



GOVT. V.Y.T. PG AUTONOMOUS COLLEGE DURG

Department of Mathematics Teaching Plan Academic Year – 2023-24



Name of the Teacher :- **NIDHI SHARMA**

Class : **M.Sc. I Sem.**

Paper- V

Title – Advanced Discrete Mathematics (I)

Month	Unit/ Title	Topic of lectures	No. of lecture	Method/Mode of Delivery
August	I	Formal Logic-Statements. Symbolic representation and Tautologies. Quantifiers. Predicates and Validity. Propositional Logic. Semigroups & Monoids-Definitions and Examples of Semigroups and monoids (including those pertaining to concatenation operation). Homomorphism of Semigroups and monoids.	9	<ol style="list-style-type: none"> 1. Flip the class 2. Group discussion 3. Problem Solving 4. Virtual Classes
September	I & II	Congruence relation and Quotient Semigroups. Subsemigroup and submonoids. Direct Products. Basic Homomorphism Theorem. Lattices-Lattices as partially ordered sets- their properties. Lattices as Algebraic Systems. Sublattices. Direct products and Homomorphisms. Some special Lattices e.g., Complete, Complemented and Distributive Lattices.	22	
October	III	Boolean Algebras. Boolean Algebras as Lattices. Various Boolean Identities. The Switching Algebra example. Subalgebras. Direct Products and Homomorphisms. Join-Irreducible elements. Atoms and Minterms. Boolean Forms and Their Equivalence. Minterm Boolean Forms. Sum of Products Canonical Forms. Minimization of Boolean Functions. Applications of Boolean Algebra to Switching Theory (using AND, OR & NOT gates).	15	
November	III & IV	The Karnaugh Map Method. Grammars and Languages-Phrase-structure Grammars. Rewriting rules. Derivations. Sentential forms. Language generated by a Grammar. Regular, Context-Free and Context Sensitive Grammars and Languages. Regular sets.	17	
December	IV	Regular expressions and the Pumping Lemma. Kleene's theorem. Notions of Syntax Analysis. Polish Notations. Conversion of Infix Expressions to Polish Notation. The Reverse Polish Notations.	17	

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Department of Mathematics Teaching Plan Academic Year – 2023-24



Name of the Teacher :- **NIDHI SHARMA**

Class : **M.Sc. II Sem.**

Paper- V

Title – Advanced Discrete Mathematics (II)

Month	Unit/Title	Topic of lectures	No. of lecture	Method/Mode of Delivery
January	Unit-I	Graph Theory- Definition of (Undirected) Graphs. Paths. Circuits. Cycles and Subgraphs. Induced Subgraphs. Degree of a vertex. Connectivity. Planar Graphs and Properties, Trees. Euler's Formula for connected planar Graphs, Complete & Complete Bipartite Graphs, Kuratowski's Theorem (statement only) and its use.	12	<ol style="list-style-type: none"> 1. Flip the class 2. Group discussion 3. Problem Solving 4. Virtual Classes
February	Unit-I & II	Spanning Trees, Cut-sets, Fundamental Cut -sets, and Cycle. Minimal Spanning Trees and Kruskal's Algorithm. Matrix Representations of Graphs. Euler's Theorem on the Existence of Eulerian Paths and Circuits. Directed Graphs. In degree and out degree of a Vertex. Weighted undirected Graphs. Dijkstra's Algorithm. Strong Connectivity and Warshall's Algorithm.	22	
March	Unit II & III	Directed Trees. Search Trees. Tree Traversals. Introductory Computability Theory--Finite State Machines and their Transition Table Diagrams. Equivalence of finite State Machines. Reduced Machines. Homomorphism. Finite Automata. Acceptors.	26	
April	UnitIV	Non-deterministic Finite Automata and equivalence of its power to that of Deterministic Finite Automata. Moore and mealy Machines. Turing Machine and Partial Recursive Functions.	24	

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Name :- NIDHI SHARMA

Class :B.Sc. I SEM

Paper- DSC

Title- CALCULUS

Month	Unit/ Title	Topic of lectures	No. of lecture	Method/Mode of Delivery
August September	I/II	Differentiability and its geometrical interpretation; Rolle's theorem, Lagrange's mean value theorem, cauchy's mean value theorem and their geometrical interpretation, Darbox's theorem. Successive differentiation and Lebnitz theorem, Maclaurin's and taylor's theorem for expansion of function	19	1.Flip the class 2.Group discussion
October	II/III	Taylor's theorem in finite form with lagrange, Cauchy and Roche-Schlomilch forms of remainder. Curvature; Aymptotes of general algebraic curves, parallel Asymptotes, asymptotes parallel to axes. Point of inflection, tangent at origin, multiple points	20	3.Problem Solving
November	III/IV	Position and nature of double points, tracing of cartesian , polar and parametric curves. Limit, continuity and first order partial derivatives, higher order partial derivatives, change of variable, Euler's theorem for homogeneous functions .Taylor's theorem ,total differentiation and jacobian	22	4.Virtual Classes
December	V	Double integration and rectangular and non rectangular regions , Double integrals in polar coordinates, Tripal integral over a parallelepiped and solid regions ,volume by tripal integrals .		

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NAME :-NIDHI SHARMA

CLASS :B.SC. II SEM

PAPER- DSC

TITLE- DIFFERENTIAL EQUATION

Month	Unit/ Title	Topic of lectures	No. of lecture	Method/Mode of Delivery
JANUARY	I	Basic Concept and genesis of ordinary differential equations, order and degree of a differential equation, differential equation of first order and first degree.	19	1.Flip the class
FEBRUARY	I/II	Equations in which variables are separable, homogeneous equations, linear differential equations and equations reducible to linear form. Statement of existence and uniqueness theorem for linear differential equations, general theory of linear differential equations of second order with variable coefficients, solution of homogeneous linear ordinary differential equations of second order with constant coefficients.	20	2.Group discussion 3.Problem Solving 4.Virtual Classes
MARCH	III/IV	linearly dependent and linearly independent solutions on an Interval, Wronskian and its properties, concept of a general solution of a linear differential equation. Power series method, Bessel's equation, Bessel's function and their properties, Recurrence relations.	22	
APRIL	V	Simple harmonic motion, Velocities and acceleration along radial and transverse direction		

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Name :- NIDHI SHARMA

Class :B.Sc. III SEM

Paper- DSC

Title-ABSTRACT ALGEBRA

Month	Unit/ Title	Topic of lectures	No. of lecture	Method/Mode of Delivery
August September	I/II	Definition and examples of groups, Elementary Properties of groups, Symmetric group, Abelian Group, The Dihedral groups. Modulo, its properties and examples. Subgroups and examples of subgroups, Centralizer, Normalizer, Center of a group, Product of two subgroups.	22	1.Flip the class 2.Group discussion
October	III	Cyclic groups, Properties of Cyclic groups, Normal subgroups, Cosets, Properties of Cosets, Factor groups, Lagrange's theorem.	20	3.Problem Solving
November	IV	Permutation groups, Cycle notation for permutations, Properties of Permutations, Even and odd Permutations, alternating groups. Group homomorphisms, Properties of homomorphisms	25	4.Virtual Classes
December	V	Kernel of homomorphism, Group isomorphisms, Cayley's theorem, Properties of isomorphisms, First, Second and Third isomorphism theorem for groups.		

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Department of Mathematics Teaching Plan Academic Year – 2023-24



Name :- NIDHI SHARMA

Class :B.Sc. IV SEM

Paper- DSC

Title- REAL ANALYSIS

Month	Unit/ Title	Topic of lectures	No. of lecture	Method/Mode of Delivery
JANUARY	I	Algebraic and order properties of Absolute value of a real number; Bounded above and bounded below sets, Supremum and infimum of a nonempty subset of Real number.	19	1.Flip the class
FEBRUARY	II/III	The completeness property of \mathbb{R} , Archimedean property, Density of rational numbers in Definition and types of intervals, Nested intervals property; Neighborhood of a point in \mathbb{R} , Open and closed sets in real number. Convergent sequence, Limit of a sequence, Bounded sequence.	20	2.Group discussion
MARCH	III/I V	Limit theorems, Monotone sequences, Monotone convergence theorem, Subsequences, Bolzano-Weierstrass theorem for sequences, Limit superior and limit inferior for bounded sequence, Cauchy sequence, Cauchy's convergence criterion. Convergence and divergence of infinite series of real numbers, Necessary condition for convergence, Cauchy criterion for convergence; Tests for convergence of positive term series: Integral test,	29	3.Problem Solving
APRIL	V	Basic comparison test, Limit comparison test, D'Alembert's ratio test, Cauchy's n th root test. Alternating series, Leibniz test, Absolute and conditional convergence, Abel's test, Dirichlet test, Test for absolute Convergence.		4.Virtual Classes

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Academic Year – 2023-24



NAME- NIDHI SHARMA

CLASS – B.SC. III YEAR

PAPER- I

TITLE - ANALYSIS

Month	Unit/ Title	Topic of lectures	No. of lecture	Method/ Mode of Delivery
August	I	Construction of real numbers as the completion of the incomplete metric space of rationals. Real numbers as a complete ordered field. Definition and examples of metric spaces.	17	1. Flip the class 2. Group discussion 3. Problem Solving 4. Virtual Classes
September	I	Neighborhoods. Limit points. Interior points. Open and closed sets. Closure and interior. Boundary points. Sub- Space of a metric space. Cauchy sequences. Completeness. Cantor's intersection theorem. Contraction principle.	13	
October	II	Dense subsets. Baire Category theorem. Separable space, second countable and first countable spaces. Continuous functions. Extension theorem. Uniform continuity. Isometric and homeomorphism. Equivalent metrics. Compactness.	12	
November	II	Sequential compactness. Totally bounded spaces. Finite intersection property. Continuous functions and compact sets. Connectedness. Components. Continuous functions and connected sets	11	
December	III	Complex numbers as ordered pair. Geometric representation of Complex numbers. Stereographic projection. Continuity and differentiability of complex functions. Analytic functions. Cauchy- Riemann equations. Harmonic functions. Elementary functions. Mapping by elementary functions. Mobius transformations. Fixed point. Cross ratio. Inverse points and critical mappings. Conformal mappings.	12	
January	IV	Riemann integral. Integrability of continuous and monotonic functions. The fundamental Theorem of integral calculus. Mean value theorems of integral calculus. Improper integrals and their convergence, comparison tests, Abel's and Dirichlet's tests. Frullani's integral. Integral as a function of a parameter. Continuity, derivability and integrability of an integral of a function of a parameter.	11	
February	V	Series of arbitrary terms. Convergence, divergence and oscillation. Abel's and Dirichlet's test. Multiplication of series. Double series. Partial derivation and differentiability of real valued functions of two variables.	12	
March	V	Schwarz and Youngs theorem. Implicit function theorem. Fourier series. Fourier expansion of piece wise monotonic function.	11	

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