(University of Delhi)
Shyam Lal College

Programme Specific Outcomes and Course Outcomes

B.Sc. (P) Mathematics

Programme Specific Outcomes

Programme	Programme Specific Outcomes
B.Sc. (Physical Science)	**PSO-1:** Students will be able to solve problems using a broad range of significant mathematical techniques, including calculus, algebra, geometry, analysis, numerical methods, differential equations, probability and statistics along with hands-on learning through CAS, LaTeX. **PSO-2:** Combine the principles of physics and chemistry, as supported by mathematics to describe the foundational concepts of the physical world and apply these concepts to new situations. **PSO-3:** Apply the techniques of mathematics to understand experimental observations and predict outcomes. **PSO-4:** Collaborate with others, including multidisciplinary groups, to solve scientific problems, and to recognize ethical issues in each respective profession. **PSO-5:** Students will be enabled to communicate mathematics effectively by written, computational and graphic means. **PSO-6:** Students will be enabled to create mathematical ideas from basic axioms. **PSO-7:** Students will learn to utilize mathematics to solve theoretical and applied problems by critical understanding, analysis and synthesis. **PSO-8:** Students will identify applications of mathematics in other disciplines and in the real-world, leading to enhancement of career prospects in a plethora of fields and research. **PSO-9:** Course will empower the students with the skills and together with the liberty of exploring their interests within the main subject. **PSO-10:** Students will be capable to use ICT tools in solving problems or gaining knowledge and to use appropriate softwares and programming skills to solve problems in mathematics. **PSO-11:** Students will acquire knowledge and skills through self-learning that helps in personal development and skill development for changing Demands of workplace. **PSO-12:** Students develop the ability to think critically, logically and analytically and hence use mathematical reasoning in everyday life. **PSO-13:** Students will be equipped with knowledge of basic concepts and ideas in mathematics and its subfields and will be able to apply the applications of the subject to other disciplines. **PSO-14:** It would also help in making responsible citizens and facilitate character building.

Course Outcomes
(Semester 1)

Course Name	Course Objectives	Learning Outcomes
Paper 1: Topics in Calculus	The primary objective of this course is to: • Introduce the basic tools of calculus which are helpful in understanding their applications in many real-world problems. • Understand/create various mathematical models in everyday life.	This course will enable the students to: • Understand continuity and differentiability in terms of limits and graphs of certain functions. • Describe asymptotic behavior in terms of limits involving infinity. • Use of derivatives to explore the behavior of a given function locating and classify its extrema and graphing the function. • Apply the concepts of asymptotes, and inflexion points in tracing of cartesian curves. • Compute the reduction formulae of standard transcendental functions with applications.

(Semester 2)

Course Name	Course Objectives	Learning Outcomes
Paper 2: Calculus and Geometry	• Define and use fundamental concepts of calculus including limits, continuity, differentiability and uniform continuity. • Sketch curves in a plane using its mathematical properties in the different coordinate systems of reference. • Use integration to find length, area and volume of surface of revolution.	• Students got familiarized with fundamental concepts of calculus. • Students are well-versed with conics and quadric surfaces so that they should able to relate the shape of real-life objects with the curves/conics.
GE 2: Linear Algebra	• Learn about vectors and vector spaces. • Concept of basis and dimension of vector space will be clear. • Study of linear transformation is done	• Students learn about vector spaces and their real life applications
GE 2: Discrete Mathematics	• Basic principles of logic, set theory, Boolean algebra is introduced • Understand the ideas of mathematical induction and basic counting techniques	• Students construct logical arguments and rigorous proofs

(Semester 3)

Course Name	Course Objectives	Learning Outcomes
Paper 3: Differential Equations	The primary objective of this course is to introduce: • Ordinary and partial differential equations. • Basic theory of higher order linear differential equations, Wronskian and its properties. • Various techniques to find the solutions of above differential equations which provide a basis to model complex real-world situations.	This course will enable the students to: • Solve the exact, linear, Bernoulli equations, find orthogonal trajectories and solve rate problems. • Apply the method of undetermined coefficients and variation of parameters to solve linear differential equations. • Solve Cauchy-Euler equations and System of linear differential equations. • Formulate and solve various types of first and second order partial differential equations.

(Semester 4)

Course Name	Course Objectives	Learning Outcomes
Paper 4: Abstract Algebra	The primary objective of the course is to introduce: • Modular arithmetic, fundamental theory of groups, rings, integral domains and fields. • Symmetry group of a plane figure, and basic concepts of cyclic groups. • Cosets of a group and its properties, Lagrange's theorem, and quotient groups.	This course will enable the students to: • Understand groups, and classify them as abelian, cyclic and permutation groups. • Explain the significance of the notion of cosets, normal subgroups and homomorphisms. • Understand the fundamental concepts of rings, subrings, fields, ideals and factor rings.

(Semester 5)

Course Name	Course Objectives	Learning Outcomes
DSE 1: Mechanics and Discrete Mathematics	• Learn about friction, centre of gravity, work and potential energy in statics. • Know about various topics in dynamics such as simple harmonic motion, simple pendulum and projectile motion. • Know about various types of graphs such as complete and bipartite graphs. • Understand graphs, their types and its applications in study of shortest path algorithms.	• The students get introduced to differential equations. • Different methods were discussed to solve differential equations. • Students get insight of partial differential equations and their applications in real world
SEC 3: Transportation and network flow	• Transportation, Assignment and traveling salesperson problems. • Network models and various network flow problems.	• Students learn the applications of linear programming to solve real-life problems such as transportation problem, assignment problem, shortest-path problem, minimum spanning tree problem, maximum flow problem and minimum cost flow problem.

(Semester 6)

Course Name	Course Objectives	Learning Outcomes
DSE 2: Probability and Statistics	• This course will enable the students to learn: Basic probability axioms and familiar with discrete and continuous random variables. • To measure the scale of association between two variables, and to establish a formulation helping to predict one variable in terms of the other, i.e., correlation and linear regression. • Central limit theorem, which helps to understand the remarkable fact, that: the empirical frequencies of so many natural populations, exhibit a bell-shaped curve. Fact that: the empirical frequencies of so many natural populations, exhibit a bell-shaped curve.	• Students are equipped with the concepts of probability and statistics
SEC 4: Statistical Software: R	• This course will enable the students to: Use Rasacalculator; • Read and import data in R. • Explore and describe data in R and plot various graphs in R.	• Students learn the statistical software R and its use in real life