

Department of Mathematics

Program Educational Objectives (PEOs)	
The B. Sc. Mathematics programme describe accomplishments that graduates are expected to attain within five to seven years after graduation	
PEO1	Acquire knowledge in functional areas of Mathematics and apply in all the fields of learning.
PEO2	Recognise the need for life long learning and demonstrate the ability to explore some mathematical content independently.
PEO3	Employ mathematical ideas encompassing logical reasoning , analytical, numerical ability, theoretical skills to model real-world problems and solve them.
PEO4	Develop critical thinking ,creative thinking, self confidence for eventual success in career.
PEO5	Analyze , interpret solutions and to enhance their Entrepreneurial skills, Managerial skill and leadership
PEO6	To prepare the students to communicate mathematical ideas effectively and develop their ability to collaborate both intellectually and creatively in diverse contexts.
PEO7	Rewarding careers in Education, Industry, Banks, MNCs and pursue higher studies

Program Specific Outcomes (PSOs)	
After the successful completion of B. Sc. Mathematics programme, the students are expected to	
PSO1	Maintain a core of mathematical and technical knowledge that is adaptable to changing technologies and provides a solid foundation for extended learning.
PSO2	Identify the applications of Mathematics in other disciplines and society.
PSO3	Develop an in-depth knowledge in Mathematics appreciating the connections between theory and its applications .
PSO4	Demonstrate their mathematical modeling ability, problem solving skills, creative talent and power of communication necessary for various kinds of employment.
PSO5	Develop mathematical aptitude and the ability to think abstractly.
PSO6	Learn independently and improve one's performance.
PSO7	Students are equipped to appear competitive examinations.

Program Outcomes (POs)	
On successful completion of the B. Sc. Mathematics programme	
PO1	Students are empowered with analytical and logical skills-to formulate results and construct mathematical argument.
PO2	Ability to organize, analyze and interpret data accurately in both academic and non-academic context.
PO3	Demonstrate effective communication of mathematical ideas and creative thinking skills to facilitate solving real world problems as a team and independently.
PO4	Appreciate and identify the connections between Mathematics and other disciplines.
PO5	Competency to obtain employment in education, public and private sectors..
PO6	Identify the area of interest for extended learning from the understanding gained from the domain and allied areas of Mathematics.
PO7	Develop mathematical aptitude and make critical observations.
PO8	Garner innovative ideas to face global challenges.
PO9	Instill a sense of responsibility in tackling professional and social issues ethically.
PO10	Trigger their passion for research in unexplored areas of Mathematics.

Semester – I

Core Paper – I : CLASSICAL ALGEBRA

Expected Course Outcomes:		
On the successful completion of the course, student will be able to:		
1	Know the concept of Binomial, Exponential, Logarithmic series and their application to summation of series.	K1
2	Acquire a clear knowledge regarding methods to find approximate roots of the equations.	K2
3	Apply the appropriate tests to find the convergence or divergence of an infinite series.	K3
4	Apply Descartes's rule of signs to find the number of positive and negative roots if any in a polynomial equation.	K3
5	Analyze the relation between roots and coefficients of the polynomial equations.	K4
K1 - Remember; K2 - Understand; K3 - Apply; K4 - Analyze; K5 - Evaluate; K6 - Create		

Core Paper – II : CALCULUS

Expected Course Outcomes:		
On the successful completion of the course, student will be able to:		
1	Identify areas in Mathematics and other fields where Calculus is useful.	K1
2	Understand the concepts of Evolutes and Envelopes, methods to find curvature and evolutes.	K2
3	Apply the concept of change of variables in double and triple integrals.	K3
4	Apply double, triple integral to find the area and volume respectively.	K3
5	Apply the Beta and gamma function to solve the multiple integrals.	K4
K1 - Remember; K2 - Understand; K3 - Apply; K4 - Analyze; K5 - Evaluate; K6 - Create		

Semester – II

Core Paper – III : ANALYTICAL GEOMETRY

Expected Course Outcomes:		
On the successful completion of the course, student will be able to:		
1	Gain knowledge about the regular geometrical figures and their properties.	K1
2	Describe the geometric concepts.	K2
3	Find equation to tangent, normal at a point on a conic	K3
4	Analyze condition of tangency and find the tangent plane to the central conicoid	K4
5	Analyze conics to explain natural phenomenon	K4
K1 - Remember; K2 - Understand; K3 - Apply; K4 - Analyze; K5 - Evaluate; K6 - Create		

Core Paper – IV : TRIGONOMETRY, VECTOR CALCULUS AND FOURIER SERIES

Expected Course Outcomes:		
On the successful completion of the course, student will be able to:		
1	Know the expansion of trigonometric functions and hyperbolic functions.	K1
2	Acquire the basic knowledge of vector differentiation and vector integration.	K2
3	Determine and apply the important quantities associated with vector fields such as the divergence, curl and scalar potential.	K3
4	Understand and find Fourier series of a given periodic function.	K3
5	Examine line integral, surface integral, volume integral and inter-relations among them.	K4
K1 - Remember; K2 - Understand; K3 - Apply; K4 - Analyze; K5 - Evaluate; K6 - Create		

Semester – III

Core Paper – V : DIFFERENTIAL EQUATIONS AND LAPLACE TRANSFORMS

Expected Course Outcomes:		
On the successful completion of the course, student will be able to:		
1	Acquire knowledge to solve Differential and Partial Differential Equations.	K1
2	Solve higher order linear differential equations.	K2
3	Expose differential equation as a powerful tool in solving problems in Physical and Social sciences.	K3
4	Demonstrate competency to solve linear PDE by Lagrange's method	K3
5	Analyzethe concepts of Laplace transforms and inverse Laplace transforms to solve ODE with constant coefficients.	K4
K1 - Remember; K2 - Understand; K3 - Apply; K4 - Analyze; K5 - Evaluate; K6 - Create		

Core Paper – VI : STATICS

Expected Course Outcomes:		
On the successful completion of the course, student will be able to:		
1	Remember the various laws.	K1
2	Understand the concepts of forces and moments.	K2
3	Understand the concepts of equilibrium .	K2
4	Apply the concepts of forces and moments.	K3
5	Analyzethe basics of coplanar forces , equilibrium of forces acting on a rigid body and solve the problems.	K4
K1 - Remember; K2 - Understand; K3 - Apply; K4 - Analyze; K5 - Evaluate; K6 - Create		

Elective : Skill Based Subject : Operations Research – Paper I

Expected Course Outcomes:		
On the successful completion of the course, student will be able to:		
1	Understand the basic concepts and application of operations research in various fields.	K1
2	Know principles of construction of mathematical models of conflicting situations.	K2
3	Analyze the relationship between a linear program and its dual.	K3
4	Apply techniques constructively to make effective decisions in business and solve problems in industry.	K3
5	Build and solve transportation problems.	K4
K1 - Remember; K2 - Understand; K3 - Apply; K4 - Analyze; K5 - Evaluate; K6 - Create		

Core Paper-VII : DYNAMICS

Expected Course Outcomes:		
On the successful completion of the course, student will be able to:		
1	Remember the basic kinematics and dynamic concepts.	K1
2	Describe the differential equation of Central Orbits .	K2
3	Apply the concepts of projectile to solve problems relating to the motion of a projectile .	K3
4	To understand & apply the concepts of composition of simple harmonic motion in two directions .	K3
5	Understand impulsive forces and analyze loss of K.E due to direct and oblique impact.	K4
K1 - Remember; K2 - Understand; K3 - Apply; K4 - Analyze; K5 - Evaluate; K6 - Create		

Semester – IV

Core Paper-VIII : PROGRAMMING IN C

Expected Course Outcomes:		
On the successful completion of the course, student will be able to:		
1	Remember the importance of C language and data types.	K1
2	Understand the basic structure, operators and statements of C language.	K2
3	Understand decision control statements, loop control statements .	K2
4	Apply the concepts of data types, operators, expressions, control statements , arrays, character arrays and strings to write the C code for a given algorithm.	K3
5	Read, understand and trace the execution of programs written in C language.	K4
K1 - Remember; K2 - Understand; K3 - Apply; K4 - Analyze; K5 - Evaluate; K6 - Create		

Core Paper VIII (Practical) : PROGRAMMING IN C-(PRACTICAL)

Expected Course Outcomes:		
On the successful completion of the course, student will be able to:		
1	1 Remember and Understand the logic for a given problem and to generate Fibonacci Series, factorial & roots for given equation. (Program-1,2,7)	K1
2	Apply the concepts to calculate Statistical Values of given data. (Program-3,4)	K2
3	Remember the logic used for sorting set of numbers and names. (Program-5,6)	K2
4	Apply the concept to calculate the product of two matrices. (Program-8)	K3
K3&K4 K1 - Remember; K2 - Understand; K3 - Apply; K4 - Analyze; K5 - Evaluate; K6 - Create		

SKILL BASED SUBJECT : OPERATIONS RESEARCH – PAPER II

Expected Course Outcomes:		
On the successful completion of the course, student will be able to:		
1	Identify the importance of stocks, the reasons for holding stock in an organization, determine the optimal order quantity for models .	K1
2	Explain the various costs related to inventory system.	K2
3	Apply game theory concepts to articulate real-world situations by identifying, analyzing and practicing strategic decisions .	K3
4	Apply and extend queueing models to analyze real world systems.	K4
5	Build and solve assignment model.	K4
K1 - Remember; K2 - Understand; K3 - Apply; K4 - Analyze; K5 - Evaluate; K6 - Create		

Semester – V

Core Paper – IX : REAL ANALYSIS - I

Expected Course Outcomes:		
On the successful completion of the course, student will be able to:		
1	Remember the basic topological properties of subsets of the real numbers .	K1
2	Understand the fundamental properties of the real numbers and analyze the real number system.	K2
3	Learn the concept of limits, sequence, continuity, convergent sequence in metric spaces appreciating the abstract ideas and their applicability .	K2
4	Have the proficiency in the formulation and construction of proofs of basic results in real analysis.	K3
5	Demonstrate skills in communicating Mathematics and learn basic techniques and examples in analysis to be well prepared for extended learning .	K4
K1 - Remember; K2 - Understand; K3 - Apply; K4 - Analyze; K5 - Evaluate; K6 - Create		

Core Paper – X : COMPLEX ANALYSIS – I

Expected Course Outcomes:		
On the successful completion of the course, student will be able to:		
1	Learn techniques of complex analysis effectively to establish mathematical results.	K1
2	Recognize the simple and multiple connected domains.	K2
3	Investigate a function for its analyticity and find its series development.	K3
4	Examine the relationship between conformal mapping and analytic functions	K4
5	Compute contour integrals directly and by the fundamental theorem.	K4
K1 - Remember; K2 - Understand; K3 - Apply; K4 - Analyze; K5 - Evaluate; K6 - Create		

Core Paper – XI : MODERN ALGEBRA – I

Expected Course Outcomes:		
On the successful completion of the course, student will be able to:		
1	Recall the properties and extend group structure to finite permutation groups .	K1
2	Explain the concepts of homomorphism, isomorphism and automorphism.	K2
3	Demonstrate abstract thinking capacity and ability to prove theorems.	K3
4	Compare features of different algebraic structures .	K4
5	Examine the properties of algebraic structures and their role in applied contexts.	K4
K1 - Remember; K2 - Understand; K3 - Apply; K4 - Analyze; K5 - Evaluate; K6 - Create		

CORE PAPER XII : DISCRETE MATHEMATICS

Expected Course Outcomes:		
On the successful completion of the course, student will be able to:		
1	Assimilate various graph theoretic concepts and familiarize with their applications.	K1
2	Know and understand about partially ordered sets, Boolean algebra, lattices and their types.	K2
3	Apply Karnaugh map for simplifying the Boolean expression.	K3
4	Demonstrate the skill to construct simple mathematical proofs and to validate .	K4
5	To achieve greater accuracy , clarity of thought and language.	K4
K1 - Remember; K2 - Understand; K3 - Apply; K4 - Analyze; K5 - Evaluate; K6 - Create		

Skill Based Subject : OPERATIONS RESEARCH – PAPER III

Expected Course Outcomes:		
On the successful completion of the course, student will be able to:		
1	Know the concept of simulation and simulate a queueing system	K1
2	Understand the overall approach of dynamic programming.	K2
3	Solve nonlinear programming problems using Lagrange multiplier and using Kuhn-Tucker conditions.	K2
4	Apply concepts in optimal scheduling	K3
5	To formulate a model for solving the intractable problems.	K4
K1 - Remember; K2 - Understand; K3 - Apply; K4 - Analyze; K5 - Evaluate; K6 - Create		

Semester – VI

Core Paper – XIII : REAL ANALYSIS – II

Expected Course Outcomes:		
On the successful completion of the course, student will be able to:		
1	Demonstrate the understanding of continuity, uniform continuity, compactness, connectedness.	K1
2	Understand partitions and their refinement.	K2
3	Determine the Riemann integrability and the Riemann-Stieltjes integrability of bounded function.	K2
4	Examine the derivatives of function.	K3
5	Acquire skills in writing and analyze the proofs that arise in the context of real analysis.	K4
K1 - Remember; K2 - Understand; K3 - Apply; K4 - Analyze; K5 - Evaluate; K6 - Create		

Core Paper – XIV : COMPLEX ANALYSIS – II

Expected Course Outcomes:		
On the successful completion of the course, student will be able to:		
1	To recognize and apply the Liouville's theorem, the mean-value property of a function and the maximum modulus principle.	K1
2	Demonstrate understanding and appreciation of deeper aspects of complex analysis.	K2
3	Apply residue theorem to compute integrals.	K3
4	Ability to think critically by proving mathematical conjectures and establishing theorems from complex analysis.	K4
5	Classify the nature of singularity, poles and residues.	K2
K1 - Remember; K2 - Understand; K3 - Apply; K4 - Analyze; K5 - Evaluate; K6 - Create		

Core Paper – XV : MODERN ALGEBRA - II

Expected Course Outcomes:		
On the successful completion of the course, student will be able to:		
1	Communicate and understand mathematical ideas and results with the correct use of mathematical definitions, terminology and symbols.	K1
2	Explain the concepts of base and dimension of Vector space.	K2
3	To apply the Gram-Schmidt process to construct an orthonormal set of vectors in an inner product space.	K3
4	Demonstrate competence with the basic ideas of Matrix theory, Vector spaces, Dual spaces, Linear transformation.	K3
5	Have an insight to analyze a real life problem and solve it.	K4
K1 - Remember; K2 - Understand; K3 - Apply; K4 - Analyze; K5 - Evaluate; K6 - Create		

Skill Based Subject : OPERATIONS RESEARCH - PAPER –IV

Expected Course Outcomes:		
On the successful completion of the course, student will be able to:		
1	Know the principles and applications of information theory.	K1
2	To understand sequencing, replacement problems.	K2
3	Demonstrate skills to achieve their objective using sequencing models.	K3
4	Apply decision making under different business environments .	K4
5	Determine a solution to a rectangular game using simplex method.	K3
K1 - Remember; K2 - Understand; K3 - Apply; K4 - Analyze; K5 - Evaluate; K6 - Create		

ELECTIVE I – A : ASTRONOMY – I

Expected Course Outcomes:		
On the successful completion of the course, student will be able to:		
1	Define properties of physical systems that comprise the known universe	K1
2	Understand the Solar system, Celestial sphere, Dip-Twilight & Kepler's laws.	K2
3	Apply their physics and mathematical skills to problems in the areas of planetary science.	K3
4	Demonstrate the skill to infer valid scientific conclusions and communicate those conclusions in a clear and articulate manner.	K4
5	Analyze the astronomical concepts.	K4
K1 - Remember; K2 - Understand; K3 - Apply; K4 - Analyze; K5 - Evaluate; K6 - Create		

ELECTIVE I – B : NUMERICAL METHODS – I

Expected Course Outcomes:		
On the successful completion of the course, student will be able to:		
1	Remember the concepts of errors and its effect on computation.	K1
2	Obtain numerical solutions of algebraic and transcendental equations.	K2
3	Apply the finite difference and interpolation concepts .	K3
4	Develop skills in designing mathematical models for constructing polynomials to the given data and drawing inferences.	K4
5	Analyze the efficiency of iteration methods.	K4
K1 - Remember; K2 - Understand; K3 - Apply; K4 - Analyze; K5 - Evaluate; K6 - Create		

ELECTIVE II – A : ASTRONOMY II

Expected Course Outcomes:		
On the successful completion of the course, student will be able to:		
1	Understand the concepts of precession and nutation.	K1
2	Describe the eclipse of the moon.	K2
3	Find equation of time .	K3
4	Demonstrate the ability to analyze the concepts.	K4
5	Describe the properties of stellar system.	K2
K1 - Remember; K2 - Understand; K3 - Apply; K4 - Analyze; K5 - Evaluate; K6 - Create		

ELECTIVE III – A : GRAPH THEORY

Expected Course Outcomes:		
On the successful completion of the course, student will be able to:		
1	Identify the properties of different types of graph and their application.	K1
2	Demonstrate knowledge of basic concepts in graph theory .	K2
3	Understand cut graphs ,cycle spaces	K2
4	Apply principles and concepts of graph theory in practical situations.	K3
5	Analyze the concepts of Planar graphs.	K4
K1 - Remember; K2 - Understand; K3 - Apply; K4 - Analyze; K5 - Evaluate; K6 - Create		

ELECTIVE III – B : AUTOMATA THEORY AND FORMAL LANGUAGES

Expected Course Outcomes:		
On the successful completion of the course, student will be able to:		
1	Acquire a fundamental understanding of the core concepts in automata theory and formal languages.	K1
2	Design grammars and automata for different language classes.	K2
3	Describe the types of grammar and derivation tree.	K2
4	To apply context-free languages, push-down automata.	K3
5	Design automata, regular expressions and context-free grammars accepting or generating a certain language.	K4
K1 - Remember; K2 - Understand; K3 - Apply; K4 - Analyze; K5 - Evaluate; K6 - Create		

ELECTIVE III – C : PROGRAMMING IN C++

Expected Course Outcomes:		
On the successful completion of the course, student will be able to:		
1	Know about class structure, member functions & data members, inheritance types and example problems .	K1
2	Understand how C++ improves C with object-oriented features.	K2
3	Develop programming skills.	K2
4	To make use of objects and classes for developing programs.	K3
5	Build C++ classes.	K4
K1 - Remember; K2 - Understand; K3 - Apply; K4 - Analyze; K5 - Evaluate; K6 - Create		

ELECTIVE III – D : NUMBER THEORY

Expected Course Outcomes:		
On the successful completion of the course, student will be able to:		
1	Understand the concepts of divisibility and primes	K1
2	Solve congruence.	K2
3	Describe the fundamental theorem of Arithmetic.	K3
4	Understand the concepts and apply the theorems in areas of Mathematics.	K3
5	Compute powers of integers modulo prime numbers.	K4
K1 - Remember; K2 - Understand; K3 - Apply; K4 - Analyze; K5 - Evaluate; K6 - Create		

ELECTIVE III – E : INTRODUCTION TO INDUSTRY 4.0

Expected Course Outcomes:		
On the successful completion of the course, student will be able to:		
1	Know the reason for adopting Industry 4.0 and Artificial Intelligence.	K1
2	Understand the need for digital transformation.	K2
3	Apply the industry 4.0 tools.	K3
4	Analyze the applications of Big Data .	K4
5	Examine the applications and security of IoT Applications.	K4
K1 - Remember; K2 - Understand; K3 - Apply; K4 - Analyze; K5 - Evaluate; K6 - Create		

