

DEPARTMENT OF MATHEMATICS

B.Sc. MATHS

PROGRAMME OUTCOMES

- PO1:** Enabling students to develop a positive attitude towards mathematics as an interesting and valuable subject of study.
- PO2:** A student should get a relation ability to pursue advanced studies and research in pure and applied mathematical science.
- PO3:** I understanding of mathematical concepts and concerned structures, and should be able to follow the patterns involved, mathematical reasoning.
- PO4:** Ability to analyze a problem, identify and define the computing requirements, which may be appropriate to its solution.
- PO5:** Introduction to various courses like group theory, ring theory, field theory, metric spaces, number theory.
- PO6:** Enhancing students' overall development and to equip them with mathematical modeling abilities, problem solving skills, creative talent and power of communication necessary for various kinds of employment.
- PO7:** The skills of observations and drawing logical inferences from the scientific experiments.
- PO8:** Analyzed the given scientific data critically and systematically and the ability to draw the objective conclusions
- PO9:** Been able to think creatively to propose novel ideas in explaining facts and figures or providing new solutions to the problem
- PO10:** Realized how interdisciplinary approach helps in providing better solutions and new ideas for the sustainable developments

SPECIFIC PROGRAM OUTCOMES FOR B SC MATHEMATICS

- SPO1:** A student should be able to recall basic facts about mathematics and should be able to display knowledge of conventions such as notations , terminology.
- SPO2:** A student should get adequate exposure to global and local concerns that explore them many aspects of mathematical sciences.
- SPO3:** Student is equipped with mathematical modeling ability, problem solving skills, creative talent and power of communication necessary for various kinds of employment.
- SPO4:** Student should be able to apply their skills and knowledge that is translate information presented verbally into mathematical form, select and use appropriate mathematical formulae or techniques in order to process the information and draw the relevant conclusion.
- SPO5:** Enabling students to develop a positive attitude towards mathematics as an interesting and valuable subject of study.
- SPO6:** Think in a critical manner.
- SPO7:** Formulate and develop mathematical arguments in a logical manner.
- SPO8:** Acquire good knowledge and understanding in advanced areas of mathematics and statistics, chosen by the student from the given courses.
- SPO9:** Ability to acquire in-depth knowledge of algebra, calculus, geometry, differential equations and several other branches of mathematics. This also leads to study of related areas like computer science and physical science. Thus, this Program helps learners in building a solid foundation for higher studies in mathematics.
- SPO10:** The skills and knowledge gained has intrinsic beauty, which also leads to proficiency in analytical reasoning. This can be utilized in modelling and solving real life problems.
- SPO11:** To recognize patterns and to distinguish between essential and irrelevant aspects of problems. Utilize mathematics to solve theoretical and applied problems by critical

understanding, analysis and synthesis.

SPO12: Ability to share ideas and insights while seeking and benefitting from knowledge and insight of others. This helps them to learn behave responsibly in a rapidly changing interdependent society.

SPO13: Ability to communicate mathematics effectively by written, computational and graphic means.

SPO14: Create mathematical ideas from basic axioms.

SPO15: Ability to apply multivariable calculus tools in physics, economics, optimization, and understanding the architecture of curves and surfaces in plane and space etc.

SPO16: Able to present mathematics clearly and precisely, make vague ideas precise by formulating them in the language of mathematics, describe mathematical ideas from multiple perspectives and explain fundamental concepts of mathematics to non-mathematicians

SPO17: This Program will also help students to enhance their employability for jobs in banking, insurance and investment sectors, data analyst and in various other public and private enterprises.

DEPARTMENT OF MATHEMATICS

SEM-I DIFFERENTIAL CALCULUS (PAPER I)

After the completion of the course, Students will be able to

- C01: Find Maxima and minima of function of two variables.
- C02: Explain sub tangent and subnormal.
- C03: Find angle of intersection of two curves.
- C04: Find circle, radius and centre of curvature.
- C05: Explain $\sin n\theta$, $\cos n\theta$ and $\tan n\theta$ by using De Moivre's theorem
- C06: Expand $\cos n\theta$, $\sin n\theta$ and $\tan n\theta$ in terms of θ
- C07: To be able to calculate limits in indeterminate forms by a repeated use of L'Hospital rule.
- C08: To know the chain rule and use it to find derivatives of composite functions.
- C09: To be able to evaluate integrals of rational functions by partial fractions.

SEM-II DIFFERENTIAL EQUATIONS (PAPER -II)

After the completion of the course, Students will be able to

- C01: Identify different types of differential equations and solve them
- C02: Extract the solution of differential equations of the first order and of the first degree by variables separable, Homogeneous and non – homogeneous methods.
- C03: Find a solution of differential equations of the first order and of a degree higher than the first by using methods of solvable for p , x and y
- C04: Compute all the solutions of second and higher order linear differential equations with constant coefficients linear equations with variable coefficients.
- C05: Solve simultaneous linear equations with constant coefficients and total differential equations.
- C06: Distinguish between linear, nonlinear, partial and ordinary differential equations.
- C07: Solve basic application problems described by second order linear differential equations.
- C08: Find the transforms of derivatives and integrals.

SEM-III REAL ANALYSIS (PAPER - III)

After the completion of the course, Students will be able to

- C01: Describe the basic difference between the rational and real numbers.
- C02: Give the definition of concept related to metric spaces such as continuity, compactness, convergent etc.
- C03: Evaluate the limits of wide class of real sequences.
- C04: Understand and perform simple proofs.
- C05: Give the essence of the proof of Bolzano Weierstrass theorem the contraction theorem as well as existence of convergent subsequence using equicontinuity.
- C06: The course provides the basic for further studies with in function analysis, topology, function theory.
- C07: Students will be able to demonstrate basic knowledge of key topics in classical real analysis.

SEM-III SEC II A THEORY OF EQUATIONS

After the completion of the course, Students will be able to

- C01: Describe the relation between roots and coefficients
- C02: Find the sum of the power of the roots of an equation using Newton's Method.
- C03: Transform the equation through roots multiplied by a given number, increase the roots, and decrease the roots, removal of terms.
- C04: Solve the reciprocal equations.

- C05: Analyze the location and describe the nature of the roots of an equation
- C06: Obtain integral roots of an equation by using Newton's Method.
- C07: Compute a real root of an equation by Horner's method
- C08: Illustrate the Division and Euclidean Algorithm
- C09: Describe the properties of prime numbers
- C010: Show that every positive integer can be expressed as product of prime power in unique way.
- C011: Write a formula for the number of positive integers less than that are relatively prime to n.

SEM-III SEC-IIB LOGIC AND SETS

After the completion of the course, Students will be able to

- C01: Properly use the vocabulary and symbolic notation of higher mathematics in definitions, theorems, and problems
- C02: Analyze the logical structure of statements symbolically, including the proper use of logical connectives, predicates, and quantifiers.
- C03: Construct truth tables, prove or disprove a hypothesis, and evaluate the truth of a statement using the principles of logic.
- C04: Solve problems and write proofs using the concepts of set theory.
- C05: Solve problems and write proofs using the basic definitions and the fundamental properties of subsets and operations on the real numbers, integers, rational and irrational, even and odd, multiples or factors of whole numbers.

SEM - IV ALGEBRA (PAPER - IV)

After the completion of the course, Students will be able to

- C01: Recognize the mathematical object called groups
- C02: Link fundamental concepts of groups' symmetries of geometrical objects.
- C03: Explain the significance of notions of cosets, normal subgroups and factor groups.
- C04: Analyze consequences of Lagrange's theorem.
- C05: Learn about structure preserving maps between groups and their consequences.
- C06: Understand the basic concepts of group actions and their applications.
- C07: Know the fundamental concepts in ring theory such as the concept of ideals, quotient rings, integral domains and field.

SEM - IV SEC IV A Number Theory

After the completion of the course, Students will be able to

- C01: Define the concept of divisibility.
- C02: Define the concept of prime number.
- C03: Explain division algorithm.
- C04: Explain Euclid's algorithm.
- C05: Explain the greatest common divisor.
- C06: Explain the concept of congruence.
- C07: Explain the concepts of linear congruence and quadratic linear congruence.
- C08: Explain Fermat's Theorem, Euler's Theorem and Pie function.

SEM - IV SEC IV B Vector Calculus

After the completion of the course, Students will be able to

- C01: Define vector equation for lines and planes

- C02: Analyze vector functions to find limits, derivatives, tangent lines, integrals, arc length, curvature, torsion
- C03: Compute limits and derivatives of functions of two and three variables
- C04: Differentiate vector fields
- C05: Determine gradient vector fields and find potential functions
- C06: Evaluate line integrals, surface area and surface integrals
- C07: Vector calculus motivates the study of vector differentiation and integration in two and three dimensional spaces.

SEM -V SEC –III(E) PROBABILITY AND STATISTICS

After the completion of the course, Students will be able to

- C01: Express the concept of factorial and the basic principal of counting.
- C02: Solve the about permutations combination and binomial theorem .
- C03: Express the concept of probability and its futures .
- C04: Express the concept of random event .
- C05: Calculate the expected value of a random variable .
- C06: Define the discrete distributions , continuous distribution and solve the problems about these distributions.
- C07: Explain major distributions of random variables.

SEM -V SEC –III(F) MATHEMATICAL MODELLING

After the completion of the course, Students will be able to

- C01: Apply mathematical concepts including calculus , linear algebra and differential equations to analyze specific problems
- C02: Use computer programming and statistical analysis skills to efficiently model systems.
- C03: Recognize the connections between mathematics and other disciplines, and how mathematical ideas are embedded in other contexts.
- C04: Represent real-world systems from science and technology in a mathematical framework.
- C05: Extend their experiences of working both independently and collaboratively within the discipline to other contexts.
- C06: Reflect the professional standards of the discipline and of science in their own work and practice.

SEM -V GE -1 LATTICE THEORY

After the completion of the course, Students will be able to

- C01: To apply the concepts of partially order sets , lattices in general.
- C02: Apply complete lattices , distributive and modular lattices and Boolean algebras .
- C03: The concepts of lattice theory are applied in various field with in mathematics , mechanics in physics .
- C04: Also applied the concept of lattices in computer science .
- C05: Apply their knowledge to solve some problems on switching circuits.

SEM -V PAPER -V LINEAR ALGEBRA

After the completion of the course, Students will be able to

- C01: Linear algebra emphasizes the concept of vector spaces and linear transformations which are essential in simplifying various scientific problems .
- C02: It aims at inculcating problem solving skills with in student to enable them compute large linear systems
- C03: The practical applications of linear algebra are in demography , archaeology , electrical engineering traffic analysis
- C04: Express vector spaces in different dimensions
- C05: Explain two vectors are orthogonal

- C06: Express that a set is orthogonal and orthonormal
 C07: Express the row and column space of a matrix
 C08: Explain eigen values and eigen vectors of a linear transformation
 C09: Explain when a transformation matrix can be written in the form of a diagonal matrix

SEM -V PAPER -VI SOLID GEOMETRY (DSE-1E/A)

After the completion of the course, Students will be able to

- C01 : Find centre and radius of sphere and circles
 C02: Find family of spheres passing through a circle, tangent planes and normal lines to sphere
 C03: Identify different conchoids and sketch them
 C04: Understand relationship between different co-ordinate system and plot the curve in spherical ,cylindrical polar co-ordinates
 C05: Obtain equation of cone ,enveloping cone ,cylinder ,right circular cylinder, enveloping cylinder and prove their results
 C06: Find equation of tangent plane ,reciprocal cone of given cone
 C07: Understand the beautiful interplay between algebra and geometry

SEM -V PAPER -VI INTEGRAL CALCULUS (DSE-1E/B)

After the completion of the course, Students will be able to

- C01 : Evaluate the area of surfaces of revolution .
 C02: Determine the area of and volume by applying the techniques of double and triple integrals
 C03: Identify different types differential equations and solve them .
 C04: Define volumes of solid of revolution .
 C05: Explain change of order of integration .
 C06: Evaluate change of the variable in a multiple inferable.
 C07: Solve different types of triple integral sums.

SEM-VI BOOLEAN ALGEBRA SEC-4G

After the completion of the course, Students will be able to

- C01 : Use truth tables and laws of identity ,distributive ,commutative and domination
 C02: Compute sum of products and product of sum expansions
 C03: Convert Boolean expressions to logic gates and vice versa
 C04: Discuss different simplification method for Boolean functions
 C05: Recall various logic gates and the rules of Boolean algebra
 C06: Realize the combinational and sequential circuits by using logical blocks

SEM-VI GRAPH THEORY SEC-4H

After the completion of the course, Students will be able to

- C01 : Able to define the basic concepts of graphs ,directed graphs and weighted graphs
 C02: Able to understand Eulerian circuit and Hamiltonian circuits
 C03: Understand the concepts of plane graph and theory
 C04: Solve problems involving vertex and edge connectivity.
 C05: Model real world problem using graph theory.

SEM-VI ELEMENTS OF NUMBER THEORY GE -2

After the completion of the course, Students will be able to

- C01 : Explain the concepts of divisibility, prime number, congruence and number theorems.
 C02: Explain division algorithm.
 C03: Explain Euclid's algorithm.

- C04: Explain the greatest common divisor.
- C05: Express the concept of congruence with its qualities.
- C06: Explain the concepts of linear congruence and quadric linear congruence.
- C07: Explain Fermat's Theorem and Wilson's Theorem..
- C08: Demonstrate uniqueness of distinguishing to prime number factors at integers..
- C09: Use Fermat's Theorem and Wilson's Theorem.

SEM-VI NUMERICAL ANALYSIS PAPER – VII (DSE -1F)

After the completion of the course, Students will be able to

- C01 : Learn various numerical methods to solve algebraic and transcendental equations
- C02 : Understand forward ,backward and central differences and relationships between them
- C03 : Learns divided difference its properties and use Newton's formula to for interpolation .
- C04 : Learn numerical differentiation and able to use various numerical methods to find differentiation .
- C05 : Approximate a function using and appropriate numerical method .
- C06 : Solve a linear system of equation using and appropriate numerical method .
- C07 : Prove results for numerical route finding methods .
- C08 : Calculate a definite integral using and appropriate numerical method .

SEM-VI PAPER- VIII COMPLEX ANALYSIS (DSE -1F/A)

After the completion of the course, Students will be able to

- C01 : Define the concepts of derivation of analytic functions.
- C02 : Calculate the analytic functions.
- C03 : Express the Cauchy's Derivative formulas.
- C04 : Define the concept of Cauchy-Goursat Integral Theorem
- C05 : Evaluate complex integrals by using Cauchy-Goursat Integral Theorem
- C06 : Define the simple and multiple connected domains.
- C07 : Express Liouville's theorem and the fundamental theorem of the algebra.
- C08 : Explain fundamental theorem algebra and maximum modules principle.

SEM-VI PAPER- VIII VECTOR CALCULUS (DSE -1F/B)

After the completion of the course, Students will be able to

- C01 : Define vector equation for lines and planes.
- C02 : Analyze vector functions to find limits , derivatives , tangent lines , integrals , arc length ,curvature.
- C03 : Compute limits and derivatives of functions of two and three variables .
- C04 : Differentiate vector fields.
- C05 : Determine gradient vector fields and find potential functions .
- C06 : Calculate work , circulation flux and verify path independence .
- C07 : Evaluate line integrals, surface area and surface integrals .