M.Sc. Mathematics (MA) Entrance Examination Syllabus. DTU-2019

Real Sequences and Series: Sequence& sub-sequences of real numbers, convergent & divergent sequences, bounded and monotone sequences, convergence criteria for sequences of real numbers, Cauchy sequences, Bolzano-Weierstrass theorem. Series of real numbers, tests of convergence for series of positive terms: – comparison test, ratio test, root test; Leibniz test for convergence of alternating series, absolute convergence.

Functions of Single Variable: Limit, continuity, intermediate value property, differentiation, Rolle's Theorem, mean value theorem, L'Hospital rule, Taylor's theorem, maxima and minima.

Functions of Multivariable: Limit, continuity, partial derivatives, differentiability, maxima andminima.

Integral Calculus: Definite integrals and their properties, fundamental theorem of calculus. Double and triple integrals, change of order of integration, evaluation of surface areas and volumes using double integrals, calculating volumes using triple integrals.

Ordinary Differential Equations: Ordinary differential equations of the first order of the form y'=f(x,y), Bernoulli's equation, exact differential equations, integrating factor, orthogonal trajectories, homogeneous differential equations, variable separable equations, linear differential equations of second order with constant coefficients, method of variation of parameters, Cauchy-Euler equation. Power series solution of differential equations, Frobenius method.

Vector Calculus: Scalar and vector fields, gradient, divergence, curl, line, surface and volume integrals, Green, Stokes and Gauss theorems.

Group Theory: Groups, subgroups, Abelian groups, cyclic groups, normal subgroups, Lagrange's Theorem for finite groups, group homomorphisms and basic concepts of quotient groups, non-Abelian groups, permutation groups.

Linear Algebra: Finite dimensional vector spaces, linear independence of vectors, basis, dimension, linear transformations, matrix representation, Rank and inverse of a matrix, determinant, solutions of systems of linear equations, consistency conditions, eigenvalues and eigenvectors for matrices, Cayley-Hamilton theorem.

Real Analysis: Finite, countable and uncountable sets, Real number system as a complete ordered field, Archimedean property, supremum, infimum, Interior points, limit points, open sets, closed sets, bounded sets, connected sets, compact sets.