

Syllabus for Mathematics Bachelor's

Section 1: Subject Knowledge

Please Note: A Total of 26 Questions will be asked, combining the following topics, with the difficulty level commensurate to a Bachelor's Candidate.

Unit I: Sequences and Series of Real Numbers

Sequence of real numbers, Convergence of sequence, Bounded and monotone sequences, Convergence criteria for sequences of real numbers, Cauchy sequences, Subsequences, Bolzano-Weierstrass theorem.

Unit II: Series of Real Numbers

Absolute convergence, Tests of convergence for series of positive terms, Comparison test, Ratio test, Root test, Leibniz test for convergence of alternating series.

Unit III: Integral Calculus

Integration as the inverse process of differentiation, Definite integrals and their properties, Fundamental theorem of calculus, Double and triple integrals, Change of order of integration, Calculating surface areas and volumes using double integrals, Calculating volumes using triple integrals.

Unit IV: Differential Equations

ODE of the first order of the form, Bernoulli's equation, Exact differential equations, IF, Orthogonal trajectories, Homogeneous differential equations, Variable separable equations, Linear differential equations of second order with constant coefficients, Variation of parameters, Cauchy-Euler equation.

Unit V: Vector Calculus

Scalar and vector fields, Gradient, Divergence, Curl, Line integrals, Surface integrals, Green's theorem, Stokes' theorem, Gauss' theorem.

Unit VI: Group Theory

Groups, Subgroups, Abelian groups, Non-Abelian groups, Cyclic groups, Permutation groups, Normal subgroups, Lagrange's Theorem for finite groups, Group homomorphisms, Basic concepts of quotient groups.

Unit VII: Linear Algebra

Finite dimensional vector spaces, Linear independence of vectors, Basis, Dimension, Linear transformations, Matrix representation, Range space, Null space, Rank-nullity theorem, Rank and inverse of a matrix, Determinant, Solutions linear equations system, Consistency conditions, Eigenvalues and eigenvectors, Cayley-Hamilton theorem.

Unit VIII: Real Analysis

Interior points, Limit points, Open sets, Closed sets, Bounded sets, Connected sets, Compact sets, Completeness of \mathbb{R} , Power series (of real variable), Taylor's series, Radius and interval of convergence, Term-wise differentiation and integration of power series.

Section 2: Fundamental Skills

Please Note: A Total of 28 Questions will be asked, combining the following topics, with the difficulty level commensurate to a Bachelor's Candidate.

Unit I: Data Analysis

Unit II: Math and Statistics

Unit III: Lab skills

Unit IV: Reading and Writing

Section 3: Specific Skill Proficiency

This section has more than 30 skills. You can select the ones you are proficient in from the enrollment form. You can choose a maximum of 2 skills. Each skill contains 10 questions.

