PG AND RESEARCH DEPARTMENT OF MATHEMATICS

REGULATION 2023-24

B.SC. (DEPARTMENT OF MATHEMATICS)

PROGRAM OUTCOMES (PO's)

PO1: Disciplinary Knowledge: Capable of demonstrating comprehensive knowledge and understanding of one or more disciplines that form a part of an undergraduate programme of study.

PO2: Critical Thinking: Capability to apply analytic thought to a body of knowledge; analyse and evaluate evidence, arguments, claims, beliefs on the basis of empirical evidence; identify relevant assumptions or implications; formulate coherent arguments; critically evaluate practices, policies and theories by following scientific approach to knowledge development.

PO3: Problem Solving: Capacity to extrapolate from what one has learned and apply their competencies to solve different kinds of non-familiar problems, rather than replicate curriculum content knowledge; and apply one's earning to real life situations.

PO4: Analytical Reasoning: Ability to evaluate the reliability and relevance of evidence; identify logical flaws and holes in the arguments of others; analyze and synthesize data from a variety of sources; draw valid conclusions and support them with evidence and examples and addressing opposing viewpoints.

PO5: Scientific Reasoning: Ability to analyse, interpret and draw conclusions from quantitative/ qualitative data; and critically evaluate ideas, evidence, and experiences from an open minded and reasoned perspective.

PO6: Self-directed & Lifelong Learning: Ability to work independently, identify and manage a project. Ability to acquire knowledge and skills, including "learning how to learn", through self-placed and self-directed learning aimed at personal development, meeting economic, social and cultural objectives.

Programme Specific Outcomes:

PSO1: Acquire good knowledge and understanding, to solve specific theoretical & applied problems in different area of mathematics & statistics.

PSO2: Understand, formulate, develop mathematical arguments, logically and use quantitative models to address issues arising in social sciences, business and other context /fields.

PSO3: To prepare the students who will demonstrate respectful engagement with other's ideas, behaviors, beliefs and apply diverse frames of references to decisions and actions.To create effective

entrepreneurs by enhancing their critical thinking, problem solving, decision making and leadership skill that will facilitate startups and high potential organizations

COURSE OUTCOME

SEMESTER I

COURSE: ALGEBRA AND TRIGONOMETRY (CORE PAPER) CREDIT:5

CLO 1: Classify and Solve reciprocal equations

CLO 2: Find the sum of binomial, exponential and logarithmic series

CLO 3: Find Eigen values, eigen vectors, verify Cayley – Hamilton theorem and diagonalize a given matrix

CLO 4: Expand the powers and multiples of trigonometric functions in terms of sine and cosine

CLO 5: Determine relationship between circular and hyperbolic functions and the summation of trigonometric series

COURSE: DIFFERENTIAL CALCULUS (CORE PAPER) CREDIT:5

CLO 1: Find the nth derivative, form equations involving derivatives and apply Leibnitz formula

CLO 2: Find the partial derivative and total derivative coefficient

CLO 3: Determine maxima and minima of functions of two variables and to use the Lagrange's method of undetermined multipliers

CLO 4: Find the envelope of a given family of curves

CLO 5: Find the evolutes and involutes and to find the radius of curvature using polar coordinate

COURSE: NUMERICAL METHOS WITH APPLICATIONS I (ELECTIVE) CREDIT:3

CLO1: After studied unit -1, the student will be able to solve Iteration method- Regula-falsi method- Newton-Raphson method.

CLO2: After studied unit -2, the student will be able to calculate interpolation values by applying Gauss-Elimination method, Gauss-Jordan method.

CLO3: After studied unit -3, the student will be able to calculate Differences of a polynomial-Factorial polynomials- inverse operator Δ^{-1} -Summation Series.

CLO4: After studied unit -4, the student will be able to estimate one or more missing terms of the given set of data.

CLO5: After studied unit -5, the student will be able to estimate the interpolation value for unequal intervals based on Lagrange's formula of inverse interpolation

COURSE: MATHEMATICS FOR COMPETITIVE EXAMINATIONS-I(ELECTIVE) CREDIT:2

CLO1: Solve Mathematical Problems using Mathematical formulae.

CLO2: Understand the knowledge of application of Mathematics

CLO3: Understand the concepts of simplification.

CLO4: Calculate the square root and cube root.

CLO5: Solve the problems on age.

COURSE: BRIDGE MATHEMATICS (FOUNDATION 1) CREDIT:2

CLO 1: Prove the binomial theorem and apply it to find the expansions of any $(x + y)^n$ and also, solve the related problems

CLO 2: Find the various sequences and series and solve the problems related to them. Explain the principle of counting.

CLO 3: Find the number of permutations and combinations in different cases. Apply the principle of counting to solve the problems on permutations and combinations

CLO 4: Explain various trigonometric ratios and find them for different angles, including sum of the angles, multiple and submultiple angles, etc. Also, they can solve the problems using the transformations.

CLO 5: Find the limit and derivative of a function at a point, the definite and indefinite integral of a function. Find the points of min/max of a function.

SEMESTER II

COURSE: ANALYTICAL GEOMETRY (CORE PAPER) CREDIT:5

CO1:	Understand and apply the concept of homogeneous equations of second degree to represent straight lines in different forms.
CO2:	Derive polar equations for straight lines, circles, and conic sections, and analyze their geometric properties.
CO3:	Formulate general equations of planes, calculate angles between two planes, and determine perpendicular distances.
CO4:	Calculate the angle between a line and a plane, determine the length of perpendiculars, and analyze coplanar and skew lines.
CO5:	Formulate equations of spheres, determine lengths of tangents, and analyze sections of spheres.

COURSE: INTEGRAL CALCULUS(CORE PAPER) CREDIT:5

CLO 1: Determine the integrals of algebraic, trigonometric and logarithmic functions and to find the reduction formulae

CLO 2: Evaluate double and triple integrals and problems using change of order of integration

CLO 3: Solve multiple integrals and to find the areas of curved surfaces and volumes of solids of revolution

CLO 4: Explain beta and gamma functions and to use them in solving problems of integration

CLO 5: Explain Geometric and Physical applications of integral calculus.

COURSE: NUMERICAL METHOS WITH APPLICATIONS I (ELECTIVE) CREDIT:3

CLO1: After studied unit -1, the student will be able to evaluate derivatives by applying Newton's forward and backward differences formulae.

CLO2: After studied unit -2, the student will be able to evaluate integrations by applying the trapezoidal rule, Simpson‟s rules, and Weddle‟s rule.

CLO3: After studied unit -3, the student will be able to find a complete solution to linear difference equations.

CLO4: After studied unit -4, the student will be able to estimate approximate numerical solutions of ordinary differential equations by Euler, Picard and Taylor.

CLO5: After studied unit -5, the student will be able to estimate approximate numerical solutions of ordinary differential equations by Runge-Kutta methods.

SEMESTER III

COURSE: VECTOR CALCULUS(CORE PAPER) CREDIT:5

CLO 1: Find the derivative of vector and sum of vectors, product of scalar and vector point function and to determine derivatives of scalar and vector products

CLO 2: Applications of the operator 'del' and to Explain soleonidal and ir-rotational vectors

CLO 3: Solve simple line integrals

CLO 4: Solve surface integrals and volume integrals

CLO 5: Verify the theorems of Gauss, Stoke's and Green's(Two Dimension)

COURSE: DIFFERENTIAL EQUATIONS(CORE PAPER) CREDIT:5

CLO 1: Determine solutions of homogeneous equations, non-homogeneous equations of degree one in two variables, solve Bernoulli's equations and exact differential equations

CLO 2: Find the solutions of equations of first order but not of higher degree and to Determine particular integrals of algebraic, exponential, trigonometric functions and their products

CLO 3: Find solutions of simultaneous linear differential equations, linear equations of second order and to find solutions using the method of variations of parameters

CLO 4: Form a PDE by eliminating arbitrary constants and arbitrary functions, find complete, singular and general integrals, to solve Lagrange's equations

CLO 5: Explain standard forms and Solve Differential equations using Charpit's method.

COURSE: MATHEMATICAL STATISTICS I (ELECTIVE) CREDIT:3

CO1	Acquire the knowledge of basic concepts in statistics
CO2	Be able to understand various types of random variables and the distributions
CO3	Calculate moments, cumulants, moment generating function and various constants of probability distributions
CO4	Illustrate the theory of random variables, distribution functions and probability distributions with suitable

CO5	Be able to evaluate solution of real-life problems under the concept of probability and probability distributions.

SEMESTER IV

COURSE: Optimization Techniques (CORE PAPER) CREDIT:5

CO1:	describe the concepts involved in solving linear programming problems which are widely used in business operations.
CO2:	apply mathematical techniques used in optimizing transportation and assignment problems.
CO3:	solve job sequencing problems.
CO4:	breakdown different inventory models
CO5:	evaluate PERT, CPM problems and develop applications

COURSE :ELEMENTS OF MATHEMATICAL ANALYSIS CREDIT:5

CLO 1: Explain in detail about sets and functions, equivalence and countability and the LUB axiom

CLO 2: Explain Sequence and Subsequence of real numbers and to find the limit of sequence to test for convergent, divergent, bounded and monotone sequences

CLO 3: Explain the operations on convergent and divergent sequences and to Explain the concepts of limit superior and limit inferior and the notion of Cauchy sequences

CLO 4: Classify the series of real numbers and the alternating series and their convergence and divergence, the conditional convergence and absolute convergence and solve problems on convergence of the sequences

CLO 5: Explain about the metric spaces and functions continuous on a Metric space

COURSE: MATHEMATICAL STATISTICS II (ELECTIVE) CREDIT:3

CO-1	Recognize the parameters and statistics to test the significance of sampling
CO-2	Finding the Goodness of Fit
CO-3	Derive the various measures of Chi-square, t and F distributions
CO-4	Correlation coefficients between Observed and Estimated values
CO-5	Analyse the Regression lines

Semester V

COURSE :ABSTRACT ALGEBRA(CORE PAPER) CREDIT:4

CLO 1: Explain groups, subgroups and cyclic groups

CLO 2: Explain about Normal subgroup, Quotient groups, Homomorphisms and Automorphisms and verify the functions for homomorphism and automorphism properties

CLO 3: Explain Permutation groups and apply Cayley's theorem to problems

CLO 4: Explain Rings, Ideals and Quotient Rings and examine their structure

CLO 5: Discuss about the field of quotient of an integral domain and to Explain in detail about Euclidean Rings.

COURSE :REAL ANALYSIS (CORE PAPER) CREDIT:4

CLO 1: Explain the concepts of Continuous and Discontinuous functions, open and close sets, Connectedness, Completeness and Compactness

CLO 2: Explain the concepts of bounded and totally bounded sets, continuity of inverse functions and Uniform continuity

CLO 3: Define the sets of measure zero, to Explain about the existence and properties of Riemann integral

CLO 4: Explain the concept of differentiability and to Explain Rolle's theorem, Law of mean, and Fundamental theorem of calculus

CLO 5: Explain the point wise and uniform convergence of sequence of function

COURSE :MATHEMATICAL MODELLING (CORE PAPER) CREDIT:4

CLO 1: Explain simple situations requiring Mathematical Modelling and to Determine the characteristics of such models

CLO 2: Model using differential equations in-terms of linear growth and Decay models

CLO 3: Model using systems of ordinary differential equations of first order, to discuss about various models under the categories 'Epidemics' and 'Medicine'

CLO 4: Explain in detail about difference equations

CLO 5: Model using difference equations
and to derive the Taylor's theorem.

Semester VI

COURSE :LINEAR ALGEBRA (CORE PAPER) CREDIT:4

CLO 1: Acquire a detailed knowledge about vector spaces and subspaces

CLO 2: Explain the concepts of Linear Dependence, Linear Independence, Bases and Dimension of basis

CLO 3: Explain the concept of Linear Transformations, their Matrix representation and the notion of dual spaces

CLO 4: Find the Eigen values and Eigen vectors, to apply the concepts for diagonalisation

CLO5: Explain about Inner product and norms and to apply Gram Schmidt Orthogonalization Process to problems on inner product spaces.

COURSE :COMPLEX ANALYSIS (CORE PAPER) CREDIT:4

CLO 1: Explain about analytic functions, their differentiation and continuity and to verify the Harmonic functions using analyticity conditions

CLO 2: Explain the concept of Conformal mappings and mappings by linear transformations and linear fractional transformations

CLO 3: Explain about the integrations of functions over simply and multiply connected domains and to derive the Cauchy integral formula, Liouvlle's theorem, Fundamental theorem of Algebra and Maximum Module Principle

CLO 4: Find the convergence the sequences and series, to derive Taylor's and Laurent's

series

CLO 5: Find the nature of singularities, to find the residue of a given function at a given singular point, to Explain about zeros and poles and to evaluate real improper integrals (Excluding poles on the real axis).

COURSE :MECHANICS (CORE PAPER) CREDIT:4

CLO 1: Define Resultant, Component of a Force, Coplanar forces, like and unlike parallel forces, Equilibrium of a Particle, Limiting equilibrium of a particle on an inclined plane.

CLO 2: Define Moment of a force and Couple with examples. Define Parallel Forces and Forces acting along a Triangle, Solve problems on frictional forces

CLO 3: Define work, energy, power, rectilinear motions under varying forces. Define Simple Harmonic Motion and find its Geometrical representation.

CLO 4: Define Projectile, impulse, impact and laws of impact. Prove that the path of a projectile is a parabola. Find the direct and oblique impact of smooth elastic spheres

CLO 5: Define central orbits, explain conic as centered orbits and solve problems related to central orbits

M.Sc MATHEMATICS

PROGRAM OUTCOMES

PO1: Problem Solving Skill

Apply knowledge of Management theories and Human Resource practices to solve business problems through research in Global context.

PO2: Decision Making Skill

Foster analytical and critical thinking abilities for data-based decision-making.

PO3: Ethical Value

Ability to incorporate quality, ethical and legal value-based perspectives to all organizational activities.

PO4: Communication Skill

Ability to develop communication, managerial and interpersonal skills.

PO5: Individual and Team Leadership Skill

Capability to lead themselves and the team to achieve organizational goals.

PO6: Employability Skill

Inculcate contemporary business practices to enhance employability skills in the competitive environment.

PO7: Entrepreneurial Skill

Equip with skills and competencies to become an entrepreneur.

PO8: Contribution to Society

Succeed in career endeavors and contribute significantly to society.

PO 9 Multicultural competence

Possess knowledge of the values and beliefs of multiple cultures and a global perspective.

PO 10: Moral and ethical awareness/reasoning

Ability to embrace moral/ethical values in conducting one’s life

PROGRAMME SPECIFIC OUTCOMES:

PSO1: Acquire good knowledge and understanding, to solve specific theoretical & applied problems in different area of mathematics & statistics.

PSO2: Understand, formulate, develop mathematical arguments, logically and use quantitative models to address issues arising in social sciences, business and other context /fields.

PSO3: To prepare the students who will demonstrate respectful engagement with other‘s ideas, behaviors, beliefs and apply diverse frames of references to decisions and actions.

COURSE: ALGEBRAIC STRUCTURES (CORE PAPER) **CREDIT:5**

CLO 1: Recall basic counting principle, define class equations to solve problems, explain Sylow‘s theorems and apply the theorem to find number of Sylow subgroups

CLO 2: Define Solvable groups, define direct products, examine the properties of finite abelian groups, define modules

CLO 3: Define similar Transformations, define invariant subspace, explore the properties of triangular matrix, to find the index of nilpotence to decompose a space into invariant subspaces, to find invariants of linear transformation, to explore the properties of nilpotent transformation relating nilpotence with invariants.

CLO 4: Define Jordan, canonical form, Jordan blocks, define rational canonical form, define companion matrix of polynomial, find the elementary devices of transformation, apply the concepts to find characteristic polynomial of linear transformation.

CLO 5: Define trace, define transpose of a matrix, explain the properties of trace and transpose, to find trace, to find transpose of matrix, to prove Jacobson lemma using the triangular form, define symmetric matrix, skew symmetric matrix, adjoint, to define Hermitian, unitary, normal transformations and to verify whether the transformation in Hermitian, unitary and normal.

COURSE: REAL ANALYSIS I (CORE PAPER) **CREDIT:5**

CLO1: Analyze and evaluate functions of bounded variation and Rectifiable Curves.

CLO2: Describe the concept of Riemann-Stieltjes integral and its properties.

CLO3: Demonstrate the concept of step function, upper function, Lebesgue function and their integrals.

CLO4: Construct various mathematical proofs using the properties of Lebesgue integrals and establish the Levi monotone convergence theorem.
CLO5: Formulate the concept and properties of inner products, norms and measurable functions.

COURSE: ORDINARY DIFFERENTIAL EQUATIONS (CORE PAPER)
CREDIT:4

CLO1: Establish the qualitative behavior of solutions of systems of differential equations .

CLO2: Recognize the physical phenomena modeled by differential equations and dynamical systems.

CLO3: Analyze solutions using appropriate methods and give examples.

CLO4: Formulate Green's function for boundary value problems.

CLO5: Understand and use various theoretical ideas and results that underlie the mathematics in this course.

COURSE: DISCRETE MATHEMATICS (CORE PAPER) **CREDIT:3**

CLO1:Know the algebraic structures of lattices and Boolean algebra, and sketch the minimization of Boolean polynomials.
CLO2: Model the switching circuits with applications.

CLO3: Understand the finite fields and its mathematics properties.

CLO4: Acquire the notions of the polynomials over finite fields, Irreducibility and factorization of polynomials.
CLO5: Apply the coding theory with the linear and cyclic codes in cryptography.

SEMESTER II

COURSE: ADVANCED ALGEBRA (CORE PAPER) **CREDIT:5**

CLO1: Prove theorems applying algebraic ways of thinking.

CLO2: Connect groups with graphs and understanding about Hamiltonian graphs.

CLO3: Compose clear and accurate proofs using the concepts of Galois Theory.

CLO4: Bring out insight into Abstract Algebra with focus on axiomatic theories.

CLO5: Demonstrate knowledge and understanding of fundamental concepts including extension fields, Algebraic extensions, Finite fields, Class equations and Sylow's theorem.

COURSE: REAL ANALYSIS II(CORE PAPER) **CREDIT:5**

CLO1: Understand and describe the basic concepts of Fourier series and Fourier integrals with respect to orthogonal system.

CLO2: Analyze the representation and convergence problems of Fourier series.

CLO3: Analyze and evaluate the difference between transforms of various functions.

CLO4: Formulate and evaluate complex contour integrals directly and by the fundamental theorem.

CLO5: Apply the Cauchy integral theorem in its various versions to compute contour integration.

COURSE: PARTIAL DIFFERENTIAL EQUATIONS (CORE PAPER)
CREDIT:4

CLO1: To understand and classify second order equations and find general solutions

CLO2: To analyse and solve wave equations in different polar coordinates

CLO3: To solve Vibrating string problem, Heat conduction problem, to identify and solve Laplace and beam equations

CLO4: To apply maximum and minimum principle's and solve Dirichlet, Neumann problems for various boundary conditions

CLO5: To apply Green's function and solve Dirichlet, Laplace problems, to apply Helmholtz operation and to solve Higher dimensional problem.

COURSE: TENSOR ANALYSIS AND RELATIVITY (ELECTIVE)
CREDIT:3

CLO1: Understand the system of different orders in Tenor Algebra.

CLO2: Explain about Tensor Calculus in Riemann spaces.

CLO3: Understand the concept of Covariant of differentiation and intrinsic differentiation

CLO4: Explain about the theory of relativity and Doppler effect.

CLO5: Analyze about the conservation of mass and energy.

COURSE: DIFFERENCE EQUATIONS (ELECTIVE) **CREDIT:3**

CLO 1: Solve problems on Linear Difference Equations of Higher order.

CLO 2: Understand the system of Linear Difference Equation **CLO 3:** Apply Z-transform techniques indifference equations.

CLO 4: Explain on Oscillation Theory.

CLO 5: Discuss on Asymptotic Behavior of Difference Equation.

SEMESTER III

COURSE: COMPLEX ANALYSIS (CORE PAPER) **CREDIT:5**

CLO1: Analyze and evaluate local properties of analytical functions and definite integrals.

CLO2: Describe the concept of definite integral and harmonic functions.

CLO3: Demonstrate the concept of the general form of

Cauchy's theorem

CLO4: Develop Taylor and Laurent series .

CLO5 Explain the infinite products, canonical products and jensen's formula .

COURSE: PROBABILITY THEORY (CORE PAPER) CREDIT:5

CLO1: To define Random Events, Random Variables, to describe Probability, to apply Bayes, to define Distribution Function, to find Joint Distribution function, to find Marginal Distribution and Conditional Distribution function, to solve functions on random variables.

CLO2: To define Expectation, Moments and Chebyshev Inequality, to solve Regression of the first and second types.

CLO3: To define Characteristic functions, to define distribution function, to find probability generating functions, to solve problems applying characteristic functions

CLO4: To define One point, two-point, Binomial distributions, to solve problems of Hypergeometric and Poisson distributions, to define Uniform, normal, gamma, Beta distributions, to solve problems on Cauchy and Laplace distributions

CLO5: To discuss Stochastic convergence, Bernaulli law of large numbers, to elaborate Convergence of sequence of distribution functions, to prove Levy-Cramer Theorems and de Moivre-Laplace Theorems, to explain Poisson, Chebyshev, Khintchine Weak law of large numbers, to explain and solve problems on Kolmogorov Inequality and Kolmogorov Strong Law of large numbers.

COURSE: TOPOLOGY (CORE PAPER) CREDIT:5

CLO1: Define and illustrate the concept of topological spaces and the basic definitions of open sets, neighbourhood, interior, exterior, closure and their axioms for defining topological space.

CLO2: Understand continuity, compactness, connectedness, homeomorphism and topological properties.

CLO3: Analyze and apply the topological concepts in Functional Analysis.

CLO4: Ability to determine that a given point in a topological space is either a limit point or not for a given subset of a topological space.

CLO5: Develop qualitative tools to characterize connectedness, compactness, second countable, Hausdorff and develop tools to identify when two are equivalent(homeomorphic).

COURSE: MECHANICS (CORE PAPER) CREDIT:4

CLO1: Explain the basics concepts of mechanical systems under generalized coordinate systems.

CLO2: Identify the Lagrange's equations and its application.
Identify the Lagrange's equations and its application.

CLO3: Derive the Hamilton Equation.

CLO4: Analyze the Hamilton's Principle and Hamilton-Jacobi Equation and separability.

CLO5: Discuss the Lagrange and Poisson brackets.

COURSE: FLUID DYNAMICS (ELECTIVE) **CREDIT:4**

CLO1: Understand the concepts of kinematics of fluids in motions.

CLO2: Find the pressure at a point in a moving fluid.

CLO3: Discuss Stokes stream function.

CLO4: Analyse complex velocity potential for two dimensional flows.

CLO5: Derive the Navier – Stokes equations of motion of a Viscous fluid

SEMESTER IV

COURSE: FUNCTIONAL NALYSIS (CORE PAPER) **CREDIT:5**

CLO1: Understand the Banach spaces and Transformations on Banach Spaces.

CLO2: Prove Hahn Banach theorem and open mapping theorem.

CLO3: Describe operators and fundamental theorems.

CLO4: Validate orthogonal and orthonormal sets.

CLO5: Analyze and establish the regular and singular elements.

COURSE: DIFFERENTIAL GEOMETRY (CORE PAPER) **CREDIT:5**

CLO1: Explain space curves, Curves between surfaces, metrics on a surface, fundamental form of a surface and Geodesics.

CLO2: Evaluate these concepts with related examples.

CLO3: Compose problems on geodesics.

CLO4: Recognize applicability of developable.

CLO5: Construct and analyze the problems on curvature and minimal surfaces

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PG AND RESEARCH DEPARTMENT OF MATHEMATICS

REGULATION 2022-2023

B.SC. (DEPARTMENT OF MATHEMATICS)

PROGRAM OUTCOMES (PO's)

PO1: Logical thinking ,critical analysis,and reasoning skills will be highly improved .

PO2: Express mathematical ideas clearly and concisely to others.
PO3: Ability to apply suitable mathematical techniques to handle problems in physical and related sciences
PO4: To demonstrate conceptual understanding of basic definitions, and theorems in Mathematics and should be able to describe elaborately with examples.

PO5: Ability to solve mathematical problems by applying the skills such as critical thinking, logical reasoning, and abstraction

PO6: Select appropriate mathematical models and tools to solve the problems including those in real-life contexts
PO7: Mathematics has its own universal language of symbols and notations. Students are expected to apply the Mathematics language appropriately while expressing mathematical ideas in both oral and written form.

PO8: Problem-solving techniques in mathematics will enhance the knowledge of students to formulateand solve any real-world problems independently

PO9 : Develop the knowledge of abstract mathematical concepts
PO10: Enhance the employability skills in both public and private sector jobs

PROGRAM SPECIFIC OUTCOMES (PSOs)

PSO1:Represent the mathematical data in numerical, graphical, and visual form.

PSO2:Develop the patience and persistence to solve a problem.

PSO3:Students will have the knowledge to use ICT tools.

PSO4:Motivation to the students to do research in the unexplored areas of Mathematics.

PSO5:Ability to apply mathematical techniques in other fields of science and engineering.

PSO6:Select appropriate algorithms and software programs to obtain accurate solutions to

mathematical problems.

PSO7:Students will be able to develop a solution oriented approach toward various social and environmental issues.

PSO8:Gaining knowledge to pursue higher studies in pure and applied Mathematics.

PSO9: Understand, formulate and apply quantitative models in management, economics, and business contexts.

PSO10: Ignites their passion to do research in Mathematics.

COURSE OUTCOME

SEMESTER I

COURSE: ALGEBRA (CORE PAPER) CREDIT:3

CO1: After studied unit -1, the student will be able to demonstrate the knowledge of the relationship between roots and coefficients of the given equation.

CO2: After studied unit -2, the student will be able to carry out the calculations of approximate roots of the given polynomial equation

CO3:.After studied unit -3, the student will be able to find the sum to infinity of the given binomial/exponential/logarithmic series

CO4: After studied unit -4, the student will be able to demonstrate the knowledge of matrices and calculate the Eigen values and Eigen vectors of a given square matrix

CO5: After studied unit -5, the student will be able to discuss the basic number theoryconcepts.

COURSE: TRIGONOMETRY (CORE PAPER) CREDIT:3

CO1: After studied unit -1, the student will be able to write the expansions of $\cos n\theta$ and $\sin n\theta$ in powers of $\cos\theta$ and $\sin\theta$.

CO2: After studied unit -2, the student will be able to expand the powers of sines and cosines of θ in terms of functions of multiples of θ.

CO3: After studied unit -3, the student will be able to discuss the concepts of hyperbolic functions.

CO4: After studied unit -4, the student will be able to demonstrate knowledge of the logarithm of complex quantities.

CO5: After studied unit -5, the student will be able to carry out the calculations of summation of trigonometric series.

COURSE: NUMERICAL METHODS-I (ALLIED) **CREDIT:3**

CO1: After studied unit -1, the student will be able to solvesimultaneous linear equations by Gauss elimination method,Gauss-Jordan Method, and Gauss-Seidel method.

CO2: After studied unit -2, the student will be able to calculateinterpolation values by applying Gregory-Newton's forward and backward formulae

CO3: After studied unit -3, the student will be able to calculate the central interpolation values by applying central differences formulae.

CO4: After studied unit -4, the student will be able to estimate one or more missing terms of the given set of data.

CO5: After studied unit -5, the student will be able to estimate the interpolation value for unequal intervals based on Lagrange's formula of inverse interpolation.

SEMESTER-II

COURSE: CALCULUS (CORE PAPER) **CREDIT:3**

CO1: After studied unit -1, the student will be able to determine the extremevalues of the given function.

CO2: After studied unit -2, the student will be able to demonstrate knowledge of Cartesian and polar coordinates

CO3: After studied unit -3, the student will be able to gain knowledge of curvature, evolutes, and envelope concepts.

CO4: After studied unit -4, the student will be able to evaluate definite integration problems and able to apply reduction formulae.

CO5: After studied unit -5, the student will be able to evaluate double and triple integrals.

COURSE: ANALYTICAL GEOMETRY OF THREE DIMENSIONS(CORE PAPER)
CREDIT: 3

CO1: After studied unit -1, the student will be able todemonstrate knowledge of the plane and its applications

CO2: After studied unit -2, the student will be able to gainknowledge of straight lines and their applications

CO3: After studied unit -3, the student will be able to carry out sphere-related problems.

CO4: After studied unit -4, the student will be able to know the concepts of the cone, right circular cone, and enveloping cone.

CO5: After studied unit -5, the student will be able to carry out the calculations ofthe

problems related to the cylinder.

COURSE: NUMERICAL METHODS-II (ALLIED) CREDIT:3

CO1: After studied unit -1, the student will be able to evaluate derivatives by applying Newton's forward and backward differences formulae.

CO2: After studied unit -2, the student will be able to evaluate integrations by applyingthe trapezoidal rule, Simpson's rules, and Weddle's rule.

CO3: After studied unit -3, the student will be able to find a complete solution to lineardifference equations.

CO4: After studied unit -4, the student will be able to estimate approximate numerical solutions of algebraic and transcendental equations.

CO5: After studied unit -5, the student will be able to estimate approximate numerical solutions of ordinary differential equations by Euler, Picard, Taylor, and Runge- Kutta methods.

SEMESTER -III

COURSE: DIFFERENTIAL EQUATIONS AND LAPLACE TRANSFORM CREDIT: 5

CO1: After studied unit -1, the student will be able to know the various methods of solving the first-order higher degree differential equations.

CO2: After studied unit -2, the student will be able to carry out the different methods of solving the second order differential equations.

CO3: After studied unit -3, the student will be able to understand the concepts of total differential equations and solve the problems.

CO4: After studied unit -4, the student will be able to demonstrate knowledge of Laplace transform and its applications.

CO5: After studied unit -5, the student will be able to solve partial differential equations.

COURSE:MATHEMATICS FOR COMPETETIVE EXAMINATIONS– I (SKILL BASED) CREDIT: 2

CO1: After studied unit-1, the student will be able to answer the questions related to the number system.

CO2: After studied unit-2, the student will be able to answer real-life simple problems by applying the HCF and/or LCM.

CO3: After studied unit-3, the student will be able to apply the correct sequence of operations to find out the value of a given mathematical expression.

CO4: After studied unit-4, the student will be

able to solve the problems involving square roots, cube roots, and average

CO5: After studied unit-5, the student will be able to carry out the problems related to ages, and simplify products and quotients involving surds.

COURSE: MATHEMATICAL STATISTICS – I (ALLIED) CREDIT:3

CO1: Implement Karl –Pearson's coefficient of correlation CO5: Understand different types of distribution. After studied unit -1, the student will be able to express the techniques of conditional probability and Baye's theorem with examples.

CO2: After studied unit -2, the student will be able to calculate expectation, and distribution function.

CO3: After studied unit -3, the student will be able to express Chebychev's inequality and its applications.

CO4: After studied unit -4, the student will be able to interpret the different types of correlation coefficient and lines of regression with examples.

CO5: After studied unit -5, the student will be able to apply domain knowledge for discrete and continuous distributions with examples.

SEMESTER -IV

COURSE: VECTOR ANALYSIS AND FOURIER SERIES(CORE PAPER)

CREDIT:4

CO1: After studied unit -1, the student will be able to demonstrate knowledge of the physical and geometrical meaning of the derivative and its applications.

CO2: After studied unit -2, the student will be able to know the concepts of divergence, curl of a vector, and their physical interpretations.

CO3: After studied unit -3, the student will be able to evaluate the line, surface, and volume integrals

CO4: After studied unit -4, the student will be able to know the applications of Stoke's, Gauss divergence, and Green's theorems.

CO5: After studied unit -5, the student will be able to express the given function as a Fourier series

COURSE: STATICS (CORE PAPER) CREDIT:4

CO1: After studied unit -1, the student will be able to know about the forces and equilibrium of a particle.

CO2: After studied unit -2, the student will be able to identify the parallel forces and couples and solve related problems.

CO3: After studied unit -3, the student will be able to demonstrate knowledge of friction and its applications.

CO4. After studied unit -4, the student will be able to find the centre of mass of different laminas.

CO5. After studied unit -5, the student will be able to demonstrate knowledge of sag and suspension bridge and solve related problems.

COURSE: MATHEMATICAL STATISTICS – II(ALLIED)

CREDIT:3

CO1: After studied unit -1, the student will be able to demonstrate sampling, parameter, and significance with examples

CO2: After studied unit -2, the student will be able to know about Chi-square distribution and its applications.

CO3: After studied unit -3, the student will be able to illustrate Students t-distribution and the applications of F- distribution.

CO4: After studied unit -4, the student will be able to state null and alternate hypotheses to the given problem and test the hypothesis.

CO5: After studied unit -5, the student will be able to apply ANOVA techniques.

SEMESTER –V

COURSE: ABSTRACT ALGEBRA(CORE PAPER) CREDIT:4

CO1: After studied unit-1, the student will be able to

determine whether a given set is a group under a binary operation and find its subgroup.

CO2: After studied unit-2, the student will be able to demonstrate knowledge of normal subgroup, homomorphism, and isomorphism.

CO3: After studied unit-3, the student will be able to carry out the problems based on permutation.

CO4: After studied unit-4, the student will be able to demonstrate knowledge of rings, ideals, and integral domain.

CO5: After studied unit-5, the student will be able to understand the concepts of ideals and Euclidean rings**.**

COURSE: REAL ANALYSIS I(CORE PAPER) CREDIT:4

CO1: After studied unit -1, the student will be able to identify countable sets, the limit of a sequence, and its convergence

CO2: After studied unit -2, the student will be able to demonstrate knowledge of divergent sequence, bounded sequence, monotone sequence, and Cauchy sequence.

CO3: After studied unit -3, the student will be able to carry out convergence and divergence of series and related problems.

CO4: After studied unit -4, the student will be able to express metric spaces and convergent and divergent sequences in a metric space.

CO5: After studied unit -5, the student will be able to demonstrate knowledge of open sets and closed sets with suitable examples.

COURSE: DYNAMICS (CORE PAPER) CREDIT:4

CO1: After studied unit -1, the student will be able to demonstrate knowledge of velocity, acceleration, and coplanar motion.

CO2: After studied unit -2, the student will be able to gain knowledge of projectile and its applications

CO3: After studied unit -3, the student will be able to know about simple harmonic motion and simple pendulum.

CO4: After studied unit -4, the student will be able to carry out problems related to impact and laws of impact.

CO4: After studied unit -5, the student will be able to demonstrate knowledge of the central orbits.

COURSE: LINEAR PROGRAMMING CREDIT:3

CO1: After studied unit-1, the student will be able to formulate a real-world problem into an LPP and carry out the calculations of the simplex method.

CO2: After studied unit-2, the student will be able to solve transportation problems.

CO3: After studied unit-3, the student will be able to understand analogies between transportation problems and assignment models.

CO4: After studied unit-4, the student will be able to demonstrate knowledge of game theory and its applications

CO5: After studied unit-5, the student will be able to know the concept of simulation and solve the problems by applying the Monte Carlo simulation technique.

COURSE: **GRAPH THEORY (ELECTIVE) CREDIT: 3**

CO1: After studied unit -1, the student will be able to know various graph structures and isomorphism between graphs.

CO2: After studied unit -2, the student will be able to know the representation of the graphs in matrix form.

CO3: After studied unit -3, the student will be able to know the concepts of connected graph, component, cut point, and bridge of a graph

CO4: After studied unit -4, the student will be able to know about trees and their applications.

CO5: After studied unit -5, the student will be able to demonstrate knowledge of Eulerian and Hamiltonian graphs.

COURSE: **MATHEMATICS FOR COMPETETIVE EXAMINATIONS – III(SKILL BASED) CREDIT:2**

CO1: After studied unit -1, the student will be able to solve the problems related to time and distance

CO2: After studied unit -2, the student will be able to carry out the boat and stream,

train, and speed- based questions.

CO3: After studied unit -3, the student will answer the questions based on alligation or mixture. Aspirants preparing for the upcoming competitive examinations will be able to answer such questions in a faster way

CO4: After studied unit -4, the student will be able to carry out problems related to compound interest.

CO5: After studied unit -5, the student will be able to demonstrate knowledge of area-related problems.

SEMESTER-VI

COURSE: LINEAR ALGEBRA (CORE PAPER)

CREDIT:4

CO1: After studied unit -1, the student will be able to identify linear dependent and independent vectors

CO2: After studied unit -2, the student will be able to classify orthogonal and orthonormal vectors.

CO3: After studied unit -3, the student will be able to know about the algebra of lineartransformations

CO4: After studied unit -4, the student will be able to know about the matrix of a lineartransformation and its properties.

CO5: After studied unit -5, the student will be able to solve a system of linear equations.

COURSE: **REAL ANALYSIS II (CORE PAPER)** **CREDIT:4**

CO1: After studied unit-1, the student will be able to demonstrate knowledge of connected sets and complete metric spaces with suitable examples

CO2: After studied unit-2, the student will be able to identify the functionswhich are continuous and uniformly continuous

CO3: After studied unit-3, the student will be able to express about Riemannintegration and its properties

CO4: After studied unit-4, the student will be able to carry out the problems related to Rolle's theorem and the law of mean

CO5: After studied unit-5, the student will be able to demonstrate knowledge of pointwise convergence, uniform convergence of sequences of functions, and of series of functions.

COURSE: COMPLEX ANALYSIS(CORE PAPER) **CREDIT:4**

CO1: After studied unit-1, the student will be able to gain knowledge about complex functions and their nature, continuous functions, necessary and sufficient conditions of ananalytic function

CO2: After studied unit-2, the student will be able to demonstrate knowledge of elementary transformations, conformal andbilinear transformations with examples

CO3: After studied unit-3, the student will be able to evaluate contour integrals using Cauchy'sintegral formula.

CO4: After studied unit-4, the student will be able to express a function as Taylor series or Laurent's series at the given domain, and also determine the circle or annulus of convergence power series expansions of analytic functions

CO5: After studied unit-5, the student will be able to carry out theproblems related to the evaluation of improper integrals.

COURSE: PROGRAMMING IN C LANGUAGE **CREDIT:3**

CO1:After studied unit -1, the student will be able to demonstrate 'c' tokens, keywords, the basic structure of Cprograms and the execution of a 'C' Program.

CO2:After studied unit -2, the student will be able to express the nature of constants, variables, data types, declaration of variables, and assigning values to variablesCO3:After studied unit -3, the student will be able to describe valuation of expressions and usage of various operators.

CO4:After studied unit -4, the student will be able toexpress the logic using control statements.

CO5:After studied unit -5, the student will be able todemonstrate knowledge pertaining to arrays.

COURSE: OPERATIONS RESEARCH **CREDIT:3**

CO1:After studied unit -1, the student will be

able to determine the critical activities of a repeated project and its completion time.

CO2:After studied unit -2, the student will be able to determine the duration of activities of a new project based on three-time estimates.

CO3:After studied unit -3, the student will be able to carry out the EOQ level of various inventory control models.

CO4:After studied unit -4, the student will be able to calculate processing times of sequencing of jobs through 2, 3, and m machines.

CO5:After studied unit -5, the student will be able to find out the length of the queue, and waiting time in the queue under single and multi-channel queuing models.

COURSE: PROJECT **CREDIT: 5**

CO1: Acquire good knowledge of project

CO2: Understand about project planning.

CO3: Evaluate front end and back end.

CO4: Understand about project design.

CO5: Evaluate project documentation

M.SC. (DEPARTMENT OF MATHEMATICS)

PROGRAM OUTCOMES (PO's)

PO1: Acquire in-depth knowledge of Mathematics both in theory and application.

PO2: Identify mathematical and computational method sin order to solve comprehensive problems .

PO3: Recognize the various specialized areas of advanced mathematics and its applications.

PO4: Analyze and interpret data to create and design new knowledge for complex problems

PO5: Develop the mathematical models for the applications of mathematics in real life situations.

PO6: Exhibit the potential to effectively accomplish tasks independently and as a member or leader in diverse teams, and in multi disciplinary settings.

PO6: Develop the skills to crack the various competitive examination

PO7: Ability to engage in life-long learning in the context of the rapid developments in the field

PO8:Demonstrat the ability to write dissertations, reports, make effective presentations and documentation.

PO9:Commitment to professional ethics and social responsibilities.

PROGRAM SPECIFIC OUTCOMES (PSOs)

PSO1: Understand the theoretical knowledge of Mathematical concepts.

PSO2: Develop the problems solving skills.

PSO3: Collaborate with the multi-disciplinary areas.

PSO4: Creatively applying the knowledge of Mathematics in selected real life situations.

PSO5:Appreciate the emphasis given on teaching the mathematical concepts through counter examples.

PSO6: Get the knowledge of inter-disciplinary approach of learning.

PSO7:Develop the skill to solve problems which appear in the various examinations like CSIR-NET,SET,IAS, etc

PSO8:Inculcate the creative and develop research level thinking in the field of pure and applied Mathematics

PSO9: Encourage to go for higher learning in research

PSO10:Understand the ethical values and human values to appreciate the cultural diversity and promote the social harmony.

COURSE OUTCOME (CO)

SEMESTER I

COURSE: ALGEBRA I (CORE PAPER) CREDIT:5

CO1: Demonstrate ability to think group actions critically by Cayley‟s theorem and apply the Sylow‟s theorems to describe the structure of certain finite abelian groups

CO2: Understand the concept of the internal and external direct product of groups. Also, apply the structure theorem on abelian groups to find the non-isomorphic abelian groups of certain orders.

CO3: Check the irreducibility of given polynomial in the defined Field

CO4: Know about Module and, difference between the Algebraic structures, Vector space and Module.

CO5: Acquire the knowledge of the Linear transformation in canonical forms. Also, the matrix form of linear transformation and its properties.

COURSE: REAL ANALYSIS I(CORE PAPER) CREDIT: 5

CO1: Understand the concept of functions of bounded variation.

CO2 : Acquires knowledge on Riemann Stieltjes integration and tosolve its related problems.

CO3: Work effectively in integration under integral sign.

CO4: Provide a strong foundation in the study of the convergence of infinite series, infiniteproduct and uniform convergence and its interplay between variouslimiting operations.

CO5: Know about the convergence of sequences of functions.

COURSE: ORDINARY DIFFERENTIAL EQUATIONS (CORE PAPER)

CREDIT:4

CO1 Analyze the methods of second order homogeneous and non-homogeneous equations.

CO2 Apply and solve the higher order homogeneous and non-homogeneous equations.

CO3 Define the methods to solve linear equations with variable coefficients.

CO4 Discuss the linear equations with regular singular points.

CO5 Construct the solutions for first order equations.

COURSE: GRAPH THEORY(MAJOR BASED ELECTIVE)

CREDIT:3

CO1: Grasp features and properties of various types of graphs.

CO2: Demonstrate capacity of illustration for mathematical reasoning

the rough analyzing,providing and explaining concepts of Eulerian circuits and Hamiltonicity in graphs.

CO3:Understand the definitions and properties of matching and independent sets.

CO4:Apply the concepts of graphs to model them in real life situations.

CO5:Explicate the applications of planarity and colorability.

SEMESTER-II

COURSE: ALGEBRA II (CORE PAPER)

CREDIT:5

CO1: Understand fundamental concepts including extension fields, Algebraic extensions andAlgebraic numbers.

CO2: Determine existence and properties of extension fields of polynomials

CO3: Demonstrate capacity of illustration for mathematical reasoning through analyzing, provingand explaining concepts from filed extensions and Galois theory

CO4: Apply knowledge of solvability of radicals over polynomials on finite fields

CO5: Analyze the theorems related to division rings to apply them on relevant fields

COURSE: REAL ANALYSIS II(CORE PAPER) CREDIT: 5

CO1: know about the properties of Lebesgue integrals and establish the Levi monotoneconvergence theorem.

CO2: develop the properties of inner products, norms and measurable functions.

CO3: understand the concept of FourierSeriesand Integrals.

CO4: acquire the knowledge of multivariable calculus.

CO5: enrich the students to work effectively on implicit functions and the extremum values of functions.

COURSE: TOPOLOGY (CORE PAPER) CREDIT: 5

CO1: Know the basics on open and closed sets and the significance of the topological spaces.

CO2: Comprehend the continuous functions on topological spaces, product topologyand

topology induced by the metric.

CO3: Understand the connected spaces, connected subspaces, components and local connectedness.

CO4: Acquire the notions of compactness, compact subspaces, limit point compactnessand local compactness.

CO5: Procure the strong theoretical background about the count ability axioms, the separation axioms and the consequences theorems.

COURSE: DIFFERENTIAL GEOMETRY (CORE PAPER)

CREDIT:5

CO1: Understand the concept of a space curve and compute its curvature and torsion.

CO2: Acquire the knowledge of curves on a surfaceand its intrinsic properties.

CO3: Analyze the geodesics and its normal properties and also familiar with Gauss Bonnet Theorem.

CO4: Determine the second fundamental form and developable associated with space curves.

CO5: Know Hilbert‟s Lemma and the fundamental existence theorem for surface theory.

COURSE: OPERATIONS RESEARCH (MAJOR BASED ELECTIVE)

CREDIT:3

CO1: Make decision under various decision-making environments.

CO2: Acquire the knowledge of replacement analysis in handling problems like staffing problem and equipment renewal problem etc.

CO3: Work effectively on Dynamic Programming models and their applications in solving Decision problem.

CO4: Provide a strong foundation in distinction between local, global and inflection extremepoints.

CO5: Solve non-linear programming problems.

SEMESTER -IV

COURSE: COMPLEX ANALYSIS II (CORE PAPER)

CREDITS:4

CO1: Understand the concepts of residues and its properties.

CO2: Evaluate the contour integrals and its applications.

CO3: Know the analytic continuation and Poisson integralformula.

CO4:Acquire the representations of meromorphic and entirefunctions.

CO5: Procure the applications of open mapping, Hurwitz andRiemann mapping theorems.

COURSE: FLUID DYNAMICS (CORE PAPER)

CREDIT:4

CO1: Understand the concepts of kinematics of fluids in motions.

CO2: Find the pressure at a point in a moving fluid.

CO3: Discuss Stokes stream function.

CO4: Analyse complex velocity potential for standard two dimensional flows.

CO5: Derive the Navier – Stokes equations of motion of a Viscous fluid.

COURSE:FUNCTIONAL ANALYSIS (CORE PAPER)

CREDIT:5

CO1: Analysethe Banach space with examples and Able to work comfortably with Continuous linear transformations

CO2: Apply the conjugate operator and acquire the knowledge of open mapping theorem.

CO3: Discuss about the Hilbert spaces.

CO4: Acquire the knowledge of Banach Algebra and Outline of spectral radius.

CO5: Construct the Gelfand-Neumark theorem.

COURSE: PROJECT **CREDIT: 5**

CO1: Acquire good knowledge of project management.

CO2: Understand about project planning.

CO3: Evaluate front end and back end.

CO4: Understand about project design.

CO5: Evaluate project documentation

CO6: Understand how to develop real time project

COURSE: NUMBER THEORY AND CRYPTOGRAPH`
Y (MAJOR BASEDELECTIVE) **CREDIT:3**

CO1: Acquire the knowledge of elementary number theory

CO2: Apply various cryptosystems and understand the concepts of quadratic, residues andreciprocity

CO3: Develop the idea of public key cryptography, RSA Algorithms.

CO4: Solve problems using the continued fraction method and the quadraticsieve method.

CO5: Demonstrate ability to apply concepts of Fermat factorization and factor bases.

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PG AND RESEARCH DEPARTMENT OF MATHEMATICS

REGULATIONS 2020-2021

B.SC. (DEPARTMENT OF MATHEMATICS)

PROGRAM OUTCOMES (PO's)

PO1: Pursue their post graduation and research activities.

PO2: Acquire the skills in a broad range of analytic, scientific, government, financial, health, technical and other positions.

PO3: Demonstrate an understanding of the basic concepts in mathematics, statistics, operations research and their importance in the solution of some real-world problems.

PO4: Create mathematical ideas from basic axioms.

PO5: Recognize and appreciate the connections between theory and applications.

PROGRAM SPECIFIC OUTCOMES (PSOs)

PSO1: Understand the mathematical concepts and applications in the field of algebra, analysis, computational techniques, optimization, differential equations, engineering, finance and actuarial science.

PSO2: Develop numerical aptitude applying both qualitative and quantitative knowledge for their future career.

PSO3: Acquire good knowledge and understanding in advanced areas of mathematics and Statistics chosen by the students from the given courses.

COURSE OUTCOME

SEMESTER I

COURSE: ALGEBRA (CORE PAPER) **CREDIT:3**

CO1:know the expansions of cosnθ, sinnθ in powers of cosθ and sinθ

CO2:expand powers of sines and cosines of θ in terms of functions of multiples of θ

CO3:know the concept of hyperbolic functions

CO4:know the logarithm of complex quantities

CO5:find the summation of trigonometric series.

COURSE: TRIGONOMETRY (CORE PAPER) **CREDIT:3**

CO1:know the expansions of cosnθ, sinnθ in powers of cosθ and sinθ

CO2:expand powers of sines and cosines of θ in terms of functions of multiples of θ

CO3:know the concept of hyperbolic functions

CO4:know the logarithm of complex quantities

CO5:find the summation of trigonometric series.

COURSE: NUMERICAL METHODS-I (ALLIED) **CREDIT:3**

CO1: Know the Newton-Gregory forward and Backward formula

CO2:Solve the gauss forward and backward formula

CO3: Understand divided difference formula .

CO4:Find the lagranges method and reversion series method.

CO5:understand the Gauss –seidal method.

SEMESTER-II

COURSE: CALCULUS (CORE PAPER) **CREDIT:3**

CO1: determine extreme values of the given function

CO2: know the concept of Cartesian and polar coordinates

CO3: gain the knowledge of curvature, evolutes and envelope concepts

CO4: solve integration problems

CO5: evaluate double and triple integrals.

COURSE: ANALYTICAL GEOMETRY OF THREE DIMENSIONS(CORE PAPER) **CREDIT: 3**

CO1: know the equation of the plane and its applications

CO2: gain the knowledge of straight line and its applications

CO3: solve sphere related problems

CO4: know the concepts of cone, right circular cone and enveloping cone

CO5: know the concepts related to cylinder.

COURSE: NUMERICAL METHODS-II (ALLIED) **CREDIT:3**

CO1: Understand Newton forward & backward differences .

CO2:UnderstandSimpson's rule.

CO3: Solve the Linear difference Equations.

CO4:Understand RegulaFalsi method.

CO5:AnalyzeEulers&Picards method.

SEMESTER -III

COURSE: DIFFERENTIAL EQUATIONS **CREDIT: 5**

CO1:solve the first order higher degree differential equations

CO2:solve the second order differential equations

CO3:know the concept of total differential equations

CO4:know the applications of Laplace transform

CO5:solve the partial differential equations.

COURSE:MATHEMATICS FOR COMPETETIVE EXAMINATIONS– I (SKILL BASED) **CREDIT: 2**

CO1: know the idea H.C.F. and L.C.M.

CO2: find the Average, square root and cubic root

CO3: solve the problems on ages and numbers

CO4: know the percentage, profit and loss

CO5: analyze the proportion and partnership problems

COURSE: MATHEMATICAL STATISTICS – I (ALLIED) **CREDIT:3**

CO1: Understand addition and multiplication law of probability

CO2: Implement moment generating function

CO3: Evaluate characteristic function

CO4: Implement Karl –Pearson's coefficient of correlation

CO5: Understand different types of distribution.

SEMESTER -IV

COURSE: VECTOR ANALYSIS AND FOURIER SERIES(CORE PAPER)

CO1:know the physical and geometrical meaning of the derivative **CREDIT:4**

CO2:know the physical and geometrical meaning of the divergence and curl

CO3:evaluating line, surface and volume integrals

CO4:know the applications of Stoke's Theorem, Gauss Divergence Theorem and Green's theorem

CO5:analyze the Fourier series in both theory and application level

COURSE:MECHANICS (CORE PAPER) CREDIT:4

CO1:Provides basic knowledge of Resultant of forces and Equilibrium of a particle

CO2:Knowledge pertaining to Parallel forces and coplanar forces

CO3:To know about Center of mass

CO4:Gain the knowledge of projectile and its applications

CO5:Understand the concept of impact

COURSE: MATHEMATICAL STATISTICS – II(ALLIED) CREDIT:3

CO1: Understand students't', chi-square and F distribution

CO2: Understand large sample test for proportion, mean and standard deviation

CO3: To know themaximum Likelyhood estimation

CO4: Solve null and alternative hyphothesis.

CO5: Understand one and two way classification.

COURSE:MATHEMATICS FOR COMPETETIVE EXAMINATIONS– II (SKILL BASED) CREDIT: 2

CO1: know the idea Time and work

CO2: find the Time and Distance

CO3: solve the problems on Trains

CO4: Evaluation of the value of Boats and Streams .

CO5: Analyze the Alligation or Mixture problems

SEMESTER –V

COURSE: ABSTRACT ALGEBRA(CORE PAPER) CREDIT:4

CO1: Students able to identify groups and subgroups.

CO2: Students able to understand homomorphism and isomorphism.

CO3:Students able to do the problems in permutation.

CO4: Students able to study the basics of rings, ideals and integral domain.

CO5: Students able to apply Euclidean rings in theorems

COURSE: REAL ANALYSIS -I(CORE PAPER) CREDIT:4

CO1:know the concept countability
CO2:identify convergent, divergent
sequences

CO3:solve conditional convergence and absolute convergence

problems

CO4:evaluate limit of a function

CO5:know the concepts of open, closed sets.

COURSE: COMPLEX ANALYSIS - I(CORE PAPER) CREDIT:4

CO1:The students can gain knowledge about Complex functions and its nature,limits and Analytic functions.

CO2:The students can gain knowledge about elementary transformations.

CO3:The students can gain knowledge about line integrals and techniques forsolving problems.

COURSE: **PROGRAMMING IN C LANGUAGE (CORE PAPER)**

CREDIT:3

CO1: Understand basic concept of variables,Data types.

CO2: Apply Operators Expression & Pre processor

CO3: Determine the concept of arrays and its declarions& uses

CO4: Determine the user define return values

CO4: Understand the Stucture and Unions.

COURSE: **MATHEMATICS FOR COMPETETIVE EXAMINATIONS – III(SKILL BASED)** **CREDIT:2**

CO1: Calculate the simple interest

CO2: Calculate the compound interest

CO3: Identify short Tricks, Tips and and logical method on Lograrithms .

CO4: calculate the area

CO4: Formulate earliest trick for solving challenging problems of mathematics in volumeand surface.

COURSE: **LINEAR PROGRAMMING (ELECTIVE)** **CREDIT:3**

CO1: Calculate the Big-M method

CO2:Understand various Techniques of simplex method.

CO3: Understand analogies between transportation problem and assignment models

CO4:Interpret the solutions in game theory .

CO5:know the concept of simulation.

SEMESTER-VI

COURSE: LINEAR ALGEBRA (CORE PAPER)

CREDIT:4

CO1: Beginning with Linear Dependence and Linear Independence on Vector Space

CO2: Knowing about Dual spaces and Inner product spaces on Vector space

CO3: Learning to study about Algebra of Linear transformations and its characteristic roots

CO4: Converting Linear equations of Vector space to Matrices its canonical and triangular forms

CO5: Deriving Trace and Transpose of Matrices.

COURSE: **REAL ANALYSIS II (CORE PAPER)** **CREDIT:4**

CO1:understand the concept of complete metric space

CO2:know the difference between continuity and uniform continuity

CO3:know Riemann integration and its properties

CO4:solve problems related to Rolle's theorem , law of mean

CO5:know the convergence of sequences of functions

COURSE: COMPLEX ANALYSIS -II (CORE PAPER) CREDIT:4

CO1:The students can gain knowledge about Contour integration and problem solving techniques.

CO2:The students can learn about singularities and Residues.

CO3:The students can gain knowledge about power series expansions of analytic functions.

COURSE: GRAPH THEORY (ELECTIVE) CREDIT:3

CO1:After studying this course the students know about the basic foundations of graphs, subgraphs and trees.

CO2:The students can learn about connected graphs, Eulerian graphs and Hamiltonian graphs.

COURSE: OPERATIONS RESEARCH (ELECTIVE) CREDIT:2

CO1:Interpret the solutions in network analysis

CO2:Knowledge about optimal use of resources

CO3:Understand to sequence the machines to do the job effectively

CO4:Analyze the system given and interpret the solutions

COURSE: PROJECT **CREDIT: 5**

CO1: Acquire good knowledge of project

CO2: Understand about project planning.

CO3: Evaluate front end and back end.

CO4: Understand about project design.

CO5: Evaluate project documentation

M.SC. (DEPARTMENT OF MATHEMATICS)

PO1: Crack lectureship and fellowship exams approved by CSIR-NET and SET.

PO2: Opportunity of employment in schools and colleges as mathematical Teachers and Professors,Analysts in software industries, Research and Development Organizations .

PO3: Innovate and design complex mathematical problems and solutions using Pure and Applied mathematics.

PO4: After completion of M.Sc they can continue their research work like M.Phil/Ph.D.

PROGRAM SPECIFIC OUTCOMES (PSOs)

PSO1:Apply the concept of graph theory &operations research in real life applications

PSO2: Prepare and motivate students for research studies in mathematical and related fields.

PSO3: Assist students in preparing for competitive examinations like CSIR,SET etc.

COURSE OUTCOME (CO)

SEMESTER I

COURSE: ALGEBRA I (CORE PAPER) CREDIT:5

CO1:demonstrate ability to think group actions critically by Cayley's theorem and applythe Sylow's theorems to describe the structure of certain finite abelian groups

CO2:know the internal and external direct product of groups. Also, apply the structuretheorem on abelian groups to find the non-isomorphic abelian groups of certain orders. CO3:check the irreducibility of a given polynomial

CO4:know about module and difference between the algebraic structures, Group, Ringand Module.

CO5:know the Linear transformation in canonical forms. Also, the matrix form of lineartransformation and its properties.

COURSE: REAL ANALYSIS I(CORE PAPER) CREDIT: 5

CO1:understand the concept of functions of bounded variation.

CO2:Discuss the Riemann integration

and to solve its related problems.

CO3:Analyse the sequences and series of function and their limits

CO4:Acquire the knowledge of Infinite Series and Infinite products

CO5:have knowledge of uniform convergence of sequence and series

COURSE: ORDINARY DIFFERENTIAL EQUATIONS (CORE PAPER)

CREDIT:4

CO1:solve Second order linear differential equations.

CO2: solve n^{th}order differential equations.

CO3: solve differential equations with variable coefficients.

CO4:solve differential equations with regular singular points.

CO5:examine the existence and uniqueness of solutions of differential equations.

CO6:apply ODE problems for real time applications.

COURSE: GRAPH THEORY(MAJOR BASED ELECTIVE) CREDIT:3

CO1:grasp features and properties of special graphs

CO2:check the given graph is Eulerian or not. Also able to find the Eulerian circuit andHamiltonian paths of the given graph.

CO3:find the matching/perfect matching, connectivity of given graphs

CO4:find independent sets and chromatic number of a given graph

CO5:apply coloring and planarity of graphs in real life problems.

SEMESTER-II

COURSE: ALGEBRA II (CORE PAPER)

CREDIT:5

CO1:demonstrate ability to find the extension field of polynomials. Also, gets the clear understanding of algebraic extensions and algebraic closures.

CO2:work with the consequences of Galois Theory such as insolubility of certain classes of equations.

CO3:work with finite fields and certain important theorems related to Finite division ring

CO4:use of Frobenius integral quaternions and the Four square theorem

COURSE: REAL ANALYSIS II(CORE PAPER) **CREDIT: 5**

CO1:understand the concept of Fouier series and Fourier integrals

CO2:analysethe functions of several variables.

CO3:discuss the inverse function theorem and implicit function theorem

CO4:acquire the knowledge of Lebesgue measure

CO5:analyse the concept of inner and outer measure

COURSE: PARTIAL DIFFERENCE EQUATIONS (CORE PAPER)

CREDIT:4

CO1:formulate and solve Partial Differential Equations (PDE) and apply PDEproblems for real time applications.

CO2:solve partial differential equations of first and second order.

CO3:classify the partial differential equations

CO4:identify the canonical forms of the partial differential equations.

CO5:analyse the solution of Laplace, Diffusion and Wave equations in Cylindrical and polarcoordinates

CO6:discuss the existence and uniqueness of solutions and Duhamel's principle

COURSE: DIFFERENCE EQUATIONS (MAJOR BASED ELECTIVE)

CREDIT:3

CO1:solve problems on Linear Difference Equations of Higher order

CO2:understand the system of Linear Difference Equations

CO3:apply Z-transform techniques in difference equations

CO4:solve problems on Oscillation Theory and Asymptotic Behaviour of Difference Equation

SEMESTER -III

COURSE: COMPLEX ANALYSIS I (CORE PAPER)

CREDIT: 6

CO1:Understand the differentiability and analytic functions.

CO2:comprehend the elementary functions and complex integration.

CO3:acquire the knowledge of conformal mappings and Mobius transformations

CO4:discuss the Maximum Principle, Schwarz' Lemma And Liouville's Theorem.

CO5:procure the applications of theClassification of Singularities.

COURSE: TOPOLOGY (CORE PAPER) **CREDIT: 5**

CO1:know the basics of open and closed sets and the significance of the topological spaces.

CO2:comprehend the continuous functions on topological spaces, product topology and topology induced by the metric.

CO3:understand the connected spaces, connected subspaces, components and local connectedness.

CO4:acquire the notions of compactness, compact subspaces, limit point compactness and local

compactness.

CO5:understandthe various countability axioms and the separation axioms.

COURSE: DIFFERENTIAL GEOMETRY (CORE PAPER)

CREDIT:5

CO1:understand the characteristics of curves and surfaces in space and also the fundamental existence theorem for space curves.

CO2:discussthe intrinsic properties of surface.

CO3:analysethe geodesics and its normal properties and familiar with GaussBonnet Theorem.

CO4:discussthe developable.

CO5:understand Hilbert's Lemma and the fundamental existence theorem for surface theory.

COURSE: OPERATIONS RESEARCH (MAJOR BASED ELECTIVE)

CREDIT:3

CO1:analyse various inventory control modules

CO2:understand the concepts of network techniques

CO3:discuss the maintenance models in replacements

CO4:understand inventory control and functional role of inventory

CO5:analyse various performance of queueing models

SEMESTER -IV COURSE: COMPLEX ANALYSIS -II (CORE PAPER) CREDIT:4

CO1:Understand the concepts of residues

CO2:Evaluate the integrals using Cauchy residue theorem.

CO3:comprehend the harmonic functions and its consequences.

CO4:understand the conformal mappings, normal families and Riemann mapping theorem.

CO5:acquire the concepts of entire and meromorphic functions.

CO6:procure the applications of analyticity and special functions.

COURSE: FLUID DYNAMICS (CORE PAPER)

CREDIT:4

CO1:understand the concepts of kinematics of fluids in motions.

CO2:analyse the examples related to the equation of continuity and acceleration of a fluid

CO3:discuss two-dimensional flows, the stream function and the Milne Thompson Circle theorem.

CO4:acquire the concept of three-dimensional flows and derive Stoke's stream function

CO5:discuss the viscous flows and Navier – Stokes equations of motion of a Viscous fluid.

COURSE:FUNCTIONAL ANALYSIS (CORE PAPER)

CREDIT: 5

CO1:analyse the Banach space with examples

CO2:understand the natural embedding N in N**

CO3:discuss Banach spaces with the Hilbert spaces

CO4:acquire the open mapping theorem, orthonormal complements and orthonormal sets

CO5:derive Gelgand-Neumark theorem

CO6:prove the structure theorems

COURSE: PROJECT **CREDIT: 5**

CO1: Acquire good knowledge of project management.

CO2: Understand about project planning.

CO3: Evaluate front end and back end.

CO4: Understand about project design.

CO5: Evaluate project documentation

CO6: Understand how to develop real time project

COURSE: NUMBER THEORY AND CRYPTOGRAPH`
Y (MAJOR BASEDELECTIVE) **CREDIT:3**

CO1:discuss the elementary number theory

CO2:understand the the quadratic, residues and reciprocity

CO3:develop the idea of Public key cryptography, RSA and discrete law

CO4:solve problems using the continued fraction method and the quadratic Sieve method

CO5:analyse Knapsact, zero knowledge

CO6:discuss Fermat factorization and factor bases.

ISLAMIAH WOMEN'S ARTS AND SCIENCE COLLEGE
Permanently Affiliated to Thiruvalluvar University
Recognized by UGC under sections 2(f) and 12(B) of the UGC Act 1956
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Phone:04174-235266 Email: principaliwc@gmail.com
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REGULATION 2017-18

PSOs, POs and COs

PROGRAM OUTCOMES (PO's)

PO1:Pursue their post graduation and research activities.

PO2: Acquire the skills in a broad range of analytic, scientific,government, financial, health, technical and other positions.

PO3: Demonstrate an understanding of the basic concepts in mathematics, statistics, operations research and their importance in the solution of some real-world problems.

PO4:Create mathematical ideas from basic axioms.

PO5:Recognize and appreciate the connections between theory and applications.

B.Sc (Mathematics)

PROGRAM SPECIFIC OUTCOMES (PSOs)

PSO -1: Understand the Mathematical concepts and applications in the field of algebra, analysis, computational techniques, optimization, differential equations, engineering, finance and actuarial science.

PSO -2: Develop numerical aptitude applying both qualitative and quantitative knowledge for their future career.

PSO -3: Acquire good knowledge and understanding in advanced areas of Mathematics and Statistics, chosen by the students from the given courses.

COURSE OUTCOME:

SEMESTER I

COURSE: ALGEBRA **CREDIT: 3**

CO1: Calculate Symmetric Functions of Roots interms of Coefficient.

CO2: Apply Horners Method And Newton RaphsonMethod .

CO3: Workout Binomial ,Exponential and Logarithmic series

CO4: Define Symmetric And Skew Symmetric Matrices

CO5: Analyse Prime and Composite Number and Decomposition of a composite number

COURSE: TRIGONOMETRY **CREDIT: 3**

CO1: Express angles both in degree and radian measures.

CO2: Solve right and oblique triangles in degree and radian for both special and non special angles.

CO3: Compare and Contrast the difference between a trigonometric functions and an inverse trigonometric functions.

CO4: Develop conceptual understanding and fluency with trigonometric functions, techniques and manipulation necessary for solving the problems.

COURSE: NUMERICAL METHODS-I **CREDIT: 4**

CO1:Apply Various interpolation methods and finite difference concepts

CO2:Compute Gauss forward and Backward formula

CO3:Classify the different types of Unequal intervals

CO4:Calculate the inverse interpolation method

CO5:Calculate Lagrange's interpolation method

CO6: Analyse Gauss Elimination, Gauss-Jacobi, and Gauss Siedel method.

SEMESTER II

COURSE: CALCULUS CREDIT: 3

CO1:Describe the concept and applications of derivatives and higher order derivatives.

CO2:Apply Lagrange's multipliers in finding the extreme value of functions .

CO3: Evaluate double integral and triple integral

CO4: Determine the reasonableness of solutions including sign , size and unit of measurement

COURSE: ANALYTICAL GEOMETRY OF THREE DIMENTIONS CREDIT: 3

CO1:Describe equation of the line that passes through the given point and perpendicular to two lines.

CO2:Formulate the equation of surfaces on Cartesian coordinates.

CO3: Classify the conditions of perpendicular and parallel lines.

CO4: Express equation of the line and a point in a given direction.

COURSE: NUMERICAL METHODS-II CREDIT: 4

CO1: Compute Newtons forward and Backward derivative formula

CO2: Apply Trapezoidal ,Simpsons one third ,three eighth Rule

CO3: Calculate Particular integrals and Complementary Functions For Linear Homogeneous difference Equations

CO4: Determine Bisection ,Iteration, RegulaFalsi ,Newton Raphson Method

CO5: Workout the Numerical Solution of Ordinary differential equations

COURSE: NUMERICAL METHODS (ALLIED PRACTICAL) CREDIT: 2

CO1: Solve problems using Newton's forward and backward interpolation formula.

CO2: Apply trapezoidal and Simpson's one third rules.

CO3: Explain Eulers method.

CO4: Calculate derivatives by Newton's method

SEMESTER-III

COURSE: DIFFERENTIAL EQUATIONS **CREDIT: 4**

CO1: Classifies the differential equations with respect to their order and linearity.

CO2: Determines the types of linear differential equation system.

CO3: Evaluate and apply linear differential equation of second order(and higher)

CO4: Identify the solution of differential equation.

CO5:Compute the solution of Laplace Transform.

COURSE: MATHEMATICAL STATISTICS –I **CREDIT: 4**

CO1: Apply discrete and continuous probability distributions, including requirements, mean and making decisions

CO2: Describe binomial outcomes and compute probability of getting X success in N trials

CO3: Analysis the characteristic of different discrete and continuous distributions

CO4: Identify the type of statistical situation to which different distributions can be applied

CO5: Apply Poisson, exponential distribution to solve statistical problems

CO6: Apply normal probability distribution including standard normal curve calculations of appropriate areas

CO7:Apply different distribution to solve simple practical problems

COURSE: LINEAR PROGRAMMING **CREDIT: 3**

CO1:Explain the applications of linear programming.

CO2: Compare and contrast the types of quantitative methods.

CO3: Apply the solution methods for LP models.

CO4: Describe quantitative methods used in decision making

COURSE: ELEMENTS OF FINANCIAL ACCOUNTING (NME)

CREDIT: 2

CO1: Understand the system of financial accounting

CO2: Aquire the knowledge of debit and credit system

CO3: Compute the method of calculating depreciation

CO4: Define differenent types of bills of exchange.

SEMESTER IV

COURSE: VECTOR ANALYSIS AND FOURIER ANALYSIS CREDIT: 4

CO1:Define a Vector differentiation.

CO2:Describe the Divergence and Curl

CO3:Define the vector integration, line surface and volume integration.

CO4:Evaluate Gauss divergence theorem, Stoke's theorem and Green's theorem.

CO5:Define Fourier series and finding Fourier expansion of a periodic functions with period .

COURSE: MATHEMATICAL STATISTICS -II CREDIT: 4

CO1:Evaluate and interpret the correlation between the variables

CO2:Evaluate the simple linear regression equation for a set of data

CO3:Compute employee the principles of linear regression and correlation, including least square method, predicting a particular value of Y for a given value of X and significance of the correlation coefficient

CO4:Classify the construction of point and interval estimators

CO5:Evaluate the properties of estimators

COURSE: MATHEMATICAL STATISTICS (ALLIED PRACTICAL)

CREDIT: 2

CO1:Analyze the statistical data using measures of central tendency , dispersion and location.

CO2:Compute correlation coefficient for raw and grouped data, rank correlation coefficient.

CO3;Apply test of significance for large and small sample.

COURSE: MATHEMATICS FOR COMPETATIVE EXAMINATION-I CREDIT: 3

CO1:Identify short tricks, tips and logical methods on difficult problems.

CO2:Compare and contrast the right approach and easiest technique to tackle math problems.

CO3:Plan and find confident in cracking GMAT, SAT and other maths exams.

CO4:Formulate easiest trick for solving challenging problems of maths in right time.

COURSE: ADVERTISING AND SALESMANSHIP CREDIT: 2

CO1:Acquire the knowledge of development of advertisement

CO2:Understand the concept of DAGMAR Approach.

CO3:Define advertisement copy, salesman report

CO4:Understand the quality of good salesman.

SEMESTER V

COURSE: ABSTRACT ALGEBRA **CREDIT: 4**

CO1:Understand the concept of group, subgroup, normal subgroup.

CO2:Explain the terms Isomorphism and Homomorphism.

CO3:Calculate Permutation, cycles and Transposition 4) Describe the characteristic of a ring ,quotient ring.

CO4:Define the ideals and their existence with examples.

COURSE: REAL ANALYSIS -I **CREDIT: 4**

CO1:Describe the basic differences between the rational and the real numbers.

CO2:Define countable and uncountable sets.

CO3:Compare open sets, closed sets and limit points of a set.

CO4:Determine the continuous functions, uniform continuous functions.

COURSE: COMPLEX ANALYSIS -I **CREDIT: 4**

CO1:Identify the concept of complex integration and series

CO2:Solve problems in derivatives in first order differential equation.

CO3:Compare and contrast the concepts of C.R equation.

CO4:Formulate improper integrals involving conformal mapping.

CO5:Apply the methods of Mapping by elementary transformation.

COURSE: STATICS **CREDIT: 4**

CO1:Apply newton's second law in vector form to problems in more than one dimension.

CO2:Solve static problems in one dimension that involve one or more forces of gravity.

CO3:Compare and contrast problems relating to the motion and a projectile in the absence of speed.

CO4:Explain basic terms for the description of the motion of particles and fundamental laws of mechanics.

COURSE: DYNAMICS **CREDIT: 4**

CO1:Identify and apply specific boundary conditions relevant to specific application

CO2:Analyse the results and draw the appropriate inferences

CO3:Apply Newton's second law in vector form to problems in more than one dimension

CO4:Evaluate mechanics problems in one dimension that involve one or more of the forces of gravity, friction and air resistance

CO5:Understand and use basic terms for the description of the motion of particles vector function and the fundamental laws of Newtonian mechanics

COURSE: GRAPH THEORY **CREDIT: 3**

CO1:Analyse concept of graphs, subgraphs, paths ,cycles ,cut vertex and cut edges.

CO2:Define degree, distance, diameter, matching.

CO3:Classify the vertices, edges, and loops of a graph.

CO4:Determine whether a graph is connected or disconnected.

CO5:Create both a path and a circuit through a graph

CO6: Analyse the concepts of planar graphs.

COURSE: MATHEMATICS FOR COMPETATIVE EXAMINATION-II

CREDIT: 3

CO1:Identify short tricks ,tips and logical method on difficult problems.

CO2:Compare and contrast right approach and earliest to tackle math problems.

CO3:Formulate earliest trick for solving challenging problems in time ,work and distance.

CO4:Plan and find confident in cracking SAT , BANK EXAM , RAILWAY EXAM and other math exams.

SEMESTER VI

COURSE: LINEAR ALGEBRA **CREDIT: 4**

CO1:Understand the new terms Basis And Dimensions.

CO2:Analyze finite and infinite Dimensional vector spaces and Subspaces over a field including the Basis structure of vector Spaces

CO3:Compute Characteristic Roots and Characteristic vectors

CO4:Define Trace And Transpose

CO5:Analyz regular,singular and similar matrices

COURSE: REAL ANALYSIS II **CREDIT: 4**

CO1:Understand the basics of Real Analysis.

CO2:Define metric spaces ,such as continuity, compactness, completeness and connectedness

CO3:Describe Limits and how they are used in sequence and series

CO4:Define Riemann Integral

CO5:Apply Taylors theorem.

COURSE: COMPLEX ANALYSIS -II CREDIT: 4

CO1:Identify the concept of complex integration and series

CO2:Solve problems in pure as well as in applied mathematics using complex analysis.

CO3:Compare and contrast the concepts of singularities and residues.

CO4:Formulate improper integrals involving trigonometric functions.

CO5:Apply the methods of complex analysis to evaluate definite integrals and infinite series.

COURSE: PROGRAMMING IN C LANGUAGE CREDIT: 3

CO1:Understand Basic Concept Of Variables, Data Types.

CO2:Apply Operators Expression & Pre Processor.

CO3:Determine the Concept Of Arrays And Its Declarations & Uses.

CO4:Determine the User Define Return Values And Their Values. Understand The Structure And Unions.

COURSE: PRACTICAL IN C LANGUAGE CREDIT: 3

CO1:Design A Program Using Looping Concepts

CO2:Create A Program For Counting Vowels & Consonants , Three Dimensional Arrays Using Arrays Concepts

CO3:Implement Program Using Fibonacci Series & Factorials Numbers.

CO4:Design Program Using Sorting Concepts.

COURSE: OPERATIONS RESEARCH CREDIT: 3

CO1:Identify and develop operational research model.

CO2:Apply three time estimates scheduling by PERT.

CO3:Determine sequencing problem .

CO4:Analyz Sequeueing theory by steady state analysis of M/M/1 And M/M/N.

COURSE: FUZZY MATHEMATICS CREDIT: 3

CO1:Apply the fuzzy set theory on the statistical method which is given

CO2:Prepare applications on fuzzy logic membership function fuzzy inference systems

CO3:Decide and compare between Crips and fuzzy set theory

CO4:Calculate homomorphic image and Pre-image

COURSE: MATHEMATICS FOR COMPETATIVE EXAMINATION-III

CREDIT: 3

CO1:Identify short tricks ,tips and logical method on difficult problems.

CO2:Compare and contrast right approach and earliest to tackle math problems.

CO3:Formulate earliest trick for solving challenging problems of maths in area, volume and surface.

CO4:Calculate Time and distance problems

PSOs, POs and Cos

M.Sc (Mathematics)

POROGRAM OUTCOMES(POs)

PO1: Crack lectureship and fellowship exams approved by CSIR-NET and SET.

PO2: Opportunity of employment in schools and colleges as mathematical Teachers and Professors,Analysts in software industries, Research and Development Organizations .
PO3: Innovate and design complex mathematical problems and solutions using Pure and Appliedmathematics.
PO4: After completion of M.Sc they can continue their research work like M.Phil/Ph.D.

PROGRAM SPECIFIC OUTCOMES (PSOs)

PSO -1: Students enable to apply the concepts of Graph theory, Fuzzy and Operations Research in real life problems.

PSO -2: Prepare and Motivate Students for research studies in mathematics and related fields.

PSO -3: Assist students in preparing for competitive examinations like CSIR, SET etc.,

COURSE OUTCOME (CO)

SEMESTER I

COURSE: ALGEBRA –I **CREDIT: 5**

CO1:Define the class equation for finite groups and its application.

CO2:Explain and compare Sylow's theorem for first, second and third theorems.

CO3:Understand finite abelian group.

CO4:Explain whether Linear Transformatins on canonical forms and Triangular forms.

CO5:Compare Jordan and rational canonical forms.

CO6:Understand Trace and Transpose.

COURSE: REAL ANALYSIS –I **CREDIT: 5**

CO1:Determine the Functions of Bounded Variation

CO2:Define Riemann Stieltjes Integral And Euler Summation Formula

CO3:Analyse the Necessary And Sufficient Conditions for the Existence of Riemann Stieltjes Integral

CO4:Describe Riemanns theorem And Rearrangement Theorem For Double Series

CO5:Understand The Sequence of functions

CO6:Explain Convergence of Series

CO7:Understand Partition and Refinement

COURSE: ORDINARY DIFFERENTIAL EQUATIONS **CREDIT: 4**

CO1:Evaluate second order differential equation including separable exact linear equations.

CO2:Compare second and first order linear differential equations.

CO3:Create and analyse ordinary and partial equations.

CO4:Identify exact equations lipcitcz condition.

CO5:Compare and contrast second order equations.

COURSE: DIFFERENTIAL GEOMETRY **CREDIT: 5**

CO1:Identify to compute quantities of geometric interest such as curvature and torsion.

CO2:Compute specialized systems such as semi geodesic coordinate and asymptotic lines.

CO3:Compare and contrast the method of determining the differential equations in surface theory.

CO4:Develop arguments in the geometric descriptions of curves and surfaces.

CO5:Formulate the basic properties of geodesics parallel transport, evaluates, minimal surfaces.

CO6:Analyze the concept of space curves and intrinsic properties of a surface and geodesics.

COURSE: GRAPH THEORY **CREDIT: 3**

CO1:Describe the Origin of Graph Theory.

CO2:Define Trees, fundamental circuits' cut sets, connectivity and seperability.

CO3:Calculate Chromatic Number

CO4:Define Dual and Planar Graph

SEMESTER II

COURSE: ALGEBRA -I **CREDIT: 4**

CO1:Define Extension fields.

CO2:Explain Transcendence of "**e"**.

CO3:Express solvability by radicals about Wedderburn's theorem.

CO4:Understand the concept of Elements of Galois theory.

CO5:Discuss Integral Quaternions and the Four square theorem.

COURSE: REAL ANALYSIS –II **CREDIT: 5**

CO1:Define open,closed set and measurable set

CO2:Analyse the existence of the lebesgue integral for bounded functions

CO3:Understand the properties of the Lebesgue integral for bounded measurable functions

CO4:Apply Riemann Localization theorem.

CO5:Compute Jacobian Matrix

COURSE: PARTIAL DIFFERENTIAL EQUATIONS **CREDIT: 5**

CO1:Understand curves and surfaces

CO2:Define partial differential equations .

CO3:Calculate the first order Differential Equation and classification of parameter.

CO4:Define linear equation and Bernoulli's equation.

CO5:Define second order partial differential equation

COURSE: MECHANICS **CREDIT: 4**

CO1:Identify generalized coordinate system, virtual work, energy and momentum.

CO2:Evaluate the equations of Newton, Lagrange, Hamilton Jacobi and theory of relativity due to Einstein.

CO3:Determine the mechanical simulation software.

CO4:Apply the vector theorems of mechanics and interpretation of their results.

CO5:Compare and contrast the parameters defining the motion of mechanical systems and their degrees of freedom.

CO6:Analyze the analytic mechanics as a systematic tool for problem solving.

COURSE: PROGRAMMING IN C++ PRACTICAL CREDIT: 3

CO1:Writing a program for class, data member and member function.

CO2:Implement of operator overloading and function , constructor overloading

CO3:Writing a program for various sorting and searching algorithm

CO4:Implement of string manipulation

CO5:Writing a program various inheritance concepts

CO6:Implement of matrix operation

SEMESTER III

COURSE: COMPLEX ANALYSIS –I CREDIT: 5

CO1:Define conformal Mappings and Explain Cauchy's theorem.

CO2:Classify different types of singularities ,Zeros and Poles .

CO3:Understand the Concepts of Residue Theorem and Argument Principle

CO4:Evaluate Definite integrals and Harmonic Functions

CO5:Express Taylors series and Laurent series

CO6:Understand the concept of General Form of Cauchy's theorem.

CO7:Express logarithmic derivative and Rouchers theorem

COURSE: TOPOLOGY CREDIT: 5

CO1:Understand terms, definitions and theorems related to Topology.

CO2:Create new Topological spaces by using subspace, product and quotient Topologies.

CO3:Understand the structure of Topological spaces using continuous functions and Homeomorphisms.

CO4:Demonstrate knowledge and understand the concept of metric spaces.

CO5:Apply theoretical concepts in Topology to understand real world applications.

COURSE: OPERATIONS RESEARCH CREDIT: 5

CO1:Apply the integer programming models using branch and bound method.

CO2:Understand the best strategy on the basis of decision criteria under risk.

CO3:Understand the best strategy on the basis of decision criteria under the uncertainty.

CO4:Explain fundamental of dynamic programming.

CO5:Use deterministic and stochastic dynamic programming approaches.

CO6:Analyse the general non linear programming problem.

CO7:Create linear integer programming models and discuss the solution technique.

COURSE: PROBABILITY THEORY CREDIT: 5

CO1:Apply problem solving techniques to solving real world events.

CO2:Identify the appropriate probability distribution for a given discrete or continuous random variable and use its properties to calculate.

CO3:Evaluate probabilities by applying laws and theoretical results.

CO4:Understand the concept of borelcantelli lemma.

CO5:Describe difference between Binomial, poisson and Normal distribution.

CO6:Explain regression of the first and second type.

CO7:Apply normal probability distribution including standard normal curve calculation of appropriate area.

COURSE: TENSOR ANALYSIS AND RELATIVITY THEORY CREDIT: 3

CO1:Analyse the concept of tensor calculus

CO2:Apply the special theory of relativity

CO3:Formulate the momentum energy,conservation of energy

CO4:Evaluate christofel symbols and their properties

CO5:Create mixed ,zero tensor, tensor field, intrinsic differentiation.

.SEMESTER IV

COURSE: COMPLEX ANALYSIS –II CREDIT: 5

CO1:Define Riemann Theta function and Normal families.

CO2:Classify infinite Products and canonical Products

CO3:Explain Arzela's theorem and families of analytic function.

CO4:Classify simply periodic functions and doubly periodic functions

CO5:Evaluate differential Equations

CO6:Express Conformal mapping of polygons

COURSE: FUNCTIONAL ANALYSIS CREDIT: 5

CO1:Identify duals of some normed spaces.

CO2:Determine whether a real valued function defined on Cartesian product of a vector space.

CO3:Analyse normed space which is not an inner product space.

CO4:Describe orthogonal sets and total sets.

CO5:Analyse Hahn-Banach Theorem.

CO6:Explain Open mapping theorem.

CO7:Apply Closed Graph theorem.

COURSE: MATHEMATICAL STATISTICS CREDIT: 5

CO1:Define Sequential probability ratio test.

CO2:Apply most powerful test using Neymannpearson lemma.

CO3:Explain critical region ,test function , two kinds of error, and power function.

CO4:Explain students t distribution and chi square distribution.

CO5:Describe properties of point estimator such that consistency, unbiasedness, sufficiency and efficiency.

CO6:Prepare ANOVA table for one way and two classification.

CO7:Apply test of significance for large and small sample.

COURSE: DIFFERENCE EQUATIONS CREDIT: 4

CO1:Analyse the general theory of linear difference equation,linear homogeneous equation.

CO2:Explain the Jordan form of linear periodic system.

CO3:Apply the inverse z-transform and solution of difference equation.

CO4:Calculate the second order difference equation of asymptotic diagonal system.

CO5:Evaluate three term difference equation of non linear difference equation of self adjoint second order equation

COURSE: MATHEMATICAL SOFTWARES- PRACTICALS CREDIT: 3

CO1:Compute various mathematical problems like multiplication of matrices and rank of the matrix.

CO2:Design two Dimensional and Three Dimensional graphs using plot function.

CO3:Create histogram and frequency curves.

CO4:Implement ANOVA using MATLAB code.

CO5:Formulate central measures and rank correlation.

PSOs, Cos

M.Phil (Mathematics)

PROGRAM SPECIFIC OUTCOMES (PSOs)

PSO -1: Generate publications in reputed mathematical journals.

PSO -2: Produce next generation researches in Mathematics.

PSO -3: Demonstrate the highest standard of ethics in research.

COURSE OUTCOME (CO)

SEMESTER I

COURSE: ALGEBRA AND ANALYSIS CREDIT: 5

CO1:Define ring, ring homomorphism ,ideals ,Quotient rings and Nilpotent elements.

CO2:Compare and contrast prime and maximal ideals.

CO3:Analyse Operations on submodules ,quotient modules and finitely generated modules.

CO4:Formulate extended and contracted ideals in rings of fraction.

CO5:Apply the primary decomposition in Noetherian rings.

CO6:Solve problems in convex functions and inequalities in L'.

CO7:Identify the concept of Banach space.

COURSE: TOPOLOGY AND DIFFERENTIAL EQUATIONS CREDIT: 5

CO1:Define Homotopy,fundamental group and covering spaces.

CO2:Analyse fundamental group of simplicial complex

CO3:Formulate Diagonalization of exponential operators.

CO4:Compare and contrast fundamental and uniqueness theorem.

CO5:Apply limit sets and dynamical systems in problems.

CO6: Identify the concept of stable manifold.