Syllabus (MA10001 Mathematics-I)

IIT Kharagpur

Functions of one variable

Rolle's theorem, Lagrange's mean value theorem, Cauchy's (generalized) mean value theorem and its applications; evaluation of indeterminate forms; Taylor's and Maclaurin's theorems.

Functions of several variables

Limit continuity, partial derivatives and their geometrical interpretation, total differential and differentiability. Derivatives of composite and implicit functions, derivatives of higher order and their commutatively; Euler's theorem on homogeneous functions, Taylor's expansion of functions, maxima and minima, constrained maximum/minimum problems using Lagrange's method of multipliers.

Differential equations

Introduction, formation of differential equation from a given n-parameters family of curve; solution using separation of variables, solution of homogeneous equations, First order differential equations - exact, integrating factors, linear and Bernoulli's equations, Higher order differential equations with constant coefficients, Cauchy-Euler equations, method of variation of parameters, system of differential equations

Complex variables

Limit, continuity, differentiability and analyticity of functions, Cauchy-Riemann equations, line integrals in complex plane, Cauchy's integral theorem, independence of path, Cauchy' s integral formula, Derivatives of analytic functions. Convergence of sequence and series of real numbers, power series, radius of convergence. Taylor's series, Laurent's series, zeros and singularities, residue theorem.

Text Books Recommended:

1. N. Piskunov: Differential Calculus and Integral Calculus – I
2. N. Piskunov: Differential Calculus, Integral Calculus – II
4. E. Kreyszig, Advanced Engineering Mathematics