***P. G. Department of Mathematics***

**FYUGP (Mathematics Minor)**

**Syllabus Distribution**

***SEMESTER - I***

**MN1A:**

**Dr. B. P. Singh**

Unit I: **Functions and Limits:** Definition of functions and their properties, Limits of functions and their properties, Continuity of functions.

Unit II: **Differential calculus:** Differentiability of a real valued function, Geometrical interpretation of differentiability, Rules of differentiation, Chain rule of differentiation, Mean value theorem and its applications, Successive differentiation, Leibnitz’s theorem.

**Prof. Yashmin Banu:**

Unit III: **Integration**: Antiderivatives, Indefinite and definite integrals, Riemann sums and the definite integral, Fundamental theorem of calculus, Properties of definite integrals, Integration Techniques.

Unit IV: **Integral Calculus:** Integration of rational and irrational functions, Reduction formula, Computing of definite integral, Curve tracing, Length of curve, Computing of double and triple integrals, Area and Volume of surface of revolution

***SEMESTER - II***

**MN1B:**

**Dr. B. P. Singh**

Unit I: **Relation:** Reflexive, Symmetric, Antisymmetric & transitive relation, Partition, Equivalence relation, Congruence Modulo Relation, Induced relation, Fundamental theorem.

Unit II: **Partial Order Relation:** Partial Order Set, $l.u.b.$ & $g.l.b,$ $inf.$, $sup.$, maximal & minimal element. Definition & examples of Lattice, Zorn’s lemma

**Prof. Yashmin Banu:**

Unit III: **Logic:** Introduction, propositions, truth table, negation, conjunction and disjunction. Implications, biconditional propositions, converse, contra positive and inverse propositions, and precedence of logical operators.

Unit IV: **Propositional equivalence:** Logical equivalences. Predicates and quantifiers: Introduction, Quantifiers, Binding variables and Negations. Validity of argument by different methods.

***SEMESTER - III***

**MN2A:**

**Dr. B. P. Singh**

Unit I: **Real Number System**

Axioms in ℝ, Absolute value of a real number; Bounds of a sets, Supremum and infimum of a nonempty subset of ℝ, The completeness property of ℝ, Archimedean property, Definition and types of intervals, Neighborhood of a point in ℝ, Open, closed and perfect sets in ℝ

Unit II: **Sequences of Real Numbers:**

Convergent sequence, Limit of a sequence, Bounded sequence, Limit theorems, Monotone sequences, Weierstrass’ theorem for−sequences, Monotone convergence theorem, Subsequences, Bolzano sequences, Limit superior and limit inferior of a sequence of real numbers, Cauchy sequence, Cauchy’s first theorem on limit, Cauchy’s convergence criterion. Completeness property of set of real number.

**Prof. Yashmin Banu:**

Unit III: **Infinite Series**

Convergence and divergence of infinite series of positive real numbers, Necessary condition for convergence, Cauchy criterion for convergence; Tests for convergence of positive term series; Basic comparison test, Limit comparison test, D’Alembert’s ratio test, Raabe’s test, Logarithmic test, Cauchy’s condensation Test, De Morgan & Bertrand’s test.

Unit IV: **Alternating series**: Alternating series, Leibniz test, Absolute and conditional convergence. Properties of absolutely convergent series.

***SEMESTER - IV***

**MN2B:**

**Dr. B. P. Singh**

Unit I: **Logic:**  Boolean algebra, Boolean expression, application to switching circuits.

Unit II: **Graph Theory:**

Basic Terminology, Walks, paths, circuits, connectedness, Handshaking Lemma, Isomorphism, Sub graphs, Reach ability, Union and Interaction of Graphs. Euler Graph, Shortest path problem, Hamiltonian graph, Traveling Salesman Problem, Bipartite graphs.

**Prof. Yashmin Banu:**

Unit III: **Trees:** Introduction to trees, Rooted trees, path length in rooted trees, spanning trees, Fundamental circuits, spanning trees of a weighted graph, cut sets and cut vertices, Fundamental cut set, Minimum spanning tree.

Unit IV: **Directed Graph:**

Directed graphs and connectedness, directed trees, Matrix representation of a graph, Planar graphs: Combinational and Geometric Duals, Kuratowski's graphs, Detection of planarity, 5 colour problem.