COURSE WISE & SUBJECT WISE OUTCOME OF UG GENERAL COURSE (B.A/B.Sc.) IN MATHEMATICS UNDER CURRICULUM AND CREDIT FRAMEWORK INTRODUCED BY UNIVERSITY OF CALCUTTA, 2023 DEPARTMENT OF MATHEMATICS

The course outcomes of the different papers offered by University of Calcutta are arranged in a tabular form.

Mathematics[MDC – Core Course (CC)] (4 Credits)

SEM	PAPER	COURSE	NAME OF THE PAPER	Code (Th)	Code (Tu)	Credit Hours	Course Outcome
1	CC1 /CC 2	MDC 1	Calculus, Geometry and Vector Analysis (I)	MATH-MD-CC 1-1 Th	MATH-MD-CC 1-1 Tu	3 (Th) +1(Tu)	**Group A (Calculus):** Understand and apply concepts of differentiability and higher-order derivatives. Solve indeterminate forms using L'Hospital's rule.Derive and use reduction formulae for integration.Calculate arc lengths, areas, and volumes of surfaces of revolution for curves. **Group B (Geometry):** Classify conics and transform equations to their canonical forms.Analyze and solve problems involving spheres, cylindrical surfaces, and conicoids. Identify and classify quadric surfaces and analyze their geometric properties. **Group C (Vector Analysis):** Apply vector algebra in geometry and mechanics, including systems of forces and couples. Perform differentiation and integration of vector functions.Analyze applications involving vector functions in

						geometric and physical contexts.
2	CC1 /CC 2	MDC 2	Basic Algebra (I)	MATH-MD-CC 2-2 Th	MATH-MD-CC 2-2 Th	3 (Th) +1(Tu)	**Group A:** Utilize De Moivre's theorem and polar representation of complex numbers.Solve polynomial equations and analyze their properties using methods like Cardan's and Ferrari's.Apply fundamental inequalities and their proofs. **Group B:** Understand relations and mappings, including equivalence relations and orderings.Analyze arithmetic functions and their properties.Apply principles like mathematical induction and the Euclidean algorithm in number theory. **Group C:** Solve linear systems using row reduction and matrix theory.Understand linear independence, vector spaces, and their geometric interpretations.Analyze solutions using algebraic and geometric approaches.

3	CC1 /CC 2	MDC 3	Ordinary Differential Equation &Group Theory (I)	MATH-MD-CC-3-3-Th	MATH-MD-CC-3-3-Tu	3 (Th) +1(Tu)	**Fundamentals of ODE**: Understand the concepts of ordinary differential equations and their types, such as linear, nonlinear, first-order, and higher-order equations.Identify and classify different types of ODEs (e.g., separable, exact, homogeneous, non-homogeneous). **Applications**: Apply ODEs to model real-world problems in various fields like physics, engineering, economics, and biology (e.g., population dynamics, mechanical vibrations, heat conduction, and fluid dynamics). • **Basic Group Theory Concepts**: Understand and define fundamental concepts in group theory, including groups, subgroups, cyclic groups, cosets, and normal subgroups. **Applications in Symmetry and Physics**: Apply group theory concepts to study symmetries in physical systems, molecular structures, and crystallography.Use group theory to understand the mathematical underpinnings of quantum mechanics and particle physics.

<table>
<tr><td colspan="7" align="center">MATHEMATICS[MDC – Minor] (4 Credits)</td><td></td></tr>
</table>

S E M	COURSE	NAME OF THE PAPER	Code (Th)	Code (Tu)	Credit Hours	Course Outcome
3	MDC m1	Calculus, Geometry and Vector Analysis (I)	MATH-MD-CC-1-3-Th	MATH-MD-CC-1-3-Tu	3(Th)+1(Tu)	**Group A (Calculus):** Understand and apply concepts of differentiability and higher-order derivatives. Solve indeterminate forms using L'Hospital's rule.Derive and use reduction formulae for integration.Calculate arc lengths, areas, and volumes of surfaces of revolution for curves. **Group B (Geometry):** Classify conics and transform equations to their canonical forms.Analyze and solve problems involving spheres, cylindrical surfaces, and conicoids. Identify and classify quadric surfaces and analyze their geometric properties. **Group C (Vector Analysis):** Apply vector algebra in geometry and mechanics, including systems of forces and couples. Perform differentiation and integration of vector functions.Analyze applications involving vector functions in geometric and physical contexts.

SEC (4 Credits)				Credit Hours	Course Outcome
S E M	NAME OF THE PAPER	Code (Th)	Code (Tu)		
1 / 2 / 3	C-Language with Mathematical Application/ Python programming and Introduction to Latex and Artificial Intelligence	MATH-MD-SEC1 -1-Th or MATH-MD-SEC2-2-Th or MATH-MD-SEC3 -3-Th /	MATH-MD-SEC1 -1-Tu or MATH-MD-SEC2-2-Tu or MATH-MD-SEC3 -3-Tu/	3(Th)+1(Tu)	Write efficient C programs to solve mathematical problems.

Utilize arrays, functions, and control statements effectively.Implement algorithms to compute mathematical series, solve equations, and perform matrix operations.Develop skills in structuring programs for modular and reusable code.

Python Programming.

Write Python programs to solve mathematical and symbolic problems.Use data structures such as lists, dictionaries, and tuples effectively.

Design algorithms for tasks like unit conversion, quadratic equation solving, and plotting.Develop recursive solutions and utilize libraries like SymPy for algebraic computations.

Introduction to LaTeX:

Prepare professional mathematical documents using LaTeX.Format complex mathematical equations, tables, and figures.

Write structured content like research articles, book chapters, and reports.Explore LaTeX packages for advanced document preparation. |
| S E M | NAME OF THE PAPER | Code (Th) | Code (Tu) | | |
| 1 / 2 / 3 | C-Language with Mathematical Application/ Python programming and Introduction to Latex and Artificial Intelligence | MATH-MD-SEC1 - 1-Th or MATH-MD-SEC2-2-Th or MATH-MD-SEC3 - 3-Th / | MATH-MD-SEC1 -1-Tu or MATH-MD-SEC2-2-Tu or MATH-MD-SEC3 -3-Tu/ | 3(Th)+1(Tu) | |

		IDC (3 Credits)				
SEM	NAME OF THE PAPER	Code (Th)	Code (Tu)		Credit Hours	Course Outcome
1 / 2 / 3	Mathematics in Daily life.	MATH-MD-IDC1 - 1 Th or MATH-MD-IDC2 - 2 Th or MATH-MD-IDC3 - 3 Th or	MATH-MD-IDC1-1 -Tu or MATH-MD-IDC2-2 -Tu or MATH-MD-IDC3-3 -Tu		2(Th)+1(Tu)	• Understand the fundamental concepts of sets, including types of sets (finite, infinite, universal, etc.), operations on sets (union, intersection, difference, complement), and Venn diagrams. • Formulate and manipulate sets using set notation.Apply set operations to solve problems. Understand the principles of compound interest and be able to calculate compound interest for various time periods and rates. Understand the methods to solve optimization problems, particularly those involving linear inequalities, and be able to formulate and solve Linear Programming Problems. Understand the properties of integers and perform operations such as addition, subtraction, multiplication, and division with integers.