HINDUSTAN COLLEGE OF ARTS & SCIENCE

PROGRAM OUTCOME, PROGRAM SPECIFIC OUTCOME & COURSE OUTCOME
(UNDERGRADUATE COURSES)
From the Academic Year 2020 – 21 to 2022 – 23

Programme Name: Bachelor of Mathematics

Programme Outcomes:

PO1: The knowledge and appreciation of the breadth and depth of mathematics, including the connections between different areas of mathematics.
PO2: Develop their basic knowledge in Mathematics, which enables them to be strong in theoretical and application skills.
PO3: Apply real situations and develop mathematical models to solve problems.
PO4: Algebra, Real Analysis, Complex Analysis, Mechanics, Operation Research, Analytical Geometry, Mathematical Statistics, Numerical Methods can able to apply this knowledge to analyze a broad range of mathematical phenomena.
PO5: To apply analytical techniques to solve problems.
PO6: To create, interpret and analyze graphical representations of data and equations.

Programme Specific Outcomes:

PSO1: Clear knowledge about algebra to solve equations of series.
PSO2: Concept of envelopes, curvature, asymptotes to perform operations with basic functions.
PSO3: To findLaplace transforms and apply these to solve differential equations.
PSO4: Clear knowledge about vector algebra to solve differentiation and integration.
PSO5: The fundamental concept of statistics used for descriptive statistics and to describe appropriately a given data set.
PSO6: The concept of mechanics to deal with statics and dynamics.
PSO7: Basic concept of algebraic structures to deal with groups, ring, fields and vector spaces.
PSO8: Basic principles of mathematical analysis to solve the theorems and problems in real and complex

Second Year B.Sc. Mathematics Semester –III
Course Outcomes

ANALYTICAL GEOMETRY

CO1: Basics of pole and polar
CO2: To utilize parametric equations in graphing and analyzing polar coordinates, conic sections.
CO3: Compute the Length of the perpendicular.
CO4: Understand the concept of a line and a plane.
CO5: Compute the equation of Sphere and circle

	PO						PSO		
	1	2	3	4	5	6	1	2	3
CO1	3	2	2	1	2	1	3	2	2
CO2	2	2	3	2	3	1	2	2	3
CO3	3	2	3	1	2	1	2	1	2
CO4	2	2	2	2	2	2	1	2	1
CO5	3	3	2	1	2	1	2	2	1

INTEGRAL CALCULUS

CO1: Students will be able to evaluate integral values by appropriate reduction formulae
CO2: Compute (relatively simple) triple integrals in rectangular, cylindrical and spherical coordinates. Compute double integrals over a sector of an annulus using polar coordinates
CO3:Explain the applications and the usefulness of these special functions. Understand purpose and functions of the gamma and beta functions, Sturm-Liouville problem, Fourier series and Transformation. (Skills)Use the gamma function, beta function and special functions to evaluate different types of integral calculus
CO4:Find the magnitude ,direction and component form of displacement vectors. Perform the following vector operations:–addition and subtraction,–scalar multiplication,–dot product, geometric and component forms,–cross product, geometric and component forms. Use vector models for applications of velocity, force, work, finding angles between vectors, and projections.
CO5: Evaluate integrals of functionsorvector-relatedquantitiesovercurves,surfaces,anddomainsin two- and three-dimensional space.

	PO						PSO		
	1	2	3	4	5	6	1	2	3
CO1	3	2	2	3	1	2	3	3	3
CO2	3	2	3	2	2	2	2	2	2
CO3	3	3	3	2	1	2	3	2	2
CO4	3	2	1	3	1	2	3	3	1
CO5	2	2	2	1	2	2	3	2	3

MATHEMATICAL STATISTICS-I

CO1: Use statistical methodology and tools in the engineering problem-solving process.
CO2: Compute and interpret descriptive statistics using numerical and graphical techniques.
CO3: Understand the basic concepts of probability, random variables, probability distribution, and joint probability distribution.
CO4: Computepointestimationofparameters,explainsamplingdistributions,andunderstandthe central limittheorem
CO5: Students will be able to think critically about the data arising in management environments, selecting the best tools to describe, analyze, and exploit this data for decision support

	PO						PSO		
	1	2	3	4	5	6	1	2	3
CO1	3	3	3	2	2	1	3	3	1
CO2	2	2	2	1	1	1	2	2	2
CO3	3	3	2	2	1	1	3	1	2
CO4	3	2	1	2	1	1	3	2	3
CO5	2	3	1	3	2	2	3	2	1

Second Year B.Sc. Mathematics Semester –IV

Course Outcomes

STATICS

CO1: Basic concept when evaluating the motion caused by forces acting on an object remember to find the vector sum of the forces
CO2: Rigid body studies the movement of systems of interconnected bodies under the action of external forces.
CO3: Basic knowledge of various kinds of forces and motion highly desirable for engineering and Practical applications. Newton's law of motion defines and gives the expression for the force.
CO4: Learn the definition of center of mass and learn how to calculate it. It is defined relative to an object or system of object
CO5: Virtual work arises in the application of the principle of least action to the steady of forces and movement of a mechanical system.

	PO						PSO		
	1	2	3	4	5	6	1	2	3
CO1	3	2	2	1	3	2	3	3	2
CO2	2	3	2	1	2	1	1	2	1
CO3	2	3	2	2	2	1	3	2	2
CO4	3	3	3	2	1	1	1	1	2
CO5	3	2	1	3	1	2	2	2	2

TRANSFORM TECHNIQUES

CO1: Understand the Laplace Transform and its existence. Know the relation between Fourier Transform and Laplace Transform .Understand the Unilateral Laplace Transform of some commonly used signals.

CO2: Calculate the convolution of simple functions. Apply the Convolution Theorem to obtain inverse Laplace transforms.

CO3: The student will be able to classify and solve wave equations and heat equations. Students are able to formulate and solve some of the physical problems involving Partial Differential Equations.

CO4: Be able to calculate the Fourier transform or inverse transform of common functions including Rect, Gaussian, Delta, Unit-Step, sinusoidal and exponential decays. Be able to calculate the Fourier transform or inverse transform of common functions including Rect, Gaussian, Delta, Unit-Step, sinusoidal and exponential decays.

C05: Students will be introduced to the concept of the Laplace transform and the application of the Laplace transform in the solution of constant coefficient, linear ODEs.

	PO						PSO		
	1	2	3	4	5	6	1	2	3
CO1	3	3	1	2	2	2	3	1	1
CO2	2	1	3	1	1	1	3	1	2
CO3	1	3	3	1	1	1	2	3	1
CO4	2	3	1	1	2	1	2	2	2
CO5	2	3	2	2	1	1	1	2	1

MATHEMATICAL STATISTICS – II

CO1: Know the most widely used probability distributions and recognize them in applications.

CO2: Know the main tools to describe a random variable, such as the probability density function, the cumulative distribution function, and the moment generating function.

CO3: Recognize the importance of the central limit theorem and understand when it is appropriate to use normal approximations for the distribution of a statistic. Possess techniques of proving theorems and thinking out counter-examples.

CO4: Be able to derive maximum likelihood estimators. Learn to develop complex mathematical reasoning

CO5: Be able to construct exact and approximate confidence intervals.

	PO						PSO		
	1	2	3	4	5	6	1	2	3
CO1	3	2	1	1	2	1	3	2	3
CO2	2	3	3	1	1	1	2	1	2
CO3	2	3	2	1	1	1	2	2	1
CO4	2	2	1	1	2	1	1	1	1
CO5	3	3	2	2	1	2	1	2	1

Third Year B.Sc. Mathematics Semester –V

Course Outcomes

ALGEBRAIC STRUCTURES - I

CO1: Basics of Groups, and Subgroups.
CO2: Understand the concept of Normal Subgroups and homomorphism
CO3: Learn the concept of Cayley's Theorem; Permutation groups.
CO4: Understand the concepts of Rings, whose components ideals, homomorphism and Quotient rings.
CO5: Understand the concepts of Euclidean Rings

	PO						PSO		
	1	2	3	4	5	6	1	2	3
CO1	3	3	3	2	2	2	3	2	3
CO2	3	2	2	3	1	2	3	1	2
CO3	3	3	1	2	1	2	2	3	3
CO4	2	3	3	3	2	1	3	2	2
CO5	3	2	2	2	2	1	3	1	2

REAL ANALYSIS -I

CO1: Basics of sets and functions.
CO2: Understand the concept of sequence of real numbers.
CO3: Learn the concept of series of real numbers.
CO4: Understand the concepts of Metric spaces

	PO						PSO		
	1	2	3	4	5	6	1	2	3
CO1	3	3	2	1	2	1	2	3	2
CO2	2	3	2	2	2	1	3	3	1
CO3	3	3	2	3	2	1	3	2	3
CO4	3	3	2	2	2	2	3	2	2

DYNAMICS

CO1: Basics of kinematics
CO2: Understand the concept of powers, simple harmonic motion and retardation
CO3: Learn the concept of projectile and impulse force
CO4: Understand the concepts circular motion and central orbit
CO5: Understand the concepts of moment of inertia and theory of dimension

	PO						PSO		
	1	2	3	4	5	6	1	2	3
CO1	3	3	2	3	3	2	3	2	1
CO2	3	3	2	2	2	1	2	3	2
CO3	2	3	3	2	1	1	2	2	2
CO4	3	2	2	2	1	2	2	2	1
CO5	3	3	2	3	2	1	3	2	1

DISCRETE MATHEMATICS

CO1: Define set, inclusive element, object and roster notation, subset, proper subset and equivalent set and examine the union of disjoint set. Understand some basic properties of graph and related discrete structures and be able to relate these to practical examples.

CO2: An ability to apply knowledge of Boolean algebra and knowledge about the symbols and truth table of basic and derived logic gates

CO3: Ability to design and conduct experiments as well as to analysis and interpret data

CO4: An ability to identify the logical gates and combinatorial circuits

CO5: Solve homogenous recurrence relation using generating function

	PO						PSO		
	1	2	3	4	5	6	1	2	3
CO1	3	2	2	2	2	1	3	2	2
CO2	2	3	2	2	2	1	2	2	2
CO3	2	2	2	2	1	1	3	2	1
CO4	3	2	3	1	2	1	2	2	2
CO5	2	3	1	2	2	2	2	3	1

Third Year B.Sc. Mathematics Semester -VI

Course Outcomes

ALGEBRAIC STRUCTURES - II

CO1: Basics of vector space, linear independent and basis.
CO2: Understand the concept of Dual spaces and homomorphism
CO3: Define inner product space and its finite-dimensional inner product space
CO4: Understand algebra of linear Transformation and its characteristic roots.
CO5: Compute matrix canonical form and triangular form.

	PO						PSO		
	1	2	3	4	5	6	1	2	3
CO1	3	3	2	1	1	1			
CO2	2	3	2	1	1	2			
CO3	3	2	2	2	2	1			
CO4	3	2	1	3	2	1			
CO5	2	3	2	3	2	1			

REAL ANALYSIS -II

CO1: Basics of open and closed sets.
CO2: Understand the concept of completeness and compactness.
CO3: Learn the concept of Riemann integration.
CO4: Understand the concepts of Calculus
CO5: Understand the concepts of sequence of functions.

	PO						PSO		
	1	2	3	4	5	6	1	2	3
CO1	3	2	3	2	3	2	3	2	2
CO2	2	3	3	1	2	1	2	1	1
CO3	3	1	2	3	1	1	3	3	2
CO4	2	2	1	1	1	1	2	2	3
CO5	3	1	2	2	1	1	1	2	1

COMPLEX ANALYSIS

CO1: Basics of limits function of complex variable and analytic function.
CO2: Understand the concept of linear functions.
CO3: Learn the concept of complex valued function
CO4: Understand the concepts of Convergence of sequences and series
CO5: Understand the concepts of Residues and definite integral

	PO						PSO		
	1	2	3	4	5	6	1	2	3
CO1	3	3	2	3	2	1	3	2	3
CO2	3	3	2	2	2	1	2	2	2
CO3	2	2	2	1	2	1	3	1	2
CO4	2	1	3	1	1	1	2	2	1
CO5	3	3	2	2	1	2	2	2	1

GRAPH THEORY

CO1: Basics of graphs and sub graphs.
CO2: Understand the degree sequences and graphic sequences.
CO3: Learn the concept of Eulerian and Hamiltonian graphs
CO4: Understand the concepts of trees and planarity
CO5: Understand the concepts of Digraphs and matrices, tournaments, some application connector problem

	PO						PSO		
	1	2	3	4	5	6	1	2	3
CO1	3	3	2	2	2	1	3	2	3
CO2	3	2	1	1	2	1	2	2	1
CO3	3	2	2	1	2	1	3	2	1
CO4	2	3	3	2	2	1	2	1	1
CO5	3	3	1	2	1	2	3	1	1

OPERATIONS RESEARCH

CO1: The characteristic of linear programming problem and also different techniques to solve LPP are introduced

CO2: once the concept becomes clear, theoretical as well as logical approach of most popularly used simplex method, Big M method, primal dual relation will be explained

CO3: Able to identify the special feature of the transportation problem and assignment problem

CO4: Understand and compute quantitative matrices of performance of queuing systems

CO5: Develop mathematical skills to analyse and solve integer programming and network models arising from a wide range of applications

	PO						PSO		
	1	2	3	4	5	6	1	2	3
CO1	3	3	3	2	1	2	3	3	3
CO2	3	2	3	2	1	1	2	2	2
CO3	3	3	3	2	1	1	2	2	2
CO4	3	3	3	1	1	1	2	1	2
CO5	2	3	2	1	1	2	1	1	2