SLC(University of Delhi)

Shyam Lal College

Programme Specific Outcomes and Course Outcomes

B.Sc.(H) Mathematics

Programme Specific Outcomes:

Programme	Programme Specific Outcomes
B.Sc.(H) Mathematics	**PSO-1:** Students will be enabled to communicate mathematics effectively by written, computational and graphic means. **PSO-2:** Students will be enabled to create mathematical ideas from basic axioms. **PSO-3:** Students will be enabled to gauge the hypothesis, theories, techniques and proofs provisionally. **PSO-4:** Students will learn to utilize mathematics to solve theoretical and applied problems by critical understanding, analysis and synthesis. **PSO-5:** 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-6:** Course will empower the students with the skills and together with the liberty of exploring their interests within the main subject. **PSO-7:** 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-8:** Students will acquire knowledge and skills through self-learning that helps in personal development and skill development for changing demands of work place. **PSO-9:** Students develop the ability to think critically, logically and analytically and hence use mathematical reasoning in everyday life. **PSO-10:** 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-11:** It would also help in making responsible citizens and facilitate character building.

Course Outcomes:

Semester 1:

Course Name	Learning Outcomes	Programme Specefic Outcomes are Attained by
BMATH101: Calculus	**CO1:** Learn first and second derivative tests for relative extrema and apply the knowledge in problems in business, economics and life sciences. **CO2:** Sketch curves in a plane using its mathematical properties in the different coordinate systems of reference. **CO3:** Compute area of surfaces of revolution and the volume of solids by integrating over cross-sectional areas. **CO4:** Understand the calculus of vector functions and its use to develop the basic principles of planetary motion.	• Students get to know basics of calculus and geometric properties of different conic sections • Understand the applications of the topic in planetary motion, design of telescope and real world. • Computer practicals help students to have deep conceptual knowledge of the topic

BMATH 102: Algebra	**CO 1:** Employ De Moivre's theorem in a number of applications to solve numerical problems. **CO 2:** Learn about equivalent classes and cardinality of a set. **CO 3:** Use modular arithmetic and basic properties of congruences. **CO 4:** Recognize consistent and inconsistent systems of linear equations by the row echelon form of the augmented matrix. **CO 5:** Find eigenvalues and corresponding eigenvectors for a square matrix.	• Students are made able to connect the concepts of equation theory, complex numbers, number theory and matrices to real-world problem. • They were able to perform matrix algebra with applications to computer graphics.
GE 1: Calculus	**CO 1:** sketching of cartesian curves **CO 2:** Learning to find volumes and surface area of three-dimensional figures CO3: understand limits, continuity and derivatives of several variables and vector valued functions	• Applications of derivatives is known to students • Students got to know various notions related to vector-valued functions and functions of several variables
GE 1: Analytic geometry and theory of equations	**CO 1:** Learn about conic section and their sketching. **CO 2:** understand the properties of roots of polynomial equations	• Students get the knowledge of conic section and are made able to sketch them. • Concept of equation theory is introduced.

Semester 2:

Course Name	Learning Outcomes	Programme Specific Outcomes are Attained by
BMATH 203: Real Analysis	**CO 1:** Understand many properties of the real line $\mathbb{R}$, including completeness and Archimedean properties. **CO 2:** Learn to define sequences in terms of functions from $\mathbb{N}$ to a subset of $\mathbb{R}$. **CO3:** Recognize bounded, convergent, divergent, Cauchy and monotonic sequences and to calculate their limit superior, limit inferior, and the limit of a bounded sequence. **CO4:** Apply the ratio, root, alternating series and limit comparison tests for convergence and absolute convergence of an infinite series of real numbers.	• Students get a deep understanding of real line $\mathbb{R}$ • Students will be able to discuss convergence and divergence of sequences and series of real numbers.
BMATH 204: Differential Equations	**CO1:** Learn basics of differential equations and mathematical modeling. **CO2:** Formulate differential equations for various mathematical models. Solve first order non-linear differential equations and linear differential equations of higher order using various techniques. **CO3:** Apply these techniques to solve and analyze various mathematical models.	• The students get introduced to differential equations. • They learn to create a model to a problem • Learned the applications of differential equations in real world.
GE 2: Linear Algebra	**CO3:** Learn about vectors and vector spaces. **CO3:** Concept of basis and dimension of vector space will be clear. **CO3:** Study of linear transformation is done	• Students learn about linear algebra and its application. • Concept of linear transformation helps them to construct matrices.
GE 2: Discrete mathematics	**CO1:** Basic principles of logic, set theory, Boolean algebra is introduced **CO2:** Understand the ideas of mathematical induction and basic counting techniques	• Students construct logical arguments and rigorous proofs

Semester 3:

Course Name	Learning Outcomes	Programme Specific Outcomes are Attained by
BMATH 305: Theory of Real Functions	**CO1:** Have a rigorous understanding of the concept of limit of a function. **CO2:** Learn about continuity and uniform continuity of functions defined on intervals. **CO3:** Understand geometrical properties of continuous functions on closed and bounded intervals. **CO4:** Learn extensively about the concept of differentiability using limits, leading to a better understanding for applications. **CO5:** Know about applications of mean value theorems and Taylor's theorem.	• Students are equipped with a matured perspective of the concepts of calculus • Students learn more applications of limits, continuity, differentiability .
BMATH 306: Group Theory-I	**CO1:** Recognize the mathematical objects that are groups, and classify them as abelian, cyclic and permutation groups, etc. **CO2:** Link the fundamental concepts of groups and symmetrical figures. Analyze the subgroups of cyclic groups and classify subgroups of cyclic groups. **CO3:** Explain the significance of the notion of cosets, normal subgroups and factor groups. **CO4:** Learn about Lagrange's theorem and Fermat's Little theorem. **CO5:** Know about group homomorphisms and group isomorphisms.	• Students learn about the fundamental theorem of groups and homomorphism • Students get to know about symmetric groups and symmetries, an important concept in group theory. • Consequences of Lagrange's theorem are learned by them and their applications.

BMATH 307: Multivariate Calculus	**CO1:** Learn the conceptual variations when advancing in calculus from one variable to multivariable discussion. **CO2:** Understand the maximization and minimization of multivariable functions subject to the given constraints on variables. **CO3:** Learn about inter-relationship amongst the line integral, double and triple integral formulations. **CO4:** Familiarize with Green's, Stokes' and Gauss divergence theorems.	• Students were made aware of applications of multivariate calculus tools in physics, economics, optimization and understanding the architecture of curves and surfaces in plane and space.
SEC 1: LaTeX and HTML	**CO1:** Create and typeset a LaTeX document. **CO2:** Typeset a mathematical document using LaTex. **CO3:** Learn about pictures and graphics in LaTex. **CO4:** Create beamer presentations. **CO5:** Create web page using HTML	• Students were able to typeset mathematical equations • They were equipped with skill of making presentations involving long mathematical equations, a number of symbols. • They learned to design their own webpage.
GE 3: Differential equation	**CO1:** Solve the exact, linear and Bernoulli equations and find orthogonal trajectories. **CO2:** Apply the method of variation of parameters to solve linear differential equations. **CO3:** Formulate and solve various types of first and second order partial differential equations.	• The students get introduced to differential equations. • Different methods were discussed to solve differential equations.
GE 3:Linear programming and game theory	**CO1:** Learn about the simplex method used to find optimal solutions of linear optimization problems subject to certain constraints. **CO2:** Write the dual of a linear programming problem. **CO3:** Solve the transportation and assignment problems. **CO4:** Learn about the solution of rectangular games using graphical method and using the solution of a pair of associated prima-dual linear programming problems.	• Students are able to construct a linear programming problem for a given situation. • Simplex method helps them to get the optimal value of the problem • Transportation problem and assignment problems are learned by them and they are able to apply them to day-to-day life • Students learn to solve two-person-zero-sum game using different methods.

Semester 4:

Course Name	Learning Outcomes	Programme Specefic Outcomes are Attained by
BMATH 408: Partial Differential Equations	**CO1:** Formulate, classify and transform first order PDE's into canonical form. **CO2:** Learn about method of characteristics and separation of variables to solve first order PDE's. **CO3:** Classify and solve second order linear PDE's. **CO4:** Learn about Cauchy problem for second order PDE and homogeneous and nonhomogeneous wave equations. **CO5**: Apply the method of separation of variables for solving many well-known second order PDE's.	• Students learn to solve partial differential equations and use of them in physical problems
BMATH 409: Riemann Integration & Series of Functions	**CO1:** Learn about some of the classes and properties of Riemann integrable functions, and the applications of the Fundamental theorems of integration. **CO2:** Know about improper integrals including, beta and gamma functions. **CO3:** Learn about Cauchy criterion for uniform convergence and Weierstrass M-test for uniform convergence. **CO4:** Know about the constraints for the inter-changeability of differentiability and integrability with infinite sum. **CO5:** Approximate transcendental functions in terms of power series as well as, differentiation and integration of power series.	• Students learn the integrability of continuous functions on closed and bounded intervals • Applications of integrable functions also learned

BMATH 410: Ring Theory & Linear Algebra-I	**CO1:** Learn about the fundamental concept of rings, integral domains and fields. **CO2:** Know about ring homomorphisms and isomorphisms theorems of rings. **CO3:** Learn about the concept of linear independence of vectors over a field, and the dimension of a vector space. **CO4:** Basic concepts of linear transformations, dimension theorem, matrix representation of a linear transformation, and the change of coordinate matrix.	• Students get the knowledge of two important algebraic structures: ring theory and linear algebra • Students are able to apply linear algebra in real life.
SEC2: Computer Algebra Systems and Related Software	**CO1:** Use of computer algebra systems (Mathematica/MATLAB/Maxima/Maple etc.) as a calculator, for plotting functions and animations. **CO2:** Use of CAS for various applications of matrices such as solving system of equations and finding eigenvalues and eigenvectors. **CO3:** Understand the use of the statistical software R as calculator and learn to read and get data into R. **CO4:** Learn the use of R in summary calculation, pictorial representation of data and exploring relationship between data. **CO5:** Analyze, test, and interpret technical arguments on the basis of geometry.	• Students are able to use different computer algebra systems and are able to solve mathematical problems using them.
GE4: Numerical methods	**CO1:** Find the consequences of finite precision and the inherent limits of numerical methods. **CO2:** Appropriate numerical methods to solve algebraic and transcendental equations.	• Important topics of numerical methods are understood by students

	CO3: Solve first order initial value problems of ODE's numerically using Euler methods.	
GE 4: Elements of analysis	**CO1:** Understand the real numbers and their basic properties. **CO2:** Be familiar with convergent and Cauchy sequences. Test the convergence and divergence of infinite series of real numbers. **CO3:** Learn about power series expansion of some elementary functions.	• Students get an insight of real number system. • They learned real sequences and series and their sums.

Semester 5:

Course Name	Learning Outcomes	Programme Specefic Outcomes are Attained by
BMATH 511: Metric Spaces	**CO1:** Understand the basic concepts of metric spaces **CO2:** Correlate these concepts to their counter parts in real analysis **CO3:** Appreciate the abstractness of the concepts such as open balls, closed balls, compactness, connectedness etc. beyond their geometrical imaginations. **CO4:** Analyze how a theory advances from a particular frame to a general frame **CO5**: Learn about Banach fixed point theorem-one of the beautiful results in analysis	• Students develop an idea of distance into an abstract form on any sets of objects, maintaining its inherent characteristics and the resulting consequences
BMATH 512: Group Theory	**CO1**: Automorphisms for constructing new groups from the given group **CO2:** External direct product $Z_2 \oplus Z_2$ applies to data security and electric circuits. **CO3:** Group actions, Sylow theorems and their applications to check non simplicity. **CO4:** Understand fundamental theorem of finite abelian groups **CO5:** Be familiar with group actions and conjugacy in S_n.	• Students get in-depth understanding of abstract algebra. • Students able to classify all finite Abelian groups.
DSE-1 (i): Numerical Analysis	**CO1:** Some numerical methods to find the zeroes of nonlinear functions of a single variable and solution of a system of linear equations, up to a certain given level of precision. **CO2:** Interpolation techniques to compute the values for a tabulated function at points not in the table.	• Students get the knowledge computational techniques to find approximate value for possible root(s) of non-algebraic equations, to find the approximate solutions of system of linear

	CO3: Applications of numerical differentiation and integration to convert differential equations into difference equations for numerical solutions.	equations and ordinary differential equations Students are able to apply linear algebra in real life. • Learn the use of Computer Algebra System (CAS) by which the numerical problems can be solved both numerically and analytically, and to enhance the problem solving skills.
DSE-2 (i): Probability Theory and Statistics	**CO1:** Distributions to study the joint behavior of two random variables **CO2:** To establish a formulation helping to predict one variable in terms of the other, i.e., correlation and linear regression. **CO3:** Central limit theorem, which helps to understand the remarkable fact that: the empirical frequencies of so many natural populations, exhibit a bell shaped curve.	• Students get familiar with the basic statistical concepts and tools which are needed to study situations involving uncertainty or randomness. • students solve several examples and exercises that blend their everyday experiences with their scientific interests.

Semester 6:

Course Name	Learning Outcomes	Programme Specefic Outcomes are Attained by
BMATH 613: Complex Analysis	**CO1:** Learn the significance of differentiability of complex functions **CO2:** Understand Cauchy Riemann equations. **CO3:** Learn some elementary functions and valuate the contour integral **CO4:** Understand the role of Cauchy-Goursat theorem and the Cauchy integral formula **CO5**: Expand some simple functions	• Students develop a basic idea of analysis of complex functions in complex variables.
BMATH 614: Ring theory and linear algebra -II	**CO1:** Appreciate the significance of unique factorization in rings and integral domains **CO2:** Compute the characteristic polynomials, eigenvectors, eigenspaces. **CO3:** Compute inner products and determine orthogonality on vector spaces **CO4:** Find the adjoint, normal and orthogonal operators	• Students learn the basic concepts of ring of polynomials and irreducibility tests for polynomials over ring of integers, used in finite fields with applications in Cryptography. • Students get to know the application of techniques using the adjoint of a linear operator and their properties to least squares approximation and minimal solutions to systems of linear equations.
DSE-3 (iii): Biomathematics	**CO1:** Learn the development, analysis and interpretation of bio mathematical models. **CO2:** Reinforce the skills in mathematical modeling. **CO3:** Appreciate the theory of bifurcation and chaos. **CO4:** Learn to apply the basic concepts of probability to molecular	• Students do scientific study of normal functions in living systems. • The basic concepts of the probability to understand molecular evolution and genetics have also been discussed.

	evolution and genetics.	
DSE-4 (ii): Linear Programming and Applications	**CO1:** Analyze and solve linear programming models of real-life situations. **CO2:** The graphical solution of LPP with only two variables, and illustrate the concept of convex set and extreme points. The theory of the simplex method is developed **CO3:** The relationships between the primal and dual problems and their solutions with applications to transportation, assignment and two-person zero-sum game problem.	• Students understand the ideas underlying the Simplex Method for Linear Programming Problem, as an important branch of Operations Research. • Students understand Linear Programming with applications to Transportation, Assignment and Game Problem. Such problems arise in manufacturing resource planning and financial sectors.

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Programme Specific Outcomes and Course Outcomes

B.Sc.(Physical Sciences)

Programme Specific Outcomes:

Programme	Programme Specific Outcomes
B.Sc.(Phy Sc)	**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 work place. **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	Learning Outcomes	Programme Specefic Outcomes are Attained by
Paper1: Calculus and matrices	**CO1:** Define vector spaces, linear transformations and their matrix characterization. **CO2:** Solve systems of linear equations and find eigenvalues and corresponding eigenvectors for a square matrix. **CO3:** Computation of matrix inverses using elementary row operations. **CO4:** Define and use fundamental concepts of calculus including sequences. **CO5:** Perform operations with various forms of complex numbers to solve equations.	• Students get to know basics of calculus and matrices. • Students are able to relate linear transformation and matrices. • An introduction to the concept of complex numbers is given to students. • Students will be able to discuss convergence and divergence of sequences and series of real numbers

GE 1: Calculus	**CO 1:** Introduction of concept of limits, derivatives of functions. Finding volumes of surface of revolution by different methods. **CO 2:** Learning about vector valued functions and curvature	• The students learn basic concepts of limits and differentiability of functions • The students are made aware of surface of revolution and volume of those surfaces. • Notion of vector valued functions is introduced to students and students get the knowledge of curvature of the functions.
GE 1: Analytic geometry and theory of equations	**CO 1:** Learn about conic section and their sketching. **CO 2:** Theory of equations and polynomials will be understood.	• Students get the knowledge of conic section and are made able to sketch them. • Concept of equation theory is introduced.

Semester 2:

Course Name	Learning Outcomes	Programme Specific Outcomes are Attained by
Paper 2: Calculus and Geometry	**CO 1:** Define and use fundamental concepts of calculus including limits, continuity, differentiability and uniform continuity. **CO2:** Sketch curves in a plane using its mathematical properties in the different coordinate systems of reference. **CO3:** 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.
GE2: Linear Algebra	**CO 1:** Learn about vectors and vector spaces. **CO 2:** Concept of basis and dimension of vector space will be clear. **CO 3:** Study of linear transformation is done	• Students learn about vector spaces and their real life applications
GE2: Discrete mathematics	**CO1:** Basic principles of logic, set theory, Boolean algebra is introduced **CO2:** Understand the ideas of mathematical induction and basic counting techniques	• Students construct logical arguments and rigorous proofs

Semester 3:

Course Name	Learning Outcomes	Programme Specific Outcomes are Attained by
Paper 3: Abstract Algebra	**CO1:** Recognize the mathematical objects that are groups, and classify them as abelian, cyclic and permutation groups etc. **CO2:** Explain the significance of the notion of cosets, normal subgroups, and factor groups. **CO3:** Understand the fundamental concepts of rings, fields and integral domains. **CO4:** Know about vector spaces over a field, and linear transformations.	• Students learn about the fundamentals of algebraic structures. • Learn the applications of vector spaces into real life problems
SEC 2: Computer Algebra System and Related softwares	**CO1:** Use of computer algebra systems (Mathematica/MATLAB/Maxima/ Maple etc.) as a calculator, for plotting functions and animations. **CO2:** Use of CAS for various applications of matrices such as solving system of equations and finding eigenvalues and eigenvectors. **CO3:** Understand the use of the statistical software R as calculator and learn to read and get data into R. **CO4:** Learn the use of R in summary calculation, pictorial representation of data and exploring relationship between data. **CO5:** Analyze, test, and interpret technical arguments on the basis of geometry.	• Students are able to use different computer algebra systems and are able to solve mathematical problems using them.

GE 3: Differential equation	**CO1:** Solve the exact, linear and Bernoulli equations and find orthogonal trajectories. **CO2:** Apply the method of variation of parameters to solve linear differential equations. **CO3:** Formulate and solve various types of first and second order partial differential equations.	• The students get introduced to differential equations. • Different methods were discussed to solve differential equations.
GE 3: Linear programming and game theory	**CO1:** Learn about the simplex method used to find optimal solutions of linear optimization problems subject to certain constraints. **CO2:** Write the dual of a linear programming problem. CO3: Solve the transportation and assignment problems. **CO4:** Learn about the solution of rectangular games using graphical method and using the solution of a pair of associated prima-dual linear programming problems.	• Students are able to construct a linear programming problem for a given situation. • Simplex method helps them to get the optimal value of the problem • Transportation problem and assignment problems are learned by them and they are able to apply them to day-to-day life. • Students learn to solve two-person-zero-sum game using different methods.

Semester 4:

Course Name	Learning Outcomes	Programme Specefic Outcomes are Attained by
Paper 4: Real Analysis	**CO1:** Be familiar with the concept of countable and uncountable set, cluster points, Bolzano Weierstrass' theorem. **CO2:** Recognize convergent, divergent, bounded, Cauchy and monotone sequences. **CO3:** Test the convergence and divergence of series using ratio test, root test and Leibnitz test. **CO4:** Understand the concepts of pointwise and uniform convergence. **CO5:** Understand Riemann integrability of continuous and monotone functions.	• Students get a deep understanding of real line $\mathbb{R}$ • Students will be able to discuss convergence and divergence of sequences and series of real numbers. • Applications of integrable functions also learned
SEC 1: Mathematical Typesetting: LaTeX	**CO1:** Create and typeset a LaTeX document. **CO2:** Typeset a mathematical document using LaTex. **CO3:** Learn about pictures and graphics in LaTex. **CO4:** Create beamer presentations.	• Students were able to typeset mathematical equations • They were equipped with skill of making presentations involving long mathematical equations, a number of symbols.
GE4: Numerical methods	**CO1:** Find the consequences of finite precision and the inherent limits of numerical methods. **CO2:** Appropriate numerical methods to solve algebraic and transcendental equations. **CO3:** Solve first order initial value problems of ODE's numerically using Euler methods.	• Important topics of numerical methods are understood by students
GE 4: Elements of analysis	**CO1:** Understand the real numbers and their basic properties. **CO2:** Be familiar with convergent and Cauchy sequences. Test the convergence and divergence of	• Students get an insight of real number system. • They learned real sequences and series and their sums.

	infinite series of real numbers. **CO3:** Learn about power series expansion of some elementary functions.	

Semester 5:

Course Name	Learning Outcomes	Programme Specefic Outcomes are Attained by
DSE 1: Mechanics and Discrete Mathematics	**CO1:** Learn about friction, centre of gravity, work and potential energy in statics. **CO2:** Know about various topics in dynamics such as simple harmonic motion, simple pendulum and projectile motion. **CO3:** Know about various types of graphs such as complete and bipartite graphs. **CO4:** 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	**CO1:** Transportation, Assignment and Traveling salesperson problems. **CO2:** 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	Learning Outcomes	Programme Specefic Outcomes are Attained by
DSE2 : Probability and Statistics	**CO1:** This course will enable the students to learn: Basic probability axioms and familiar with discrete and continuous random variables. **CO2:** 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. **CO3:** 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
SEC4: Statistical Software: R	**CO1:** This course will enable the students to: Use R as a calculator; **CO2:** 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