

DEPARTMENT OF MATHEMATICS
PROGRAMME: M.Sc (Maths)

PO No.	Programme Outcomes Upon completion of the M.Sc.degree programme, the graduate will be able to
PO-1	Obtain through knowledge in pure mathematics.
PO-2	Obtain a basic knowledge in research & methodology.
PO-3	Develop aptitude skills and skill based knowledge.
PO-4	Improve logical and reasoning capacity.
PO-5	Receive training to face SET/NET examinations.

PSO No.	Programme Specific Outcomes Upon completion of these courses the student would
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PSO-1	Become an individual academic excellence in the discipline of mathematics.
PSO-2	Acquire knowledge for research programme.
PSO-3	Be an entrepreneur for training SET/NET examinations.
PSO-4	Been capable of executing research and research projects.
PSO-5	Become a Software professional.

Course Title	Paper I –Algebra 1
Code	M101
CO No.	Course Outcomes
CO-1	Describe the definitions of Automorphism, Conjugacy and G- sets with its examples.
CO-2	Discuss finitely generated abelian groups and invariants of finite abelian groups.
CO-3	Explain Sylow's first theorem, Sylow's second theorem and Sylow's third theorem with its examples.
CO-4	Discuss ideals and homomorphism, Maximal ideal and prime ideal, Nilpotent ideal and nil ideal.

CO-5	Simply explain Zorn's lemma.
CO-6	Learn the unique factorization domain, principal ideal domain and Euclidean domain.

SEMESTER I

Course Title	Paper II – Real Analysis-1
Code	M102
CO No.	Course Outcomes
CO-1	Describe the finite countable and uncountable sets, Metric spaces and Compact sets.
CO-2	Explain the convergent sequences & Cauchy sequences & some special sequences.
CO-3	Solve the problems to using ratio and root tests and analyze power series
CO-4	Understand the limits of functions & continuity and compactness and Monotonic functions.
CO-5	Learn the Mean value theorems ,L- Hospital's Rule and Taylor's theorem.

Course Title		Paper III – Differential Equations
Code		M103
CO No.	Course Outcomes	
CO-1	Applications of second order linear differential equations will be studied.	
CO-2	Solve Homogeneous equations and use of a known solution to find another.	
CO-3	Recognise differential equations that can be solved by each of three methods.	
CO-4	Solve the boundary value problems and by Sturm Comparison theorem solved Eigen values, Eigen functions.	
CO-5	Review of Power Series and solved first and second order linear equations to verify ordinary, regular singular points.	
CO-6	Understand the linear system and solved homogeneous linear system with constant Coefficients.	

Course Title		Paper IV – Topology
Code		M104
CO No.	Course Outcomes	
CO-1	Gain an understanding the algebra of sets , functions, Product of sets , Partitions and equivalence relations.	
CO-2	Learn the basic concepts of open set and closed sets and apply these two sets in real life examples.	
CO-3	Develop the Knowledge on Topological spaces through the participating in a Quiz.	
CO-4	Know the Weak Topologies.	
CO-5	Understand the Tychonoff's theorem and Ascoli's theorem.	

Course Title	Paper V – Discrete Mathematics
Code	M105
CO No.	Course Outcomes
CO-1	Discuss relations, properties of binary relations in a set, Relation matrix and graph of a relation, partition and covering of a set, equivalence relations, compatibility relation, composition of binary relations.
CO-2	Discuss lattices as partially ordered sets, some properties of lattices, lattices as algebraic systems.
CO-3	Explain Boolean algebra, sub algebra, direct product and homomorphism.
CO-4	Acquire the knowledge from Boolean forms and free Boolean algebras, values of Boolean expressions.
CO-5	Describe representations and minimizations of Boolean functions.
CO-6	Explain finite state machines, Introductory sequential circuits, equivalence of Finite State Machines.

SEMESTER II

Course Title	Paper I – Algebra- II
Code	M201
CO No.	Course Outcomes
CO-1	Discuss the definitions of Irreducible polynomials and Eisenstein criterion, Algebraic extensions and algebraically closed fields with it's examples.
CO-2	Explainsplitting fields and normal extensions, multiple roots, finite fields and Separable extensions.
CO-3	Simply explainfundamental theorem of Galois theory and fundamental theorem of algebra.
CO-4	Explain applications of Galois theory to classical problems.
CO-5	Solve the problems by using radicals, ruler and compass construction.

Course Title	Paper II – Real Analysis - II
Code	M202
CO No.	Course Outcomes
CO-1	Learn the definition and existence of the Riemann stieltjes Integral.
CO-2	Acquire the Knowledge of uniform convergence and uniform convergence & continuity and Integration.
CO-3	Apply the stone wierstrass theorem for obtain results von the function of algebra.
CO-4	understand the Linear Transformations and the contraction principle.
CO-5	Give seminars on the implicit function theorem ,the Rank theorem & Derivatives of higher order for improving subject.

Course Title	Paper III – Complex Analysis - I
Code	M203
CO No.	Course Outcomes
CO-1	Discuss the elementary properties and solved the examples of Analytic functions.
CO-2	Understand the mobius transformations.
CO-3	Know the fundamentals of Analytic functions, to study Riemann Stieltjes integrals and Analyze Power Series representation of Analytic function.
CO-4	Learn the Cauchy's theorem and the homotopic version of Cauchy's theorem.
CO-5	Examine functions are analytic in a punctured disk.

Course Title	Paper IV – Linear Algebra
Code	M204
CO No.	Course Outcomes
CO-1	Explain elementary canonical forms, annihilating polynomials, invariant subspaces.
CO-2	Discuss Simultaneous triangulation and simultaneous diagonalization.
CO-3	Describe direct –sum decompositions, invariant direct-sums.
CO-4	Discuss the primary decomposition theorem, cyclic subspaces and Annihilators. Learned cyclic decompositions and the rational forms.
CO-5	Acquire the knowledge in the Jordan forms, computation of invariant factors, semi simple operators.
CO-6	Discuss Bilinear forms, symmetric bilinear forms and skew symmetric Bilinear forms.

Course Title	Paper V – Probability Theory and Statistics
Code	M205
CO No.	Course Outcomes
CO-1	Discuss Sample spaces, events and the axioms of Probability.
CO-2	Learn some elementary theorems and Boole's inequality.
CO-3	Give brief explanation on Conditional probability and studied Bayes theorem.
CO-4	Discuss Descrete and Continuous Random variables and studied Binomial, Poisson, Normal and uniform distributions.
CO-5	Learn meaning of Correlation, Scatter diagram Karl Pearson's coefficient of Correlation, Rank Correlation.
CO-6	Know types of sampling, parameters and solved some problems on tests of significance.

SEMESTER III

Course Title	Paper I – Functional Analysis
Code	M301
CO No.	Course Outcomes
CO-1	Learn linear transformations, continuous linear transformations, Hahn-Banach theorem in Banach spaces.
CO-2	Explain the open mapping theorem and the conjugate of an operator.
CO-3	Discuss the definition and some simple properties in Hilbert spaces, orthogonal complements and orthonormal sets.
CO-4	Describe the conjugate space, the adjoint of an operator, self-adjoint operators.
CO-5	Acquire the knowledge in normal and unitary operators and also in projections.
CO-6	Discuss matrices, determinants and the spectrum of an operator, the spectral theorem in Finite-Dimensional Spectral Theory.

Course Title	Paper II – Lebesgue Theory
Code	M302
CO No.	Course Outcomes
CO-1	Explain algebra of sets, Lebesgue measure, outer measure, measurable set and Lebesgue measure.
CO-2	Discuss non-measurable set, measurable function, Littlewood's three principles.
CO-3	Describe the Riemann integral, the Lebesgue integral of a bounded function over a set of finite measures.
CO-4	Explain the integral of a non-negative function, the general Lebesgue integral convergence in measure.

CO-5	Acquire the knowledge in differentiation of monotonic functions, functions of bounded variation, differentiation of an integral.
CO-6	Learn L_p -spaces, the Holder's and Minkowski inequalities, convergence and completeness.

Course Title	Paper III – Analytical Number Theory
Code	M303
CO No.	Course Outcomes
CO-1	Discuss Mobius function, Euler totient function and also explained relation between them.
CO-2	Learn the Dirichlet inverse and Mobius inversion formula, Mangoldt function and Liouville's function.
CO-3	Describe big Oh notation and Euler summation formula.
CO-4	Explain Chebyshev's function, Shapiro's theorem and its applications.
CO-5	Learn reduced residue system and Euler-Fermat theorem, Lagrange theorem and its applications, Chinese remainder theorem and its applications.

Course Title	Paper IV – Partial Differential Equations
Code	M304
CO No.	Course Outcomes
CO-1	Recall the basic concepts of Partial Differential Equations.
CO-2	Explain the Pfaffian Differential forms and equations and some exercises.
CO-3	Solve the problems on Cauchy's Method of characteristics & compatible system of first order equations.
CO-4	Know the Partial Differential Equations of the second order and solve the linear hyperbolic equations.
CO-5	Understand the elementary solutions, and Method of separation of variables of solving Laplace equation and the wave equation.

Course Title	Paper V – Elective – ICommutative Algebra
Code	M305
CO No.	Course Outcomes
CO-1	Review the definition and elementary properties of rings.
CO-2	Discuss the prime and maximal ideals and explain the various elementary operations performed on ideals.
CO-3	Give the definition and elementary properties of modules and give brief treatment of tensor products.
CO-4	Discuss how tensor products behave for exact sequences.
CO-5	To educate the definitions and simple properties of the formation of fractions.
CO-6	Discuss the decomposition of an ideal into Primary ideals and establish the uniqueness theorems.

SEMESTER IV

Course Title	Paper I – Measure Theory
Code	M401
CO No.	Course Outcomes
CO-1	Explain convergence and completeness in measure spaces.
CO-2	Discuss measurable functions, integration, general convergence theorems.
CO-3	Describe signed measures, the Raydon- Nikodym theorem, the LP spaces.
CO-4	Explain outer measures and measurability, the Extension theorem
CO-5	Discussthe Lebesgue- stieltjes integral, product measures.
CO-6	Acquire the knowledge in integral operators, inner measure, extension by sets of measure 0, caratheodory outer measure.

Course Title	Paper II – Numerical Analysis
Code	M402
CO No.	Course Outcomes
CO-1	Determine the roots of a polynomial equation and obtain the initial approximations to the roots by solved some problems in different methods.
CO-2	To find the roots of the equations by some of the iteration methods.

CO-3	Discuss the methods to construct the interpolating polynomials to a function and interpolate the indicated points.
CO-4	To evaluate the derivative of a function in the closed form by Numerical methods.

Course Title	Paper III –Graph Theory
Code	M403
CO No.	Course Outcomes
CO-1	Learn the basic concepts of graphs and trees and fundamental circuits.
CO-2	Know the cutsets and connectivity and separability .
CO-3	Acquire the Knowledge of Planar graphs and Dual graphs.
CO-4	Explain the Matrix representation of graphs and Application to a switching network in real life.
CO-5	Describe the coloring, covering and Partitioning and further Operation Research.

Course Title	Paper IV – Linear programming
Code	M404
CO No.	Course Outcomes
CO-1	Discuss the formulation of linear programming problems, graphical solution and general solution of linear programming problem.
CO-2	Describe simplex method and two- phase method, Big- M method and to resolve degeneracy in linear programming problem, solved problems in simplex method.

CO-3	Explain the concept of duality in linear programming and comparison of the solution of the dual and primal.
CO-4	Learn the formulation of assignment problem, Reduction theorem and Hungarian assignment method, traveling salesman problems
CO-5	Explain information of transportation problem, methods to find initial basic feasible solution and north- West corner rule, lowest cost entry method and Vogel's approximation method.
CO-6	Discuss optimality test, degeneracy in transportation problems and unbalanced transportation problem.

Course Title	Paper V – Elective-II Discrete Dynamical Systems	
Code	M405	
CO No.	Course Outcomes	
CO-1	Discuss Phase portrait, periodic points and stable sets, differentiability and its implications.	
CO-2	Explain the Sarkovskii's theorem and some basic problems.	
CO-3	Learn the definitions of parameterized families of functions and bifurcations Cantor set's, symbolic dynamics and chaos.	
CO-4	Describe topological Conjugacy, period doubling cascade, Newton method.	
CO-5	Solve the problems on Numerical solutions of differential equations on Newton's method in complex plane.	