Department of Mathematics
Faculty of Sciences, Jamia Millia Islamia

B. Sc. (Hons.) Applied Mathematics
Course Structure and Syllabus (w. e. f. 2024-25)

Semester – III

Category	Code	Title of Paper	Credits
Major	24MATC203	Real Analysis	4
Major	24MATC204	Group Theory	4
		Total Credits	**8**

24MATC203 Real Analysis

Unit-I Bounded and unbounded sets, Infimum, supremum of a set and properties, Order completeness property of R, Archimedian property of R, Neighbourhoods, Open sets, Interior points, limit points of a set, Closed sets and related results. Derived sets, Closure of a set, Bolzano-Weierstrass theorem for sets

Unit-II Sequence of real numbers, Bounded sequences, Convergent and divergent sequences, Subsequences, limit points of a sequence, Bolzano Weierstrass theorem for sequences, Limit inferior and limit superior, Algebra of sequences, Monotone sequences, Monotone Convergence Theorem, Cauchy's sequence, Cauchy's general principal of convergence, Cauchy's first & second theorems on limits of sequences

Unit-III Infinite series: convergence and divergence, Cauchy's criterion for convergence of a series, Test for convergence of positive term series, Comparison tests, Ratio test, Cauchy's nth root test, Raabe's test, Alternating series, Leibnitz test, Absolute and conditional convergence

Unit-IV Continuous functions: $\epsilon - \delta$ approach, Sequential criterion for continuity, Theorems on continuity, Uniform continuity, Relation between continuity and uniform continuity, Derivative, Increasing and decreasing functions, Darboux theorem.

Books Recommended

1. R. G. Bartle and D. R. Sherbeer Introduction to Real Analysis (3rd Edition), John Wiley and Sons (Asia) Pvt. Ltd., Singapore, 2003
2. S. C. Malik and S. Arora Mathematical Analysis, New Age International (P) Ltd. Publishers, 2009
3. S. R. Ghorpade and B. V. Limaye: A course in Calculus and Real Analysis, Undergraduate Text in Maths. Springer (SIE), Indian reprint 2006
4. T. M. Apostol: Mathematica. Analysis, Addison-Wesley Series in Mathematics, 1974

24MATC204 Group Theory

Unit-I Sets, Relations, Functions, and binary operations (Review), Groups with examples and their properties, Subgroups, Cosets, Lagrange's theorem and its consequences, Order of an element of a group, Cyclic groups, Normal subgroups, Factor groups.

Unit-II Group homomorphism, Kernel of a homomorphism, The homomorphism theorems, Isomorphisms, The isomorphism theorems, Permutation groups, Even and odd permutations, Alternating groups, Cayley's theorem, and regular permutation group.

Unit-III Automorphism, Inner automorphism, Automorphism group of finite and infinite cyclic groups, Conjugacy relation, Normalizer and Centre, External direct products, and internal direct products.

Unit-IV Class equation of a finite group and its applications, Structure of finite Abelian groups, Cauchy's theorem, Sylow's theorems and its consequences, Simple groups, and non-simplicity tests.

Books Recommended

1. Surjeet Singh and Q. Zameeruddin: Modern Algebra, Vikas Publ. House, New Delhi, 2002.
2. I.N.Herstein, Topics in Algebra, John Wiley & Sons, New York, 2006.
3. J. A. Gallian, Contemporary Abstract Algebra, Narosa Publishing House, New Delhi,1998.
4. N. S. Gopalakrishan: University Algebra, New Age Int. Publishers, New Delhi, 2015.
5. N. Jacobson: Basic Algebra Vol. I & II, W. H. Freeman and Company,New York 1974.
6. J. B. Fraleigh, A first Course in Abstract Algebra, Pearson Education Inc. Essex, 2002.