# B.Sc. Mathematics Course Outcomes Summary Sheet

| Course | Paper | Course Outcome 1 | Course Outcome 2 | Course Outcome 3 | Course Outcome 4 | Course Outcome 5 |
|---|---|---|---|---|---|---|
| B.Sc.Part I | Discrete Mathematics | CO1: Understand basic concepts of sets, relations, and functions. | CO2: Apply principle of inclusion-exclusion for counting problems. | CO3: Prove mathematical statements using mathematical induction. | CO4: Understand Boolean algebra and perform basic operations. | CO5: Analyze logical structure of propositions and arguments. |
| B.Sc.Part I | Calculus | CO1: Understand concept of derivative and find derivatives of various functions. | CO2: Apply derivative to solve optimization problems. | CO3: Understand concept of integration and find integrals of various functions. | CO4: Apply integral to solve problems in area, volume, and work. | CO5: Understand concept of infinite series and test for convergence. |
| B.Sc.Part I | Analytic Geometry and Optimization Theory | CO1: Understand basic concepts of analytic geometry (lines, planes, conic sections). | CO2: Solve problems involving intersection of lines and planes. | CO3: Understand concept of optimization and solve linear programming problems. | CO4: Apply simplex method to solve linear programming problems. | CO5: Understand duality and solve dual problems. |
| B.Sc.Part II | Real Analysis | CO1: Understand basic concepts (limits, continuity, differentiation). | CO2: Prove Bolzano-Weierstrass and Heine-Borel theorems. | CO3: Understand Riemann integration and find integrals of various functions. | CO4: Apply integral to solve problems in area, volume, and work. | CO5: Understand infinite series and test for convergence. |
| B.Sc.Part II | Differential Equations and Partial Differential Equations | CO1: Understand basic concepts of differential equations (order, degree, solution methods). | CO2: Solve first-order differential equations of various types. | CO3: Understand linear differential equations and solve second-order linear differential equations. | CO4: Apply differential equations to solve problems in various fields. | CO5: Understand basic concepts of partial differential equations and solve some simple examples. |
| B.Sc.Part II | Numerical Analysis and Vector Calculus | CO1: Understand basic concepts of numerical analysis (interpolation, differentiation, integration). | CO2: Use numerical methods to solve problems in various fields. | CO3: Understand basic concepts of vector calculus (gradient, divergence, curl). | CO4: Apply vector calculus to solve problems in various fields. | |
| B.Sc.Part III | Abstract Algebra | CO1: Understand basic concepts of abstract algebra (groups, rings, fields). | CO2: Prove basic theorems about groups, rings, and fields. | CO3: Apply abstract algebra to solve problems in cryptography and coding theory. | CO4: Understand concept of vector space and perform basic operations on vectors. | CO5: Apply vector spaces to solve problems in various fields. |
| B.Sc.Part III | Complex Analysis | CO1: Understand basic concepts of complex analysis (complex numbers, analytic functions, complex integration). | CO2: Prove Cauchy-Riemann equations and Cauchy integral theorem. | CO3: Apply complex analysis to solve problems in fluid dynamics and electromagnetism. | CO4: Understand concept of residue and use residue theorem to evaluate integrals. | CO5: Apply residue theorem to solve problems in physics and engineering. |
| B.Sc.Part III | Mechanics | CO1: Understand basic concepts of mechanics (motion, forces, energy). | CO2: Solve problems involving linear motion, projectile motion, and circular motion. | CO3: Understand concept of moment of inertia and calculate moments of inertia of various objects. | CO4: Apply principles of equilibrium to solve problems involving forces and moments. | CO5: Understand concept of virtual work and use it to solve problems in statics and dynamics. |

| B.Sc. Mathematics Program Summary Sheet: | | | |
|---|---|---|---|
| **S.NO.** | **Program Outcomes (POs):** | **Program Specific Outcomes (PSOs):** | **Program Educational Objectives (PEOs):** |
| PO1/PSO1/PEO1 | Demonstrate thorough understanding of fundamental mathematical concepts, theories, and techniques. | Apply mathematical concepts and tools to solve problems in calculus, real analysis, differential equations, numerical analysis, vector calculus, abstract algebra, complex analysis, and mechanics. | Graduates will be able to demonstrate a mastery of fundamental mathematical concepts and techniques. |
| PO2/PSO2/PEO2 | Apply mathematical reasoning and problem-solving skills to solve complex problems in various fields. | Use mathematical software and programming tools to solve mathematical problems. | Graduates will be able to apply their mathematical knowledge to solve problems in a variety of fields. |
| PO3/PSO3/PEO3 | Communicate mathematical ideas clearly and concisely, both orally and in writing. | Design and conduct mathematical research projects. | Graduates will be able to communicate mathematical ideas effectively to a variety of audiences. |
| PO4/PSO4/PEO4 | Work independently and collaboratively as part of a team to achieve mathematical goals. | Communicate mathematical ideas effectively to a variety of audiences, including mathematicians and non-mathematicians. | Graduates will be able to work independently and collaboratively as part of a team. |
| PO5/PSO5/PEO5 | Demonstrate understanding of the ethical responsibilities of mathematicians in society. | Pursue graduate studies in mathematics or related fields. | Graduates will be able to demonstrate an understanding of the ethical responsibilities of mathematicians in society. |

## Mapping of Course Outcomes of all courses of B.Sc. Mathematics with Program Outcomes, Program Specific Outcomes, and Program Educational Objectives

| Course Outcomes | Program Outcomes | Program Specific Outcomes | Program Educational Objectives | Level |
|---|---|---|---|---|
| **B.Sc. Part-I Discrete Mathematics** | | | | |
| CO1: Understand basic concepts of sets, relations, and functions. | PO1 | PSO1 | PEO1 | Understand (Low) |
| CO2: Apply principle of inclusion-exclusion for counting problems. | PO2 | PSO1 | PEO2 | Apply (Medium) |
| CO3: Prove mathematical statements using mathematical induction. | PO1 | PSO1 | PEO1 | Analyze (High) |
| CO4: Understand Boolean algebra and perform basic operations. | PO1 | PSO1 | PEO1 | Understand (Low) |
| CO5: Analyze logical structure of propositions and arguments. | PO3 | PSO4 | PEO3 | Analyze (Medium) |
| **B.Sc. Part-I Paper-II Calculus** | | | | |
| CO1: Understand concept of derivative and find derivatives of various functions. | PO1 | PSO1 | PEO1 | Understand (Low) |
| CO2: Apply derivative to solve optimization problems. | PO2 | PSO1 | PEO2 | Apply (Medium) |
| CO3: Understand concept of integration and find integrals of various functions. | PO1 | PSO1 | PEO1 | Understand (Low) |
| CO4: Apply integral to solve problems in area, volume, and work. | PO2 | PSO1 | PEO2 | Apply (Medium) |
| CO5: Understand concept of infinite series and test for convergence. | PO1 | PSO1 | PEO1 | Analyze (Medium) |
| **B.Sc. Part-I Paper-III Analytic Geometry and Optimization Theory** | | | | |
| CO1: Understand basic concepts of analytic geometry (lines, planes, conic sections). | PO1 | PSO1 | PEO1 | Understand (Low) |
| CO2: Solve problems involving intersection of lines and planes. | PO2 | PSO1 | PEO2 | Apply (Medium) |
| CO3: Understand concept of optimization and solve linear programming problems. | PO2 | PSO1 | PEO2 | Understand (Medium) |
| CO4: Apply simplex method to solve linear programming problems. | PO2 | PSO1 | PEO2 | Apply (High) |
| CO5: Understand duality and solve dual problems. | PO1 | PSO1 | PEO1 | Analyze (High) |
| **B.Sc. Part-II Paper-I Real Analysis** | | | | |
| CO1: Understand basic concepts (limits, continuity, differentiation). | PO1 | PSO1 | PEO1 | Understand (Low) |
| CO2: Prove Bolzano-Weierstrass and Heine-Borel theorems. | PO1 | PSO1 | PEO1 | Analyze (High) |
| CO3: Understand Riemann integration and find integrals of various functions. | PO1 | PSO1 | PEO1 | Understand (Low) |
| CO4: Apply integral to solve problems in area, volume, and work. | PO2 | PSO1 | PEO2 | Apply (Medium) |
| CO5: Understand infinite series and test for convergence. | PO1 | PSO1 | PEO1 | Analyze (Medium) |
| **B.Sc. Part-II Paper-II Differential Equations and Partial Differential Equations** | | | | |
| CO1: Understand basic concepts of differential equations (order, degree, solution methods). | PO1 | PSO1 | PEO1 | Understand (Low) |
| CO2: Solve first-order differential equations of various types. | PO2 | PSO1 | PEO2 | Apply (Medium) |
| CO3: Understand linear differential equations and solve second-order linear differential equations. | PO1 | PSO1 | PEO1 | Understand (Medium) |
| CO4: Apply differential equations to solve problems in various fields. | PO2 | PSO1 | PEO2 | Apply (High) |
| CO5: Understand basic concepts of partial differential equations and solve some simple examples. | PO1 | PSO1 | PEO1 | Understand (Medium) |
| **B.Sc. Part-II Paper-III Numerical Analysis and Vector Calculus** | | | | |
| CO1: Understand basic concepts of numerical analysis (interpolation, differentiation, integration). | PO1 | PSO1 | PEO1 | Understand (Low) |

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|---|---|---|---|---|
| CO2: Use numerical methods to solve problems in various fields. | PO2 | PSO2 | PEO2 | Apply (High) |
| CO3: Understand basic concepts of vector calculus (gradient, divergence, curl). | PO1 | PSO1 | PEO1 | Understand (Medium) |
| CO4: Apply vector calculus to solve problems in various fields. | PO2 | PSO1 | PEO2 | Apply (High) |
| **B.Sc. Part-III Paper-I Abstract Algebra** | | | | |
| CO1: Understand basic concepts of abstract algebra (groups, rings, fields). | PO1 | PSO1 | PEO1 | Understand (Medium) |
| CO2: Prove basic theorems about groups, rings, and fields. | PO1 | PSO1 | PEO1 | Analyze (High) |
| CO3: Apply abstract algebra to solve problems in cryptography and coding theory. | PO2 | PSO1 | PEO2 | Apply (High) |
| CO4: Understand concept of vector space and perform basic operations on vectors. | PO1 | PSO1 | PEO1 | Understand (Medium) |
| CO5: Apply vector spaces to solve problems in various fields. | PO2 | PSO1 | PEO2 | Apply (High) |
| **B.Sc. Part-III Paper-II Complex Analysis** | | | | |
| CO1: Understand basic concepts of complex analysis (complex numbers, analytic functions, complex integration). | PO1 | PSO1 | PEO1 | Understand (Medium) |
| CO2: Prove Cauchy-Riemann equations and Cauchy integral theorem. | PO1 | PSO1 | PEO1 | Analyze (High) |
| CO3: Apply complex analysis to solve problems in fluid dynamics and electromagnetism. | PO2 | PSO1 | PEO2 | Apply (High) |
| CO4: Understand concept of residue and use residue theorem to evaluate integrals. | PO1 | PSO1 | PEO1 | Analyze (High) |
| CO5: Apply residue theorem to solve problems in physics and engineering. | PO2 | PSO1 | PEO2 | Apply (High) |
| **B.Sc. Part-III Paper-III Mechanics** | | | | |
| CO1: Understand basic concepts of mechanics (motion, forces, energy). | PO1 | PSO1 | PEO1 | Understand (Low) |
| CO2: Solve problems involving linear motion, projectile motion, and circular motion. | PO2 | PSO1 | PEO2 | Apply (Medium) |
| CO3: Understand concept of moment of inertia and calculate moments of inertia of various objects. | PO1 | PSO1 | PEO1 | Understand (Medium) |
| CO4: Apply principles of equilibrium to solve problems involving forces and moments. | PO2 | PSO1 | PEO2 | Apply (High) |
| CO5: Understand concept of virtual work and use it to solve problems in statics and dynamics. | PO2 | PSO1 | PEO2 | Apply (Medium) |