Mathematics:

COURSE OUTCOME OF MATHEMATICS HONOURS (CBCS PATTERN)

Programme	Semester	Course name with course code	Course Outcome
B.A/B.Sc in Mathematics Honours	1st	MTMA-CC-1 TH+TU Calculus, Geometry and Vector analysis	• Applications of integral calculus include computations involving area, volume, arc length, center of mass, work, and pressure. • Classification of conics. Equation of plane, straight line, spheres and cylindrical surfaces. • Vector calculus plays an important role in differential geometry and in the study of partial differential equation. It is used extensively in physics and engineering, especially in the description of electromagnetic fields, gravitational fields, and fluid flow.
		MTMA-CC-2 TH+TU Algebra	• Complex numbers allow solutions to all polynomial equation, even those have no solutions in real numbers. More precisely, the fundamental theorem of algebra asserts that every polynomial equation with real or complex coefficients has solutions which is a complex number. • A system of linear inequalities is often used to determine the maximum or minimum values of a situation with multiple constraints. • Relations are an important concept in set theory and its operations. Therefore, they play an important role in other concepts like functional analysis. • One useful application of

			calculating the rank of a matrix is the computation of the number of solutions of a system of linear equation.
	2nd	MTMA-CC-3 TH+TU Real Analysis	• Describe the fundamental properties of the real numbers that underpin the formal development of real analysis. • Demonstrate an understanding of the theory of sequences and series
		MTMA-CC-4 TH+TU Group Theory-I	• Extend group structure to finite permutation groups. • Learn to know the symmetry using group theory,. algebra of electrical circuits and the algebra of logic.
	3rd	MTMA-CC-5 TH+TU Theory of real functions	• Calculate the limit of a function of two variables. • Learn how a function of one variable can approach different values . • To evaluate the limits of indeterminate forms for the derivatives in calculus, L'Hospital's rule is used. Recognize when to apply L'Hôpital's rule.
		MTMA-CC-6 TH+TU Ring Theory and Linear Algebra-I	• Explain the fundamental concepts of advanced algebra such as groups and rings and their role in modern mathematics and applied contexts. • Demonstrate capacity for mathematical reasoning through analyzing, proving and explaining concepts from advanced algebra. • Apply problem-solving using advanced algebraic techniques applied to diverse situations in physics, engineering and other mathematical contexts
		MTMA-CC-7 TH+TU Ordinary Differential Equation &	• Analyze real world scenarios to recognize when ordinary differential equations (ODEs) or systems of

		Multivariate Calculus-I	ODEs are appropriate, formulate problems about the scenarios, creatively model these scenarios in order to solve the problems using multiple approaches. • A comprehensive understanding of the gradient, including its relationship to level curves (or surfaces), directional derivatives, and linear approximation. • An understanding of a parametric curve as a trajectory described by a position vector; the ability to find parametric equations of a curve and to compute its velocity and acceleration vectors.
		MTMA-SEC-A TH C Programming Language	• In daily life, we use different embedded systems like coffee machines, microwaves, climate control systems etc, which are mostly programmed in C. • It has been used in various gaming applications and graphics. C programming language also helps in creating many popular childhood games like Tic-Tac-Toe, The Snake game.
	4^{th}	MTMA-CC-8 TH+TU Riemann Integration and Series of functions	• Develop a reasoned argument in handling problems about functions, especially those that are of bounded variation. • Develop the ability to reflect on problems that are quite significant in the field of real analysis.
		MTMA-CC-9 TH+TU Partial Differential Equation and Multivariate Calculus-II	• formulate physical problems as PDEs using conservation laws. understand analogies between mathematical descriptions of different (wave) phenomena in physics and engineering. classify PDEs, apply analytical methods, and physically interpret the solutions. • Concepts of multiple integral helps us to compute the volume and surface area revolution.

		MTMA-CC-10 TH+TU Mechanics	• Understand and use basic terms for the description of the motion of particles, vector functions and the fundamental laws of Newtonian mechanics. • Solve mechanics problems in one dimension that involve one or more of the forces of gravity, friction and air resistance. • Understand the concept of terminal speed, and use it in solving mechanics problems in one dimension • Apply Newton's second law in vector form to problems in more than one dimension. • Solve problems relating to the motion of a projectile in the absence of air resistance.
		MTMA-SEC-B TH Scientific computing with Sagemath & R	• Performing computations with real numbers using order of operations. • Translating verbal statements into algebraic expressions and equations. • Make easier to Solve first-degree equations.
	5^{th}	MTMA-CC-11 TH+TU Probability & Statistics	• Formulate theorems about the concept of probability. • Calculate probabilities using Conditional probability, Rule of total probability and Bayes' theorem. • Explain the concept of a random variable and the probability distributions.
		MTMA-CC-12 TH+TU Group Theory-II & Linear Algebra-II	• Linear transformations (algebra of linear transformations, isomorphisms, linear functionals, duality). • Explains about the canonical form of a matrix like Jordan canonical

			and invariant subspaces, simultaneous diagonalization and triangulation, direct-sum decompositions, rational forms. • Involves Inner product spaces linear functionals and adjoints of a linear operator.
		MTMA-DSE-A-1 TH+TU Advanced Algebra	• Helps to classify the groups of different orders. • Approaches to answer towards the converse of Lagrange's Theorem.
		MTMA-DSE-B-1 TH+TU Linear Programming & Game Theory	• Formulate a given simplified description of a suitable real-world problem as a linear programming model in general, standard and canonical forms • sketch a graphical representation of a two-dimensional linear programming model given in general, standard or canonical form • solve a two-dimensional linear programming problem graphically • Bring out to distinguish a game situation from a pure individual's decision problem.
	6^{th}	MTMA-CC-13 TH+TU Metric Space & Complex Analysis	• Understand and appreciate the concept of a metric space and be able to recognize standard examples. • Be familiar with the fundamental notions of continuity, convergence and compactness. • Identify curves and regions in the complex plane defined by simple expressions. • Describe basic properties of complex integration and having the ability to compute such integrals. • Decide when and where a given function is analytic and be able to find it Power series expansion.
		MTMA-CC-14	• The main objective of this course

		TH+PR Numerical Methods	is to understand and implement various concepts of numerical analysis and statistics to solve real life problems.
		MTMA-DSE-A-2 TH+TU Differential Geometry	• Analyse the equivalence of two curves by applying some theorems. • Express definition and parametrization of surfaces. • Express tangent spaces of surfaces and explain differential maps between surfaces and find derivatives of such maps.
		MTMA-DSE-B-2 TH+TU Point Set Topology	• In Mathematics, topology is concerned with the properties of a geometric object that are preserved under continuous deformations, such as stretching, twisting, crumpling and bending, that is, without closing holes, opening holes, tearing, gluing or passing through itself.

Mathematics:

COURSE OUTCOME OF MATHEMATICS GENERAL (CBCS PATTERN)

Programme	Semester	Course name with course code	Course Outcome
B.A/B.Sc in Mathematics General	1st	MTMG-CC-1/GE-1 TH+TU Algebra-I Differential Calculus-I Differential Equation-I Coordinate Geometry	• Complex numbers allow solutions to all polynomial equation, even those have no solutions in real numbers. The fundamental theorem of algebra asserts that every polynomial equation with real or complex coefficients has solutions which is a complex number. • To understand the idea of derivative: in terms of the idea of a tangent line to the graph of a function, how a derivative can be used to describe the rate of change of one quantity with respect to another, and how to relate the geometric ideas to the analytic ideas. • Analyze real world scenarios to recognize when ordinary differential equations (ODEs) or systems of ODEs are appropriate, formulate problems about the scenarios, creative model these scenarios in order to solve the problems using multiple approaches. • Classification of conics. Equation of plane, straight line, spheres and cylindrical surfaces.

	2nd	MTMG-CC-2/GE-2 TH+TU Differential Calculus-II Differential Equation- II Vector Algebra Discrete Mathematics	• Demonstrate an understanding of the theory of sequences and series • Practical applications to find maxima & minima of function • Bring out basic ideas of vector to implement in the problem of mechanics. • Ideas of congruence are highly important in field of cryptography. • Ideas of Boolean Algebra useful for circuit construction • Idea to find check digit, ISBN number of book
	3rd	MTMG-CC-3/GE-3 TH+TU Integral Calculus Numerical Methods Linear Programming	• Applications of integral calculus include computations involving area, volume, arc length, center of mass, work, and pressure. • The main objective of this course is to understand and implement various concepts of numerical analysis and statistics to solve real life problems. • Formulate a given simplified description of a suitable real-world problem as a linear programming model in general, standard and canonical forms

	4th	MTMG-CC-4/GE-4 TH+TU Algebra-II Computer Science & Programming Probability & Statistics	• Explain the fundamental concepts of advanced algebra such as groups and rings and their role in modern mathematics and applied contexts. • Increase ability to critically analyze a problem and to design, implement, and evaluate a computing solution that meets requirements. • Calculate probabilities using Conditional probability, Rule of total probability and Bayes' theorem.
	5th	MTMG-SEC-A TH Object Oriented Programming in C++	• Create an analyze algorithms for solving simple problems. • Use basic ideas to create, test and debug algorithms for analytical problems.
		MTMG-DSE-A TH+TU Particle Dynamics	• Solve mechanics problems in one dimension that involve one or more of the forces of gravity, friction and air resistance.
	6th	MTMG-SEC-B TH Boolean Algebra	• This branch gives the fundamental ideas of the validity of Mathematical logic and used in other areas of Science. • It helps us to know the fundamentals of switching circuits.
		MTMG-DSE-B TH+TU Advanced Calculus	• The tool of Laplace transform in advanced calculus converts an ordinary differential equation into an algebraic equation of the same order which is easier to solve. • Fourier transforms in Advanced Calculus are useful to interpret any stable system and signaling.