ▪ Sketch curves in a plane using its mathematical properties in the different coordinate systems of reference over cross-sectional areas. ▪ 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. ▪ Become familiar with the polar equations of conics & their tangents and normal. ▪ Understand the geometrical terminology and have a detailed clear-cut idea of the Planes, Straight lines in 3D, Spheres, Cylindrical surfaces, Central conicoids, Paraboloids, Plane sections of conicoids along with the Tangent and normal of the conicoids.
UG MATH- SEC-T-01	Logic & Boolean Algebra	3	45	<p>This course will enable the students to</p> <ul style="list-style-type: none"> ▪ Explain and apply basic notions of symbolic logic. ▪ Define proposition and argument. ▪ Explain propositional connectives. ▪ Explain and exemplify truth value status of a proposition. ▪ Use truth tables and laws of identity, distributive, commutative, and domination. ▪ Compute sum of products and product of sum expansions. ▪ Convert Boolean expressions to logic gates and vice-versa.

SEMESTER-II

<p style="text-align: center;">UG MATH- M-T-02</p>	<p style="text-align: center;">Algebra-I</p>	<p style="text-align: center;">6</p>	<p style="text-align: center;">75</p>	<p>This course will enable the students to</p> <ul style="list-style-type: none"> ▪ Employ De Moivre's theorem in a number of applications to solve numerical problems. ▪ Learn about equivalent classes and cardinality of a set. ▪ Use modular arithmetic and basic properties of congruences. ▪ Recognize consistent and inconsistent systems of linear equations by the row echelon form of the augmented matrix. Find eigenvalues and corresponding eigenvectors for a square matrix. ▪ Recognize the mathematical objects that are groups, and classify them as abelian and permutation groups, etc. ▪ Link the fundamental concepts of groups and symmetrical figures. ▪ Concept of cyclic group with properties .
<p style="text-align: center;">UG MATH- SEC-T-02</p>	<p style="text-align: center;">Fuzzy Set Theory</p>	<p style="text-align: center;">3</p>	<p style="text-align: center;">45</p>	<p>This course will enable the students to</p> <ul style="list-style-type: none"> ▪ Gain the main subject of fuzzy sets ▪ Learn crisp and fuzzy set theory. ▪ Decide the difference between crisp set and fuzzy set theory. ▪ Make calculation on fuzzy set theory. ▪ Gain the methods of fuzzy logic. ▪ Recognize fuzzy logic membership function. ▪ Recognize fuzzy logic fuzzy inference systems. ▪ Make applications on fuzzy logic membership function and fuzzy inference systems. ▪ Use the fuzzy set theory on the statistical method which is given. ▪ Evaluate fuzzy statistics applications. ▪ Analyse statistical data by using fuzzy logic methods. ▪ Get theory of the statistics fuzzy logic theory together.

SEMESTER-III

Course Code	Course Title	Course Credit	Full Marks	Course Outcome
UG MATH- M-T-03	Real Analysis-I	6	75	<p>This course will enable the students to</p> <ul style="list-style-type: none"> ▪ Understand many properties of the real line \mathbb{R}, including completeness and Archimedean properties. ▪ Learn to define sequences in terms of functions from \mathbb{N} to a subset of \mathbb{R}. ▪ Recognize bounded, convergent, divergent, Cauchy and monotonic sequences and to calculate their limit superior, limit inferior, and the limit of a bounded sequence. ▪ Apply the ratio, root, alternating series and limit comparison tests for convergence and absolute convergence of an infinite series of real numbers. ▪ Have a rigorous understanding of the concept of limit of a function. ▪ Learn about continuity and uniform continuity of functions defined on intervals. ▪ Understand geometrical properties of continuous functions on closed and bounded intervals. ▪ Learn extensively about the concept of differentiability using limits, leading to a better understanding for applications. ▪ Know about applications of mean value theorems and Taylor's theorem. ▪
UG MATH- SEC- T&P-03	Programming in C	3	45	<p>After completion of this paper, student will be able to</p> <ul style="list-style-type: none"> ▪ Understand and apply the programming concepts of C++ which is important to mathematical investigation and problem solving. ▪ Learn about structured data-types in C++ and learn about applications in factorization of an integer and understanding Cartesian geometry and Pythagorean triples. ▪ Use of containers and templates in various applications in algebra. Use mathematical libraries for computational objectives. ▪ Represent the outputs of programs visually in terms of well formatted text and plots.

SEMESTER-IV

<p style="text-align: center;">UG MATH- M-T-04</p>	<p style="text-align: center;">Differential Equations</p>	<p style="text-align: center;">6</p>	<p style="text-align: center;">75</p>	<p>The course will enable the students to</p> <ul style="list-style-type: none"> ▪ Learn basics of differential equations and mathematical modelling ▪ Formulate differential equations for various mathematical models. ▪ Solve first order non-linear differential equations and linear differential equations of higher order using various techniques. ▪ Apply these techniques to solve and analyse various mathematical models. ▪ Formulate, classify and transform first order PDEs into canonical form. ▪ Learn about method of characteristics and separation of variables to solve first order PDE's. ▪ Classify and solve second order linear PDEs. ▪ Power series solution of Diff. equation . ▪ Application of Lipschitz condition and Picard's Theorem .
<p style="text-align: center;">UG MATH- M-T-05</p>	<p style="text-align: center;">Algebra-II</p>	<p style="text-align: center;">6</p>	<p style="text-align: center;">75</p>	<p>The course will enable the students to</p> <ul style="list-style-type: none"> ▪ Learn about the fundamental concept of rings, integral domains and fields. ▪ Know about ring homomorphisms and isomorphisms theorems of rings. ▪ Learn about the concept of linear independence of vectors over a field, and the dimension of a vector space. ▪ Replacement , Extension and Deletion theorem and applications . ▪ Basic concepts of linear transformations, dimension theorem, matrix representation of a linear transformation, and the change of coordinate matrix.

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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.

SEMESTER - I & II

Course Code	Course Title	Course Credit	Full Marks	Course Outcome
UG MATH- MI-T-01	Algebra & Analytical Geometry	4	50	<p>This course will enable the students to</p> <ul style="list-style-type: none">▪ 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.▪ Become familiar with the polar equations of conics & their tangents and normal.▪ Learn about equivalent classes and cardinality of a set.▪ Use modular arithmetic and basic properties of congruences.▪ Recognize the mathematical objects that are groups, and classify them as abelian and permutation groups, etc.▪ Rank of a matrix and how to solve system of linear equations.▪ Become familiar with polynomial ,nature of roots of an equation ,relation between roots and coefficients ,cardan's method .▪ Employ De Moivre's theorem in a number of applications to solve numerical problems.

SEMESTER – III & IV

Course Code	Course Title	Course Credit	Full Marks	Course Outcome
UG MATH- MI-T-02	Calculus & Differential equation	4	50	<p>This course will enable the students to</p> <ul style="list-style-type: none"> ▪ Become familiar with limit and continuity by using $\epsilon - \delta$ definition ▪ Learn first and second and higher derivative tests for relative extrema and apply the knowledge in problems in business, economics and life sciences. ▪ 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 . ▪ Reduction formula of integration . ▪ Learn first and second and higher derivative tests for relative extrema and apply the knowledge in problems in business, economics and life sciences. ▪ Sketch curves in a plane using its mathematical properties in the different coordinate systems of reference over cross-sectional areas. ▪ Learn basics of differential equations and mathematical modelling ▪ Formulate differential equations for various mathematical models. ▪ For second order Diff Equation (i) Method of variation of parameter (ii) Method of undetermined coefficient . ▪ Linear homogeneous equation with constant coefficient , method of variation of parameter and simultaneous diff. equation .