Department of mathematics

PG Course Outcomes

SEMESTER I		
Paper Name	**Paper code**	**Outcomes After completion of the course the student should be able to**
Algebra-I	M101	**CO 1:** Introduce the basic concepts of group theory and study the structure of groups. **CO 2:** Introduce the concepts of conjugacy and G sets and prove cayley theorem. To introduce explicitly the properties of permutation groups **CO 3:** Determine structure of any abelian groups. To determine structure of finite nonabelian groups through Sylow theorems. **CO 4:** Introduce concepts of ring theory. To introduce different types of ideals. To apply Zorn's lemma on the set of ideals. **CO 5:**Study on UFD as a generalization of fundamental theorem of arithmetic, PID based on ideals and ED is division algorithm applied on polynomials introduces to fundamental techniques adapted in advanced algebra
Real analysis-1	M102	**CO 1:** Describe elementary concepts on metric spaces to get the general idea that is relevant to Euclidean spaces. **CO 2:** Study the continuity and its properties of real valued functions in metric spaces. **CO 3:** Describe the derivatives of real valued functions defined on intervals or segments, and study its properties. **CO 4:** Introduce Riemann-Stieltjes integral as a generalization of Riemann integral and discuss the existence of this integral. **CO 5:** Study differentiation of integrals and further the extension of integration to vector valued functions
Topology-I	M103	**CO 1 :** Will be able to handle operations on sets and functions and their properties **CO 2:** Understand the concepts of Metric spaces, open sets, closed sets, convergence, some important theorems like Cantor's intersection theorem and Baire's theorem **CO 3:** Be familiar with the concept of Topological spaces, continuous functions in more general and characterize continuous functions in terms of open sets, closed sets etc. **CO 4:** Explain the concept of compactness in topological spaces **CO 5:** Characterise compactness in metric spaces and their

		properties
Differential equations	M104	**CO 1:** Familiarize with essential concepts of real function theory that help to grasp the theory of ordinary differential equations **CO 2:** Introduce basic theorems in theory of ordinary differential equations pertaining to existence, uniqueness, continuation of solutions. **CO 3:** Understand dependence of solutions on initial conditions and parameters **CO 4:** Transform nth order differential equations in to differential systems and extend the theory to differential systems. **CO 5:** Study the qualitative behaviour of solutions of homogeneous and non homogeneous linear equations and systems
Linear algebra	M105	**CO-1:**Bridge the relation between matrix theory and vector spaces. **CO-2:**Understand the applications of Cayley-Hamilton Theorem. **CO-3:**Find an inverse of a linear transformation(a matrix) using Cayley-Hamilton Theorem. **CO-4:**Find the Jordan forms of a complex matrix with a given characteristic polynomial. **CO-5**: Understand the relation between semi-simple operators and diagonalizable operators.
SEMESTER II		
Algebra-II	M201	**CO 1:**Understand the concept of extensions of a field, based on the study of irreducible polynomials. **CO 2:**Understand the concept of normal extensions and separable extensions based on the study multiplicity of roots of a polynomial **CO 3:**Introduce the concept of group of automorphisms on a field. To introduce fixed fields. To prove the fundamental theorem of Galois theory. **CO 4:**Apply Galois theory and prove the fundamental theorem of algebra. To study the properties of nth cyclotomic polynomial. **CO 5:**Understand Galois theory and study its applications
Real analysis-II	M202	**CO 1:** Discuss the most important aspects of the problems that arise when limit processes are interchanged. **CO 2:** Study the approximation of continuous complex function and its generalization and an introduction of power series. **CO 3:** Study of exponential and logarithmic functions, the trigonometric functions and Fourier series and their properties.

		CO 4: Discuss linear transformations on finite-dimensional vector spaces over any field of scalars and derivative of functions of several variables. **CO 5**: Study the method of solving implicit functions. Interesting illustration of the general principle that the local behaviour of a continuously differentiable mapping near a point. Further study of derivatives of higher order and differentiation of integrals.
Topology-II	M203	**CO 1:**Understand various toplogical spaces like T 1 spaces, Hausdorff spaces, Completely regular spaces, normal spaces **CO 2:**Prove the existence of continuous functions on normal spaces **CO 3:** Characterize connected subsets of Real number system , understand local connectedness and totally disconnected spaces **CO 4:**Prove various approximation theorems for continuous functions **CO 5:** Locally compact spaces and generalise Stone - Weirstrass theorems
Complex analysis	M204	**CO 1:**Solve problems using the properties of analytic functions like power series expansion, Cauchy-Riemann equations etc. **CO2**: Analyze the properties of power series and apply them to understand properties of analytic functions. **CO 3**: Apply the Cauchy integral formula to solve problems. **CO4**: Analyze the zeros of analytic functions. **CO5**: Identify and analyze the nature of singularities and behavior of functions near the singularities.
Discrete mathematics	M205	**CO 1:** Understand The Four Colour Theorem and applications in chemistry and physics. **CO 2:** Familiarize the basic concepts of graphs and different types of graphs. **CO 3:** Learn the modelling of Konigsberg Bridge Problem and Hamilton's Game by graphs. **CO 4**: Characterize graphs which are both Eulerain and Hamiltonian. **CO 5:** Understand specific difference between modular and distributive lattices.
SEMESTER III		
Functional analysis	M301	**CO 1:** The concept of Banach space through which it helps to consider the combination of algebraic and metric structures opens up the possibility of studying linear transformations of one Banach space into another with the additional property of being continuous. **CO 2:** To understand the algebraic and topological aspects of the continuous linear functionals. **CO 3:** To study elementary theory of Hilbert spaces and their operators to provide an adequate foundation for the higher studies.

		CO 4: To understand a natural correspondence between H and its conjugate space H* , and the adjoint of an operator on a Hilbert space. **CO 5:** To study the spectral resolution of an operator T on a Hilbert space H..
Calculus of variations	M302	**CO 1:** To learn about method of variations with fixed boundaries **CO 2:** To learn about method of variations with moving boundaries **CO 3:** To gain knowledge on some specific variational problems such as those involving extremals with corners and one sided variations **CO 4:** To understand about sufficient conditions for an extremum for variational problems. **CO 5:** To learn about variational problems involving a conditional extremum
Electives: **Number theory-I**	M303	**CO 1 :** To introduce arithmetical functions and explore their role in the study of distribution of primes. **CO 2 :** To study the averages of arithmetical functions and some related asymptotic formulas. **CO 3 :** To introduce the foundations of congruences and study the polynomial congruences. **CO 4 :** To understand the prime number theorem on distribution of primes and develop some equivalent forms. **CO 5:**To introduce the characters of a group and apply to the Dirichlet Theorem on primes in a progression..
Lattice theory-I	M305	**CO 1 :** To familiarize the concepts of POset, chain conditions. **CO 2 :** To learn the lattice theoretic duality principle. **CO 3 :** To study complements, relative complements and semi-complements of elements of a bounded lattices. **CO 4 :** To learn the properties of compact elements and compactly generated lattices. **CO 5 :** To study the posets as topological spaces.
Commutative algebra-I	M306	**CO 1 :** To familiarize the essential concepts of ideals, quotient rings and homomorphisms. **CO 2 :** To understand the difference between zero divisors, nilpotent elements and units. **CO 3 :** To study the properties of finitely generated modulus. **CO 4 :** To introduce tensor product of modulus and its exactness properties. **CO 5 :** To learn the concepts of extended and contracted ideals in ring of fractions
SEMESTER IV		

Measure &integration	M401	**CO 1 :** Introduce a special theory on sets, called outer measure of a set and measurable sets, which are useful to get an idea on real number system. **CO 2 :** To understand measurable functions through the certain construction of measurable sets and their properties. **CO 3 :** To introduce and understand the Lebesgue integral of various measurable functions and their properties. **CO 4 :** To study differentiation of Lebesgue integral and convex functions. **CO 5 :** To study some spaces of functions of a real variable, the L_p spaces
Partial differential equations	M402	**CO 1 :** To be introduced to categorization of partial differential equations such as linear, quasi linear and nonlinear equations. **CO 2 :** To learn a few methods of solving linear, semi linear and quasi linear equations and construction of Cauchy problem for first order partial differential equations **CO 3 :** To understand the classification pertaining to second order equation and learn the Procedure of reducing equations to their cannonical forms. **CO 4 :** To understand the structure of hyperbolic equation, know its properties and solve related problems **CO 5 :** To understand the structure of elliptic equation, know its properties and solve related problems
ELECTIVES: **Number theory-II**	M403	**CO 1 :** To introduce the concept of Quadratic residues. To define Legendre symbol and evaluate Quadratic residue. To generalize Legendre symbol to Jacobi symbol and to study applications of Quadratic residues **CO 2 :** To introduce the concept of primitive roots. To understand the study on existence of primitive roots. **CO 3 :** To define Dirichlet Series and identify the plane of absolute convergence and convergence of Dirichlet series. To establish Euler products to Dirichlet series. **CO 4 :** To derive some analytic properties of Dirichlet series. To develop some expressions as exponential and integral form for Dirichlet series. **CO 5 :** To understand the analytic proof of prime number theorem based on the analytic properties of the particular Dirichlet series, Riemann Zeta function.

Lattice theory-II	M405	**CO 1 :** To study equivalent conditions for a lattice to become modular and distributive. **CO 2 :** To learn meet-representations of modular and distributive lattices. **CO 3 :** To understand the equivalent conditions for a complete Boolean algebra to become atomic. **CO 4 :** To study the properties of valuations of Boolean algebras. **CO 5 :** To learn the properties of rings of sets.
Commutative algebra-II	M406	**CO 1 :** To learn the decomposition of ideals into primary ideals. **CO 2 :** To learn Going-Up and Going-Down theorems concerning prime ideals in an integral extensions. **CO 3 :** To study valuation rings of a given field of fractions. **CO 4 :** To characterize Noetherian rings and Artin rings. **CO 5 :** To study primary decomposition in Noetherian rings and to learn The Structure Theorem for Artin rings.