

Programme B.Sc. MATHEMATICS

Programme Outcomes

- Students are to be passionately engaged in initial learning with an aim to think differently as agents of new knowledge, understanding and applying new ideas in order to acquire employability / self-employment.
- Students are made to be competent and socially responsible citizen of India.
- Students are to be exposed to technical, analytical and creative skills.
- Learners are to be imparted with a broad conceptual background in Mathematics.

Programme Specific Outcomes

- Learners will obtain basic knowledge on mathematics
- Students will learn the basic ethics and their social responsibility.
- Students will improve their communication and presentation skills.
- Students will get introduced to new topics in mathematics, which will develop their critical and analytical thinking skills.

Course Outcomes

SEMESTER – I

Calculus

- Enable the students to learn and gain knowledge about curvatures, integrations and its geometrical applications.
- On successful completion of course the students should have gained about the evolutes and envelopes, different types of integrations, its geometrical application, single and multiple integration.

Classical Algebra

- Enable the students to learn about the convergence and divergence of the series and to find the roots for the different types of the equations.
- On successful completion of this course the students should have gained knowledge about the convergence of series and solving equations.

Allied –I: Statistics-I

- Students learn the concept of measures of dispersion.
- Students learn the concept of measures of central tendencies.
- Gain the knowledge on probability distributions.
- Gain knowledge on Concepts of Random Variables and Distributions
- Acquire knowledge on Basic Concepts of Expectation and continuous & discrete distribution

Allied Mathematics (For science students)

Algebra and Differential Equations

- Students gain the knowledge on order and degree of ODE.
- Learners understand the basic Theory of equations.
- Learners study the concept of Laplace transforms.
- Gain knowledge on Theory of matrices.

SEMESTER – II

Analytical Geometry Of Three Dimensions

- Enable the students to learn and visualize the fundamental ideas about co-ordinate geometry.
- On successful completion of the course students should have gained knowledge about the regular geometrical figures and their properties.

Differential Equations

- Enables the students to learn the method of solving Differential Equations. Objectives: End of this course, the students should gain the knowledge about the method of solving Differential Equations.
- It also exposes Differential Equation as a powerful tool in solving problems in Physical and Social sciences.

Statistics II

- Students acquire the knowledge on Basic concepts of Sampling and testing of Hypothesis
- Learners knowledge of Testing of Hypothesis for real life problems and for small samples.
- Gain knowledge about various types of Estimators.
- Learners learn the Concepts of Correlation and rank correlation coefficient.
- Gain Practical Knowledge of Correlation and Rank Correlation Coefficient, t-distribution and F-distribution.
- Gain knowledge on statistical quality control.

Allied Mathematics

Vector Calculus & Fourier Series

- Acquiring knowledge on vector differentiation and vector integration
- Gaining knowledge on evaluation of double & triple integrals.
- Know about Green's, Stokes and Divergence theorem.

- Gaining knowledge on Fourier series.

SEMESTER – III

Real Analysis I

- Enable the students with a good foundation of classical analysis.
- Learners will obtain the knowledge on behaviour of sequences and series

Allied II: Statistics-I

- Gaining knowledge on the concept of measures of dispersion and measures of central tendencies.
- Enable the students to develop the concept of Probability distributions.

Skill Based

Vector Calculus

- Acquire basic knowledge of vector differentiation and vector integration
- Enable the students to solve problems related to that

Non – Major Elective

Mathematics for Competitive Examinations-I

- Enable the students to learn the problems solving techniques for aptitude problems
- Enable the students to prepare themselves for various competitive examinations

Fundamentals of Statistics-I

- Students get introduced on measures of central tendency to other major students
- Gaining knowledge on correlation, regression and solving simple problems

SEMESTER – IV

ABSTRACT ALGEBRA I

- Acquire knowledge on the concept of Groups, Ring and Field.
- Gaining knowledge on the concept of homomorphism

Statistics -II

- Enable the students to know about the concept of index numbers
- Enable the students to study the distribution functions
- Enable the students to understand the Analysis of variance

Allied Mathematics

- Acquire basic knowledge of vector differentiation and integration
- Learners can solve integration problems

Skill Based

Trigonometry, Fourier Series And Laplace Transforms

- Enable the students to understand the concept of Trigonometry
- Gaining knowledge on the concept of Laplace transform
- Learners will know about the concept of Fourier series

Non – Major Elective

Mathematics for Competitive Examinations -II

- Enable the students to learn the problems solving techniques for aptitude problems
- Enable the students to prepare themselves for various competitive examinations

Fundamentals of Statistics-II

- Students get introduced on measures of central tendency to other major students
- Acquire knowledge on index numbers and simple problems
- Learners will know the concepts of attributes

SEMESTER – V

Abstract Algebra II

- Enable the students to facilitate a better understanding of vector space
- Enable the students to solve problems in matrices

Real Analysis – II

- Students can understand the real number of system and metric spaces
- Students will know the concepts of continuity and Riemann integrals
- Enable the students to understand the concept of connectedness and compactness

Statics

- Enable the students to realize the nature of forces and resultant forces when more than one force is acting on a particle.
- On successful completion of course the students should realize the concept about the forces, resultant force of more than one force acting on a surface, friction and center of gravity. Also he can differentiate static and dynamic forces.
- Enable the students with the basic knowledge of equilibrium of a particle
- Enable the students to develop a working knowledge to handle practical problems

Transforms And Their Applications

- Acquire knowledge on Transformations
- Enable the students to solve the problems connected with Transforms.

Major Elective - I

Astronomy - I

- Gaining knowledge on the exciting world of Astronomy.
- Enable the students to understand the movements of the celestial sphere.
- Acquire knowledge on the Kepler's laws of motion.

Discrete Mathematics

- Learners will know about the concept of Mathematical logic.
- Enable the students to understand the basics of Lattices and Boolean Algebra.
- Enable the students to know about the number system and codes.

Combinatorial Mathematics

- Acquisition of knowledge on the basic concepts of Pairings and arrangements etc.
- Enable the students to understand aspects of assignment problems.
- Students will be able to understand the concepts of block designs.

Major Elective -II

Operations Research-I

- Students get introduced to the various techniques of operations research.
- Enable the students to solve real life problems in Business Management.
- Gaining knowledge on different types of Linear programming Problems.

Stochastic Process

- Acquisition of knowledge on probability and distribution functions.
- Enable the students to understand the concepts of stochastic process.
- Students able to identify Markov chains.

M.S. Office

- Acquire basic knowledge of computer.
- Acquisition of knowledge on word, excel and power point.

SEMESTER – VI

Complex Analysis

- Enable the students to understand the functions of complex variables
- Students will obtain knowledge about elementary transformations, concepts in complex variables.
- Enable the students to understand the singularity concepts and residues.

Number Theory

- Enable the students to highlight the beauties in the world of numbers.
- Students get prepared for coding through congruence.

Graph Theory

- Learners will know about the notion of graph theory and its applications.
- Acquisition of knowledge on the techniques of combinatorics in graph theory.

Dynamics

- Acquire basic knowledge on the behaviour of objects in motion.
- Enable the students to develop a working knowledge to handle practical problems.

Numerical Methods

- Gaining knowledge on the finite differences.
- Enable the students to solve numerical problems by different methods.

Major Elective - III

Astronomy – II

- Enable the students to understand the exiting world of Astronomy.
- Acquisition of knowledge on the concepts of eclipses.
- Enable the students to facilitate the movements of celestial objects.

Fuzzy Mathematics

- Acquire basic knowledge on fuzzy concepts to students.
- Facilitate the students to study fuzzy operations and fuzzy numbers.

Mathematical Modelling

- Learners will know about mathematical models through ODE and difference equations
- Enable the students to develop mathematical models in real life problems

Major Elective - IV

OPERATIONS RESEARCH-II

- Students get introduced to Games and strategies.
- Enable the students to understand networking problems.
- Enable the students to solve real life problems in business and management.

Coding Theory

- Learners get introduced to coding and decoding concepts.
- Train the students in the field of coding theory.

Programming in C

- Students get introduced to the exiting world of programming to the students.
- Train the students to run simple C programs.

PROGRAMME M.SC. MATHEMATICS

Programme Outcomes

- The idea of the program is to attract the young talents to Mathematics keeping in line with the policy of the Government of India to promote education in pure sciences. The syllabus is framed keeping this goal in mind.
- Elective course in the fourth and fifth years are planned to suit competitive examinations like NET and SLET.
- Students undergoing this programme will have the opportunity of choosing research / teaching at leading research institutions or a career in corporate sectors.
- To enable the students to have a thorough exposure to the different branches of Mathematics so as to gain a comprehensive knowledge of Mathematics.
- To cultivate logical thinking and analytical skills, this sharpens their concentration and provides patience to grapple with life outside the campus.

Programme Specific Outcomes

- To enable the students to have a thorough exposure to the different branches of Mathematics so as to gain a comprehensive knowledge of Mathematics.

Course Outcomes

Semester I

1 ALGEBRA - I

- Learners will acquire knowledge on Counting Principle and Homomorphisms.
- Knowledge gained about Automorphisms and Cayley's theorem.
- Learners will gain knowledge about Permutation groups, Sylow's theorems and Direct products.

2 ANALYSIS – I

- Acquisition of knowledge about Metric spaces, Compact sets, Perfect sets, Cantor sets and Connected sets.
- Learners will gain knowledge about Convergence sequences, Sub sequences, Cauchy sequence, Lower and Upper limits, Series and Some special sequences.
- Knowledge gained about Root test and Ratio test.
- Students will gain knowledge on Continuity, Limit of functions and Discontinuous.
- Students will know about Differentiation, Derivative of a real function, L'Hospital Rule and Taylor's theorem.

3 ANALYTIC NUMBER THEORY

- Knowledge gained about the fundamental Theorem of Arithmetic.

- Acquisition of knowledge about Arithmetic functions, Multiplicative functions and Dirichlet Multiplication.
- Students will gain knowledge about Averages of Arithmetical functions, Partial sums of Dirichlet product and Chebyshev's functions.

4 ORDINARY DIFFERENTIAL EQUATIONS

- Knowledge gained about Second Order linear equations and Power series solutions.
- Acquisition of knowledge about Legendre polynomials, Bessel functions, The Gamma functions and Linear systems.

5 NUMERICAL ANALYSIS

- Knowledge gained about various interpolation methods.
- Acquisition of knowledge about Numerical differentiation and Numerical Integration.
- Students will gain knowledge to solve ordinary differential equations by using various numerical methods.

Semester II

6 ALGEBRA II

- Knowledge gained about Ring Homomorphisms
- Acquisition of knowledge about Euclidean rings, Polynomial rings, Certain radicals of a ring, Jacobson radical of a ring and Semi simple ring

7 ANALYSIS II

- Knowledge gained about Integration of vector valued functions.
- Acquisition of knowledge about Uniform Convergence, Uniform Convergence and Continuity, Uniform Convergence and Integration, Uniform Convergence and Differentiation.
- Knowledge gained about The Stone Weierstrass Theorem, Fourier Series and The Gamma function.

8 CLASSICAL MECHANICS

- Learners will gain knowledge about Mechanics of particle and Mechanics of a system of particles with constraints.
- Acquisition of knowledge about D'Alembert's Principle, Lagrange's equation and Hamilton's Principle.
- Knowledge gained about one-body problem, the virial theorem and the Kepler problem.

9 DIFFERENTIAL GEOMETRY

- Knowledge gained about space curves and surface.
- Acquisition of knowledge about Contact between curves and surfaces, Families of curves, Geodesic curvature and Principal Curvature, Lines of Curvature.

10 GRAPH THEORY

- Graduates will have basic knowledge on graph theory
- 11 i. PROGRAMMING WITH C++**
- Enable the students to develop a C++ program for a given problem.
- ii. DISCRETE MATHEMATICS**
- Acquisition of knowledge about Propositional Logic, Propositional equivalence, The Basics of counting, Relation and their properties.
 - Students will gain knowledge on Boolean functions and Logic Gates.
- iii. PARTIAL DIFFERENTIAL EQUATIONS**
- Acquisition of knowledge about Pfaffian Differential Forms and Equations and their Solution in three variables.
 - Students will know about Origins of first order Partial Differential equations.
 - Knowledge gained about Cauchy's Method of Characteristics and Charpit's Method.
 - Learners will know about Second order equations in Physics, Linear Partial Differential equations with Constant Coefficients and Characteristics of Equations in three variables.

Semester –III

12. Measure And Integration

- Gain the knowledge of measure spaces and measure interruption.
- Understanding the concept of lesbeague measure, lesbeague integration and signed measure.
- To provide the understanding of general measure spaces.
- Basic knowledge of differentiation, integration and continuity of real functions.
- Knowledge gained about lesbeague theory and general measure spaces and their properties and construction.

13. Topology I

- To distinguish space by means of Simple Topological invariants.
- Gain the knowledge of constructing spaces by giving and to prove that in certain case, that the result is homeomorphic to standard spaces.
- Basic knowledge in Set Theory and Analysis at undergraduate level.
- Knowledge gained about Topological Spaces and the theories based on these Spaces.

14. Advanced Algebra I

- The aim of the paper is to introduce some of the most fundamental algebraic structures like inner product space, Determinants, etc.
- Basic knowledge in set theory and Matrix theory.

- After learning this paper the student can understand the notion of Dual Spaces and the algebra of Linear transformations.

15. Operations Research

- To modify real life into Standard Mathematical Models.
- To learn different optimization techniques.
- To know classification of different structured problems.
- Basic computing knowledge and techniques at undergraduate level.
- Identification of actual problems and its equivalent mathematical models.
- Application to different optimization techniques in real life situations.
- Knowledge gained in utilization of Optimum Resources.

16. Research Methodology

- To understand the Basic aspects in research.
- To learn Mathematical and Statistical technique for research.
- To acquire basic knowledge about various instruments and techniques in Mathematical research.

17. Elective 2(Any one) Algebraic Number Theory

- To acquire knowledge about recent developments in Algebra have its impact on Number Theory and Number Theory too has its own contribution to the development of algebra.
- To understand and appreciate the role played by Algebra in Number Theory.
- Basic knowledge in Distribution of primes, Mathematical Induction and Congruence.
- Knowledge gained about various types of numbers such as algebraic Numbers, Pythagorean triples and representation of number as sum of positive squares.

Calculus Of Variations And Integral Equations

- The objective of this paper is to place at the disposal of the student, the basis of an intelligent working knowledge of a number of facts and techniques which are useful in varied fields of application.
- Basic knowledge in Elementary Matrix Theory, Quadratic forms, Coordinate Transformations.
- Gain knowledge in maxima minima technique and solution of certain types of Integral equations.

Formal Languages And Automata Theory

- This course provides a formal connection between algorithmic problems solving and union of languages and automata and develop them into a mathematical view towards algorithmic design and computation.
- Basic knowledge in computer operations and languages.
- Be able to understand the basic properties of formal languages.
- Be able to understand the basic properties of deterministic and non-deterministic finite automata.

SEMESTER –IV

18. Functional Analysis

- To gain knowledge about Banach Spaces, Hilbert Spaces and Banach Algebra.
- To use algebraic structure in Analysis.
- Graduates will have a strong foundations and in depth understanding of the current topics related with functional Analysis, Spectral Theory, Approximation Theory.

19. Complex Analysis

- To gain advanced knowledge about Complex functions and Analytic functions as mappings
- To understand the concept of Analyticity Conformality, Linear Transformation and Complex Integration.
- Acquisition of solving problems in Complex Integration and boundary value problems.

20. Advanced Algebra II

- Gain knowledge in fields in the theory of numbers, the theory of equations and Galois Theory.
- Understand the application of Galois Theory in theory of equations and Geometry.

21. Topology II

- Gain knowledge in separation axioms in Topological Spaces.
- Understanding the concepts of Normal and Regular Spaces.
- Improves the standard of understanding Set theory, Analysis and Topology and pave the way to do Research in these areas.

22. Project

- Projects will enable the learners to undergo research aptitude in the areas of his /her specialization with more deep knowledge.
- It should be helpful to explain the basic physical concepts and useful for the development of basic science.

Programme M.Phil Mathematics

1 Research and Teaching Methodology

- Learners will gain knowledge of commutative rings.
- Students get introduced in algebraic structure through the modules, different types of modules and it's algebraic application.
- To motivate students to do research in diverse fields such as homological algebra, algebraic number theory, algebraic geometry, finite fields and computational algebra.

2 Advanced Analysis

- Enable the students to understand borel measure in real and complex field.
- Motivating the students is to prepare scholars with L_p spaces for the study of analysis.
- To help the students to undertake further research in Fourier analysis, Harmonic analysis and Functional analysis.

3 Project Oriented Elective Course (Theory)

1 Banach Algebra And Spectral Theory

- Students get introduced into the topics of Banach algebra and Hilbert spaces.
- Students are motivated to learn about various operators and their characteristics.

2 Advanced Graph Theory

- Enable the learners to understand some topics for his research in graph theory.
- It provides several conjectures and open problems to widen the scope of research.
- The outcome of the course is identification area and problems for research in graph theory.

3 Harmonic Analysis

- Students will gain knowledge on periodic functions, which play a vital role in solving many problems in Mathematics and Physics.
- Enable the students to do Fourier analysis, is the study of various aspects of periodicity of functions.
- Enable the students to do Harmonic Analysis is a natural generalization of Fourier analysis and is significant for its mathematical aspect.
- The outcome of the course is to help researchers in both pure and applied mathematical fields.

4 Theory Of Near-Rings

- To provide the knowledge about the generalized ring structures.

- Gain knowledge on near-ring, which is a natural generalization of rings in the sense that the set of all endomorphism's of a group form a ring, where the set of all mappings of a group form a near-ring.
- Students will understand the structure of near-rings, is useful in project geometry to deal about generalized field conditions.

5 Advanced Calculus

- Gain knowledge on the Calculus of several variables, which involves many branches of Mathematics such as Partial Differential Equations, Optimization, Statistics etc.
- The main objective of this course is to give a thorough understanding of differentiation and integration of functions of several variables.
- The outcome of the course is the ability to solve problems involving several variables.

6 Algebraic Graph Theory

- To improve the knowledge of the learner to apply algebra in graph theory.
- It is framed to give adequate exposure about algebraic approach to graph theory.
- The outcome of the course is to enable the student to do qualitative research in algebraic graph theory.

7 Stochastic Modeling

- It is concerned with concepts and techniques and it is oriented towards a broad spectrum of mathematical, scientific and engineering interests.
- Characterization, Structural properties , inferences and control of Stochastic processes are covered in every unit.
- The paper is designed to get deep knowledge of stochastic processes.

8. Wavelets

- Wavelet analysis has drawn much attention from both mathematicians and engineers alike.
- The emphasis of the course is on spline wavelets and time-frequency analysis.
- Enable the learners to apply the pure mathematics in signal processing and image analysis.

Semester II

4 Project and Viva Voce

- Students are introduced to various potential fields of research in mathematics.
- Enable the students to improve their manuscript writing skills, their way of presenting their results, training in LATEX way of presenting their thesis etc.
- Enable the students in various analytical methods, analyse their results, come to know the qualitative and quantitative analysis, error calculations etc.
- Enable the learners to undergo research aptitude in the areas of his/her specialization with more deep and socital need for explaining the various physical concepts.

Programme Ph.D Mathematics

1 Commutative algebra

- Enable the students to know about commutative rings.
- Learners are introduced to algebraic structure through the modules and different types of modules and its algebraic application.
- Students are motivated to do research in diverse fields such as homological algebra, algebraic number theory, algebraic geometry, finite fields and computational algebra.

2 Advanced analysis

- Enable the students to understand boreal measure in real and complex field.
- Motivation is to prepare scholars with an excellence in L_p spaces for the study of analysis.
- To help the students to undertake further research in Fourier analysis, Harmonic analysis and Functional analysis.

3 Banach algebra and spectral theory

- Learners are introduced to the topics of Banach algebra and Hilbert spaces.
- Gain knowledge about various operators and their characteristics.

4 Advanced graph theory

- To introduce the learner some topics for his research in graph theory.
- It provides several conjectures and open problems to widen the scope of research.
- Learners will able to identify the area and problems for research in graph theory.

5 Harmonic analysis

- Gain knowledge on periodic functions which play a vital role in solving many problems in Mathematics and Physics.
- Gain knowledge on Fourier analysis which is the study of various aspects of periodicity of functions. Harmonic Analysis is a natural generalization of Fourier analysis and is significant for its mathematical aspect.
- Obtain the basic knowledge of Real and Complex analysis to help student researchers in both pure and applied mathematical fields.

6 Stochastic modelling

- Gain knowledge on the basics of probability space random variable.
- Learners will know about discrete distributions and Continuous distributions.
- Students will understand Expectation and Conditional Expectation.
- Learners will obtain knowledge on Moment Generating Function, Probability Generating Function and Laplace Transform.

- Gain knowledge on Joint Distributions, Functions of random variables and random vectors.

7 Wavelets

- Students will obtain the knowledge on Wavelet analysis.
- Learners will obtain on spline wavelets and time-frequency analysis.
- Enable the learners to apply the pure mathematics in signal processing and image analysis.

8 Theory of near-rings

- This course will provide the knowledge about the generalized ring structures.
- Gain knowledge on formation of a ring and a near ring.
- Gain knowledge on the structure of near-rings, which is useful in project geometry to deal about generalized field conditions.

9 Advanced calculus

- Learners will gain knowledge on Partial Differential Equations, Optimization, Statistics etc.
- Learners will get a thorough understanding of differentiation and integration of functions of several variables.
- The prerequisite is a precise knowledge of Calculus of single variable.
- Students will have the ability to solve problems involving several variables.

10 Algebraic graph theory

- To improve the knowledge of the learner to apply algebra in graph theory.
- It is framed to give adequate exposure about algebraic approach to graph theory.
- Enable the students to do qualitative research in algebraic graph theory.

11 Combinatorial theory

- Students developed their skills to apply the techniques of combinations and permutations for counting the number of certain configurations.
- After completing this course, the student will be able to solve problems involving the distributions of objects into cells, partitions of integers, generating functions, permutations with restrictions on relative positions, rook polynomials and Polya's theory.

12 Advanced domination theory in graphs

- Students are introduced to Domination theory in graphs, is a potential area of research with many open problems.
- It helps the candidate to identify an interested area with wide scope for research.

13 Graph reconstruction theory

- Gaining knowledge on Reconstruction Conjecture, is one of the foremost and famous unsolved problems in Graph Theory.

- The learners are expected to know some interesting classes of reconstructible graphs, some reconstructible parameters of graphs, an innovative technique used in counting lemma and the current status of the Conjecture.
- Enable the scholars to prove more new classes of graphs and new parameters of graphs to be reconstructible.

14 Algebraic topology

- Elaborates to learners about topological spaces and continuous maps between them.
- It demonstrates the power of topological methods in dealing with problems involving shape and position of objects and continuous mappings, and shows how topology can be applied to many areas, including geometry, analysis, group theory and physics.
- The outcome of the course is to the ability to pursue further studies in this and related areas of the candidate.