

M.Phil. (Mathematics) SYLLABUS

1. Algebra

Part – A: Symmetric groups, alternative groups, Simple groups, Conjugate elements, Class equations of finite groups, Sylow theorems, Solvable groups, Jordan Holder theorems, nilpotent groups, direct product, structure theorems of finite abelian groups, Rings, Maximal ideals, Prime ideals, Integral domains, Euclidean domains, Principal ideals domains, Polynomial rings, Modules and isomorphism theorems, Injective and Projective modules and Krull-Schmidt theorem.

Part – B: Vector space, Basis and dimensions, linear transformations, Dual spaces rank of linear transformation and matrices, Bilinear forms, Quadratic forms, characteristic roots and vectors, Cayley-Hamilton theorem, invariant subspaces, algebra of linear transformation, Reduction of matrices to canonical forms, inner-product spaces and orthogonality, Quotient fields, finite fields, characteristic of a field, Elements of Galois theory, Solvability by radicals, Ruler and compass construction.

Books:

1. T. Lam: Lectures of Modules and Rings
2. I. Herstein: Topics in Algebra
3. P. Bhattacharya, S. Jain and Nagpaul: Basic Abstract Algebra (2nd Edition)
4. N. Jacobson: Lectures in Abstract Algebra
5. S. Singh and Q. Jameeruddin: Modern Algebra
6. S. Sharma: Modern Algebra
7. Anderson and Fuller: Rings and Categories of Modules, 2nd Edition (Springer- Verlag)

2. Functional Analysis

Part – A: Normed linear spaces, Banach spaces, Series in normed spaces, Function spaces, sequence space, L_p -space, Completion of L_p , Holder and Minkowsky inequalities, Uniform boundedness principle, Banach-Steinhaus Theorem, Open mappings and closed graph theorems, Hahn-Banach extension theorem and their applications.

Part – B: Inner product spaces, Hilbert spaces, Orthonormal sets, Bessel's inequality, Complete orthonormal sets and Parseval's identity, structure of Hilbert spaces, projection theorem, Riesz representation theorem, adjoint of an operator on Hilbert spaces, Reflexivity of Hilbert spaces, Self-adjoint operators, Positive, Projection normal and unitary operators, The generalized Lax-Milgram Theorem.

Books:

1. B. Kreyszig: Functional Analysis
2. I.J. Maddox: Elements of Functional Analysis

3. Discrete Mathematics

Partially ordered sets, Lattices, Complete lattices, Distributive lattices, Complement, Boolean Algebra, Boolean Expressions, Applications to switching circuits, Elements of graph Theory, Eulerian and Hamiltonian graphs, Planer Graphs, Discrete Graphs, Trees, Permutation and Combinations, Pigenhole principle of inclusion and Exclusion, Derangements.

Books:

1. J. P. Trembley and R. Manohar: Discrete Mathematical Structure with Applications to Computer Science, McGraw-Hill Book Co., 1997.
2. J. I. Gersting: Mathematical Structures of Computer Science (3rd Edition), Computer Science Press, New York.
3. Seymour Lipschutz: Finite Mathematics (International Edition 1983), McGraw-Hill Book Co., New York.
4. S. Wutala: Discrete Mathematics A United Approach, McGraw-Hill Book Company.
5. G. L. Lin: Elements of Discrete Mathematics, McGraw-Hill Book Company.

4. Mathematical Programming

Part – A: Feasible, Basic feasible and optimal solutions, Extreme points, Some basic properties of convex sets, convex and concave functions, Simple method, Big-M Method, Two Phase method, Degeneracy, Alternative optima, unbounded and infeasible solutions, Definition of dual problem, Relationship between the optimal primal and dual solutions, Economic Interpretation of Duality, Dual Simplex Method, Primal – Dual Computations.

Part – B: Formulation of Transportation Problem (T.P.), Special features of T.P., Methods of selection of an initial basic feasible solution to a T.P., Optimal solution of T.P., Formulation of Assignment Problem (A.P.) and Hungarian method of solution, Optimal solution of Two- person, zero sum games, Solution of Mixed strategy games.

Books:

1. H.A. Taha: Operation Research – An Introduction, Macmillan Publishing Co. Inc., New York.
2. S.C. Rao: Optimization Theory and Applications, Wiley Eastern Ltd., New Delhi.