FIRST SEMESTER

M101T: ALGEBRA – I

Course Outcome:

- Concepts of symmetric groups and permutation groups are used to solve many mathematical puzzles, games; specifically in Rubik's cube.
- Notion of Sylow subgroups leads to find the number of p-Sylow subgroups and verify whether the group is abelian, cyclic or not while knowing only the order of the group.
- Theoretical knowledge of conjugacy classes motivates to find the class equation of a finite groups.
- Solvable groups have many applications in Galois theory.
- Fundamental theorem of Homomorphism of rings provide a mathematical ability to say whether the two rings or quotient rings are isomorphic or not.
- Concept of Euclidean rings provide a critical thinking in finding the GCD of two elements.
- Gauss' lemma will provide a mathematical skill to sow the irreducibility of the polynomials over a field.
- Notion of maximal ideals and prime ideals leads to define Nilradical and Jacobson radicals which are studied in their subsequent semester.

Learning Outcome: Students

- Acquire the knowledge to solve many mathematical puzzles and games using permutation and symmetric groups
- Able to apply the theoretical knowledge of conjugacy classes to find the class equation of finite groups.
- Develop their analytical ability to find the irreducibility of a polynomial using Eisenstein's criterion
- Understand and make use of Eisenstein's criterion to solve the irreducibility of polynomials and cyclotomic polynomials.

Course Objectives:

- This course will provide a foundation for students required for their subsequent semester.
- The concepts of this course help students to transfer their concrete mathematical knowledge to more abstract algebraic generalizations. The concepts of this course will explore mathematical thinking and problem solving skills.

M102T: REAL ANALYSIS

Course Outcome:

- Riemann-Stieltje's integration and their properties provide mathematical ability and problem solving skills
- Concept of sequence and series of functions leads to distinguish between pointwise convergence and uniform convergence
- Notion of continuity and differentiability of functions of several variables will provide a problem solving skills to solve certain examples
- Theoretical knowledge of topology of R^n leads to several other concepts like compactness, countably compactness etc.
- Concepts of functions of several variables will provide mathematical ability to understand partial derivatives, directional derivatives etc.

Learning Outcome: Students

- Can solve the problems on integration of a function with respect to another function on some interval
- Able to distinguish the types of convergence of sequences/ series of functions
- Understand and make use of Weierstrass approximation theorem in approximating any polynomial to a continuous function
- Can apply the theoretical knowledge of Heine-Borel theorem to discuss the compactness of the set
- Can able to solve the continuity of differentiability of functions of several variables.

Course Objectives:

- This course begins with the detailed study of Riemann-Steiltje's integration and their properties which is the generalization of Riemann integration which helps in the study of Lebesgue integration.
- Sequences and series of functions will provide a mathematical thinking to investigate the pointwise / uniform convergence for the concerned problems
- Topology of Rn deals with many concepts like limit points, neighborhood, compactness, countably compactness etc., which gives precise critical thinking
- Functions of several variables mainly focuses on the continuity and differentiability of functions of several variables.

M103T: TOPOLOGY – I

Course Outcome:

- Concept of set theory with an intuitive approach which is used to define the concepts of metric space and topological space
- Notion of metric for an arbitrary set is being studied
- Concept of topological spaces and connectedness of these spaces are being introduced which are studies in subsequent semester

Learning Outcome: Students will be able to

- identify the denumerable/countable/uncountable sets and work on cardinality of sets
- define different types of metrics on a non-empty set; and embedding of a metric space in a complete metric space.
- find open sets/closed sets/neighbourhood of a point/limit point of a set/closure/interior and boundary of a set in a topological space.
- apply the homeomorphism of topological spaces to find the connectedness of a set.

Course Objectives:

- This course deals with the set theory through intuitive approach, then study about cardinality of sets (finite and infinite sets).
- Later the student study about the metric space with its completeness and the basic concepts of topology.

M104T: Ordinary Differential Equations

Course Outcome:

- Wronskian and Abel's identity concepts helps in investigating the fundamental set of solutions and linear dependence of solutions for linear differential equations of nth order.
- Theoretical knowledge of Green's formula and variations of parameter leads to find the solution of linear differential equation
- Sturm's comparison and separation theorem plays an cardinal role in investigating the zeros of solutions.
- Notion of power series method of solving differential equation leads to find the general solutions of Hermite, Leguerre, Chebyshev, Hypergeometric differential equations.
- Linear system of homogeneous and non-homogeneous equations can be solved by matrix method. Investigating critical points and stability of the linear and non-linear autonomous system of equations by Lyapunov direct method.

Learning Outcome: Students

- Develop their ability to find the solutions of linear differential equation by the method variation of parameters, Green's formula and Abel's identity.
- Can make use of Sturm's comparison and separation theorem in finding zeros of solutions
- Can investigate the eigen values and eigen functions of Sturm-Liouville problem

- Gain the knowledge of solving Hermite, Laguerre, Chebyshev, Hypergeometric differential equations
- Can find the critical points and stability of the linear / non-linear system of equations

Course Objectives:

- This course covers the solution of linear differential equation by Abel's identity, Green's formula and the method of variation of parameters, Study of existence and uniqueness of solution to various types of linear differential equation; obtain the solution to eigen value problems; finding power series solutions of linear differential equation at ordinary and regular singular points.
- Later solution to linear system of homogeneous and non-homogeneous equations are studied.

M105T: Discrete Mathematics

Course Outcome:

- Notion of logic leads to write the different methods of proofs and rules of interference will leads to the validity of arguments
- Different counting techniques can solve the various real life problems
- Representation of relations using matrices / digraphs and check the transitive closure of relation using Warshall algorithm
- Posets and lattices helps to draw Hasse diagrams
- An introduction to graph theory motivates to learn graph isomorphism, connectedness in graphs, Dijkstra's and Prims algorithm to find the shortest distance paths in graphs.

Learning Outcome: Students

- Gain the knowledge of tackling different counting problems.
- Can develop their ability to solve recurrence relation by various methods
- Can be able to express the relations using matrices / digraphs and to check the transitive closure of a relation
- Theoretical knowledge of graph theory will leads to find the isomorphism of graphs, find the shortest distance paths in graphs and to find the minimum spanning tree of a graph.

Course Objectives:

This course gives an introduction to Logic, counting techniques, modeling with recurrence relations, types of relations on sets, Lattices and Graph theory.

M106P: Maxima Practicals based of paper Discrete Mathematics

Course Outcome:

- Programs on the topics of Discrete Mathematics and graph theory studied in the paper M105T is dealt with

Learning Outcome: Students

- Are able to write the programs in Maxima to check the transitive closure of relation using Warshall algorithm, drawing Hasse diagram, Dijkstra's and Prims algorithm

Course Objectives:

Course deals with writing the Maxima programs for Warshall algorithm, Dijkstra's and Prims algorithm in discrete mathematics and graph theory.

M107SC: Mathematical Analysis

Course Outcome:

- Notion of limits helps in the discussion of continuity and differentiability of functions
- Concept of continuity, compactness and connectedness leads to several other results
- Mean value theorems play an important role in the proof of fundamental theorem of calculus
- Taylor's theorem is a powerful tool used for approximating functions, finding roots of algebraic equations and solving differential equation in forms suitable for computer calculations
- Cauchy sequences converges without finding the potential limit value, which leads us to the notion of completeness.
- Infinite products can be used to represent entire functions

Learning Outcome: Students

- Acquire the knowledge to find continuity and differentiability of functions
- Understand and analyse the compactness and connectedness of sets
- Can use Taylor's theorem for approximating functions to find roots of an algebraic equations
- Are equipped with the knowledge of testing the convergence of sequence / series by different methods

Course Objectives:

This course will cover fundamental concepts of limits, continuity and differentiability of functions. Derivative of a function leads to several other results like mean value theorems, Taylor's theorem and Darboux's theorem. Later different methods are used to check the convergence of sequences / series of real numbers. Further convergence of infinite products is discussed.

M201T: Algebra – II

Course Outcome:

- Module theory is one of the fundamental algebraic structure used in abstract algebra
- Module theory is a generalization of the notion of vector space over a field and modules are closely related to the representation theory of groups
- Introduction to commutative algebra is studied with the theory of modules and applications to Artinian and Noetherian rings is also discussed.
- Concept of algebraic extensions and degree of extension leads to find the splitting field of the polynomial
- Notion of contructible numbers is discussed with the aid of straight edge and compass

Learning Outcome: Students

- Able to find the splitting field by calculating the roots of the polynomial
- Capable to verify whether a regular polygon is constructible or not
- Understand and analyse the theory of modules and operations on modules.

Course Objectives:

This course begin with basic theory of modules, types of modules which leads to different results. Further, a field theory covers algebraic extensions, splitting fields and finite fields. Finally, Galois theory has been introduced.

M202T: Complex Analysis

Course Outcome:

- Knowledge of analytic functions and basics of complex analysis in the preliminary section along with a few basic theorem like Cauchy's theorem and residue theorem
- Understanding the concept of series and application of it to Taylor's and Laurent's series
- Concept of analytic functions, rational functions, singularities and poles will be known
- Learning entire and meromorphic functions and its extension to various theorems like Rouche's theorem, Schwartz lemma, open mapping theorem, maximum modulus theorem and its application along with concepts of convex function with regard to Hadamard's three circle theorem
- Few results on Riemann mapping theorem, Weistrass factorization theorem, mean value theorem are studied

Learning Outcome: Students

- Will be able to get a clear understanding of the basics of complex analysis in terms of analytic functions, Cauchy's theorem, Liouville's theorem and fundamental theorem of algebra
- Will also learn about series, its convergence and application in terms of Taylor's series and Laurent's series. Also they will learn the behaviour or analytic functions, singularities and poles
- Will be introduced to the concept of entire and meromorphic functions and evaluation of various definite integrals. Few standard theorems based on entire functions like Rouche's theorem, Schwartz lemma, open mapping theorem, maximum modulus theorem, Hadamard's three circle theorem
- Also learn theorems like Riemann mapping theorem, mean value theorem, Poisson's formula, integral formula, Jensen's formula, Poisson-Jensen's formula

Course Objectives:

A better understanding of the subject in terms of analytic functions, entire functions, series, meromorphic functions and harmonic functions

M203T: Topology – II

Course Outcome:

- Concepts of compact spaces, countability axioms and separation axioms are studied for a topological space and conclusion can be drawn by comparing these concepts with metric spaces
- Study of Urysohn lemma plays a crucial role in proving a number of important results, particularly Tietze extension theorem, which is an important result in applications of topology
- The concept of paracompactness is one of the most useful generalizations of compactness. Particularly, it is useful for applications in algebraic topology and differential geometry

Learning Outcome: Students

- Understand the concepts of different types of compactness, axioms of countability and separation axioms.
- Are able to check the equivalence of these properties for metric spaces
- Course of Topology – I and II are fundamental courses for the study of algebraic topology and applications of topology

Course Objectives:

This course deals with the concepts of compactness, countability axioms, separation axioms and paracompactness. Major goal of this course is to prove the Urysohn's metrization theorem which gives us conditions under which a topological space is metrizable.

M204T: Partial Differential Equations

Course Outcome:

- Learning first order partial differential equations, its geometrical representation and solving using various methods
- Solving second order partial differential equations – linear, non-linear, homogeneous and non-homogeneous.
- Various examples like heat equations, wave equations, Laplace equations, diffusion equations are studies and its solutions are explored using different methods and techniques
- Knowledge of solving boundary value problems and to solve hyperbolic, parabolic and elliptic equations

Learning Outcome: Students

- Gain a deep knowledge of partial differential equations, its various kinds, the geometrical representation, a recapitulation to solve various partial differential equations using different methods
- Are able to solving first and second order partial differential equations
- Gain the knowledge of classification of partial differential equations into hyperbolic, parabolic and elliptic forms.
- Learn to find the solution of linear homogeneous and non-homogeneous partial differential equations and to solve partial differential equations using Monge's method
- Learn to solve wave equations, Laplace equations, diffusion equations by using various methods in cylindrical, spherical and polar coordinates

Course Objectives:

Proper understanding of partial differential equations of higher order and its day to day usage in real world which also lays foundation for students who like to pursue research in partial differential equations.

M205T: Numerical Analysis – I

Course Outcome:

- Non-linear equations in one variable can be solved by different numerical methods and analyse their convergence criteria

- Study of solving linear and non-linear system of equation by direct methods and iterative methods which provide a theoretical knowledge and can be adopted for computer calculations
- Concept of interpolation is a best method for approximating any function to a polynomial, which provides background for cubic spline interpolation and bivariabe interpolation
- Notion of approximation is used to express the trigonometric functions, exponential functions and rational functions to the polynomial functions
- Numerical integration is the central part of applied mathematics, which can be used to integrate numerically, when exact integration is not possible

Learning Outcome: Students

- Gain problem solving skills by learning various numerical methods
- Develop their mathematical ability by solving system of equations
- Able to find the missing value of a function at some point
- Acquire the knowledge of approximation to express a trigonometric function, exponential function in terms of rational function
- Can be able to evaluate any integral value numerically

Course Objectives:

This course deals with the various numerical methods and their convergence criteria for algebraic and transcendental equations where analytical methods fail. Solution of system of linear and non-linear algebraic equation by using direct methods and iterative methods is discussed where analytical solutions are difficult or impossible. Further, the study of Lagrange and Hermite interpolation gives polynomial approximation to any unknown function. Finally, numerical integration can be used to integrate numerically, when exact integration is not possible. All the above numerical methods are adopted for computer calculations.

M206P: Scilab Practicals based on Numerical Analysis – I

Course Outcome:

- Writing of Scilab programs for the numerical methods studied in the theory paper Numerical Analysis – I is studied

Learning Outcome: Students

- Are able to write programs for various numerical methods studied in the theory paper Numerical Analysis – I using Scilab

Course Objectives:

The concepts of various numerical methods studied in the theory is applied to write programs in Scilab.

M207SC: Elementary Number Theory

Course Outcome:

- Knowledge of division algorithm helps to solve linear Diophantine equations
- Concept of congruences and its applications helps students develop skills to solve the problems containing linear congruences and congruences modulo prime powers
- Notion of quadratic residues will provide a critical thinking in the solution of Legendre symbol and Jacobi symbol
- Notion of sums of squares is briefly introduced

Learning Outcome: Students

- Are capable in verifying whether the solution of linear Diophantine equation exists or not
- Able to solve simultaneous linear congruences and polynomial congruences modulo prime and solve Diophantine equation by using Legendre symbol and Jacobi symbol
- Have mathematical skills to find the Pythagorean triples as an application to sum of squares

Course Objectives:

This course covers the divisibility of primes, congruences and its applications. Then the quadratic residues, Legendre symbol and Jacobi symbol are dealt with applications to Diophantine equations. Finally, it deals with sum of squares as a special case to Pythagorean triples.

M301T: Differential Geometry

Course Outcome:

- Concepts of calculus on Euclidean space deals with differentiable functions, directional derivatives and their properties
- Notion of reparametrization of a curve gives clear picture to the velocity and speed of a curve
- Definition of tangent vector field, normal vector field, binormal vector field, curvature and torsion of a curve will be useful in proving Frenet formulas
- Notion of calculus on a surface deals with some standard ways to construct surfaces
- Study of shape operators helps to define the normal and principal curvature, Gaussian and mean curvatures

Learning Outcome: Students

- Develop skills to analyze and solve the problems related to velocity, speed and reparametrization of a curve
- Able to find the one-form and differential forms of a given curve
- Can apply their analytical abilities to find the Frenet apparatus for a unit speed curve and for any arbitrary speed curve
- Able to analyze the parametrization of cylinder, surface of revolution, torus
- Able to compute the Gaussian and mean curvatures for some standard surfaces

Course Objectives:

This course deals with differentiable functions, directional derivatives and their properties on the Euclidean space. Reparametrization of a curve gives an insight in finding velocity and speed of a curve. Further, the discussion of one-forms and differential forms leads to several other results. Concept of Frenet formulae motivates us to study different vector fields which gives mathematical measurements of the turning and twisting of a curve in Euclidean space. Calculus on surface deals with parametrization of surfaces, vector fields and curves on a surface, directional derivatives of a function on surfaces, differential forms and exterior derivative form on surface. Finally, it deals with shape operators of different surfaces and it is useful in computing mean curvature and Gaussian curvature.

M302T: Fluid Mechanics

Course Outcome:

- Concepts of tensors as an extension to the theory of vectors and vector calculus are being studied
- Notion of continuum and its description of motion are useful in describing the vorticity, circulation, strain and stress tensors
- Concept of basic physical laws are described which are applied for the study of motion of non-viscous and viscous fluids

Learning Outcome: Students

- Are able to distinguish between a vector and a tensor
- Are capable to distinguish between material form and spatial form of description of motion of a continuum
- Acquire the knowledge of fundamental basic physical laws which are applicable to study of motion of viscous and non-viscous fluids

Course Objectives:

First part of the course deals with the calculus of tensors and its basic properties. Further, continuum hypothesis is being considered to study the motion of a continuum. Second part

of the course covers fundamental basic physical laws and application to motion of non-viscous and viscous fluids

M303T: Functional Analysis

Course Outcome:

- Concepts of Banach space and its properties are studied
- Notion of projections on a Banach space is studied with application to open mapping theorem and closed graph theorem
- By defining inner product for a linear space, the theory of Hilbert space is studied
- Orthogonal decomposition of Hilbert space leads to the definition of projections on Hilbert space
- Concepts of adjoint operators are introduced

Learning Outcome: Students are

- Able to distinguish between Banach space and Hilbert space
- Able to understand the concept of linear functional leading to the projections on Banach space
- Able to verify whether a Banach space can be a Hilbert space by defining inner product
- Able to distinguish between projection of Banach space and Hilbert space

Course Objectives:

This course deals with introduction to Banach space by defining norm on a linear space and continues with study of Hilbert space by defining inner product.

M304T: Linear Algebra

Course Outcome:

- This course provides a platform for the students to know and learn Linear algebra in detail in terms of various concepts starting from vector space to Bilinear forms.
- Various new terms and definitions are introduced like rank of the transformation, mapping between vector spaces, dual, representation of vectors in the matrix form, characteristic polynomials, canonical forms, inner product spaces, orthogonalization, orthonormalization of matrix is been introduced.
- Quadratic forms is taught for optimization techniques to find the maxima, minima and saddle points in the matrix.
- SVD is been introduced which has a large application in the recent times in Digital Signal Processing, image recognition, pattern identification etc.

Learning Outcome: Students

- will be able to understand the concept of vectors, vector spaces in both 2D and 3D, operations on vectors , linear combination , dependence , independence and linear transformation of vectors.
- They also learn about polynomials being minimal, irreducible and transformations being regular, singular. Studying Cayley Hamilton theorem enables them to understand the system of equations in the matrix form and the triangular form of the matrix in terms of system of linear equations. Also symmetric and non symmetric matrices and its properties are learnt in detail. The concept of basis in terms of coordinate matrix is introduced where the students learn to work on change in basis with respect to coordinate system. Invariant subspaces are introduced, problems with respect to matrix diagonalizability are learnt.
- Various canonical forms like Rational canonical forms, Jordan canonical forms with respect to minimal polynomials and characteristic equations are been taught and its matrix representation in the form of Jordan blocks will b learnt as an outcome , nilpotent transformations and inverse transformations are also learnt.
- Inner product spaces , Orthogonal complements, diagonalization of matrices is been learnt along with Gram Schmidt orthonomalization process of 3*3 matrices.
- They learn about Quadratic forms, its representation kinds of quadratic forms and optimization techniques to find the maxima, minima and saddle points in a 3*3 matrix or a quadratic form.
- A new method to diagonalize a non square matrix called Singular value decomposition (SVD) method is taught (where both square and non square matrix is diagonalized).
- As a last part of the course they learn about various bilinear forms like symmetric and skew symmetric forms, rank , signature of a matrix and Sylvester's law of inertia with respect to rank and signature is learnt.

Course Objectives:

In the linear algebra course the student with have a clear understanding of vectors, vector space, dimension, rank, transformations, matrix representation, range, rank of the transformation, Null space, Kernels, Basis, coordinate system, dual space, Eigen values, eigen vectors, characteristic equation/roots. They will also be able to diagonalize a matrix, learn various canonical forms like Jordan, rational connonical forms and transformations like nilpotent are learnt. They learn SVD and its application which is used in many of the research articles in recent times for digital processing of signals, image detection, face recognition algorithms, finger print techniques where the data entered are converted into a matrix form and the required operation is performed for the required outcome.

M305T: Numerical Analysis – II

Course Outcome:

- Initial value problems can be solved by various numerical methods and analyze their errors and stability
- Second order differential equations are discussed using finite difference method, shooting method and cubic spline method
- Laplace's, Poisson, one dimensional heat and one dimensional wave equations can be solved by explicit and implicit difference method and analyze their stability conditions

Learning Outcome: Students

- Develop skills to analyze and solve numerically by Euler's method, Runge-Kutta method and predictor-corrector methods and compare with analytic solution and draw the reasonable conclusion
- Can apply the theoretical knowledge and problem solving skills to solve partial differential equations by finite difference methods and compare with analytic solution and draw reasonable conclusion
- Can explore their theoretical and experimental knowledge for computer calculations

Course Objectives:

This course mainly focuses on the numerical solution of first order differential equation with initial conditions, numerical solution of second order differential equations with boundary conditions and numerical solution of partial differential equations by various methods. In each method, convergence, error and stability conditions are discussed.

M306P: Scilab practicals based on Numerical Analysis – II

Course Outcome:

- Writing of Scilab programs for the numerical methods studied in the theory paper Numerical Analysis – II is studied

Learning Outcome: Students

- Are able to write programs for various numerical methods studied in the theory paper Numerical Analysis – II using Scilab

Course Objectives:

The concepts of various numerical methods studied in the theory is applied to write programs in Scilab.

M401T: Measure and Integration

Course Outcome:

- Generalization of length of an interval on a real line is studied as a Lebesgue measure of a set
- Concepts of measurability for continuous functions which is used to define Lebesgue integral
- Concepts of convergence and Lebesgue integral are studied

Learning Outcome: Students are

- Able to distinguish between the length of an interval and measure of a set
- Able to distinguish between Riemann integral and Lebesgue integral
- Able to understand several convergence theorem on a measurable set

Course Objectives:

This course deals with the introduction to the theory of measure and integration. Further differentiable measurable functions and integrability of these functions are studied.

M402T: Mathematical Methods

Course Outcome:

- Techniques of integral transforms and types of integral transforms provide a critical thinking and analytical abilities to solve ordinary differential equations partial differential equations
- Notion of solution and integral equations by various methods motivates to analyze the problems, evaluate and draw the reasonable solution
- Theoretical knowledge of asymptotic expansions and its techniques will train to evaluate the integrals, where analytical solutions are difficult or impossible
- Concepts of perturbation methods leads to the solution of first and second order differential equations involving constant and variable coefficients, which gives an exploration to the research field.

Learning Outcome: Students

- Learn different techniques of integral transforms and develop skills to solve ordinary differential equations partial differential equations
- Able to understand and have mathematical abilities to reduce the initial value problems, boundary value problems and eigen value problems to integral equations
- Acquire theoretical knowledge of perturbation techniques to the solution of first and second order differential equations involving constant and variable coefficients
- Able to express the integral in terms of asymptotic series or find the leading order term of integral using asymptotic expansion techniques

Course Objectives:

This course begin with general definition of integral transforms, its types and the solution of integral equations by various methods. Further different techniques of asymptotic expansions are applied to evaluate the integrals, where the analytical solutions are difficult or impossible. Finally, regular and singular perturbation methods are discussed to solve first and second order differential equations involving constant and variable coefficients.

M403T B: Special Functions

Course Outcome:

- Concepts of hypergeometric series and several transformation formulas are dealt with
- As an extension to hypergeometric series the concept of basic hypergeometric series are studied analogously.
- Derivation of Jacobi triple product identity, Quintuple product identity are studied
- Introduction to Ramanujan's general theta function and several results of Ramanujan are studied
- Concepts of partition of a positive integer are introduced at the basic level

Learning Outcome: Students

- Study several transformation formulas of hypergeometric series and its analogues results in basic hypergeometric series
- Are able to understand the elementary results of Ramanujan's general theta function
- Are able to find the generating function for partition function and are able to prove Euler's pentagonal number theorem combinatorially
- Are motivated towards the works of Ramanujan for their research career

Course Objectives:

This course deals with introduction to hypergeometric series and basic hypergeometric series. Further introduction to Ramanujan's general theta function which leads to a proof of Euler's pentagonal number theorem. Finally, introduction to theory of partition is being studied.

M403T – D : Entire and Meromorphic functions

Course Outcome:

- Notion of maximum modulus leads to define the order and type of an entire function and exponent of convergence of zeros of an entire function motivates to prove the Picard's and Borel's theorem for entire functions
- Concept of asymptotic values provide a connection between asymptotic and various exceptional values

- Nevanlinna's characteristic function plays an cardinal role in the theory of meromorphic functions which leads to several important results
- Theoretical knowledge of deficient values leads to some fundamental inequalities

Learning Outcome: Students

- Can be able to find the order and type of an entire function
- Are able to understand the connection between asymptotic values and various exceptional values
- Are able to find the characteristic function of meromorphic function
- Are able to distinguish between deficient values and exceptional values

Course Objectives:

This course begins with study of entire functions, its basic properties, exponent of convergence of zeros of an entire function which leads to several significant results. Characteristic function and Nevanlinna's second fundamental theorem plays remarkable role in the study of meromorphic function. Further, the deficient values and relation between various exceptional values are discussed. In this direction, some applications of Nevanlinna's second fundamental theorem is also discussed

M403T – G: Graph Theory

Course Outcome:

- This course enables the student to know and learn graph theory in detail
- It covers major topics like connectivity, planarity, colorability, Matchings and factorization, Domination and Directed Graphs.

Learning Outcome: Students

- Learns about the concept of connectivity with respect to its applications in Network theory in terms of vertex connectivity, edge connectivity, Mengers theorems, and conectedness with repect to n vertex graphs.
- In planarity the concept of embedding in plane is been taught. They also learn about planarity of graphs , non planar graphs , its charactrization of graphs , crossing number and its dual.
- The concept of colorability, which is related to map coloring is been dealt in terms of vertex and edge coloring. Chromatic number, chromatic polynomial, with respect o edges and vertices are been taught. The first theorem on colorings viz., the four color theorem and its improvisation , five color theorem is been learnt.
- In the concept of matchings they learn about the real world problems in terms of personnel assignment problem and marriage problem. They also learn 1 factors, 2 factors , perfect matching and saturated matching. The Havel Hakimi algorithm with respect to degree sequence of graph being reliazable or not is also been learnt.

- In domination, the concept of minimum domination number, dominating set, domatic number, of few standard graphs are also been learnt.
- In directed graphs, the concept of orientations, in degree, out degree, few standard theorems on digraphs , tournaments , cycles and strong and weak digraphs are also learnt .

Course Objectives:

This course enables the student to learn the various applications of graph theory in day to day life and also learn the subject in depth which helps them to pursue research in the field of graph theory.

M404P: Latex and Beamer Latex Practicals

Course Outcome:

- Concepts of creating documents and presentations using Latex software with different editors are introduced.

Learning Outcome: Students

- Are able to create different documents and presentations using Latex

Course Objectives:

This course deals with writing the programs for creating different types documents and presentations in Latex