Syllabus for Admission to M.Sc. in Mathematics and Computing

Sequences and Series of Real Numbers: convergence of sequences, bounded and monotone sequences, Cauchy sequences, Bolzano-Weierstrass theorem, absolute convergence, tests of convergence for series comparison test, ratio test, root test, power series (of one real variable), radius and interval of convergence, term-wise differentiation and integration of power series.

Functions of One Real Variable: limit, continuity, intermediate value property, differentiation, Rolles Theorem, mean value theorem, L'Hospital rule, Taylor's theorem, Taylor series, maxima and minima, Riemann integration (definite integrals and their properties), fundamental theorem of calculus.

Functions of Two or Three Real Variables: limit, continuity, partial derivatives, total derivative, maxima and minima.

Integral Calculus: double and triple integrals, change of order of integration, calculating surface areas and volumes using double integrals, calculating volumes using triple integrals.

Differential Equations Bernoulli's equation, exact differential equations, integrating factors, orthogonal trajectories, homogeneous differential equations, method of separation of variables, linear differential equations of second order with constant coefficients, method of variation of parameters, Cauchy–Euler equation.

Matrices: systems of linear equations, rank, nullity, rank-nullity theorem, inverse, determinant, eigenvalues, eigenvectors.

Finite Dimensional Vector Spaces: linear independence of vectors, basis, dimension, linear transformations, matrix representation, range space, null space, rank-nullity theorem.

Groups: cyclic groups, abelian groups, non-abelian groups, permutation groups, normal subgroups, quotient groups, Lagrange's theorem for finite groups, group homomorphisms.