

Syllabus

Summer Training programme

Linear Algebra

1. Vector spaces, subspaces, linear dependence, basis, dimension, algebra of linear transformations, algebra of matrices, rank and determinant of matrices, linear equations, Eigen values and Eigen vectors.
2. Matrix representation of linear transformation, change of basis, canonical forms, Inner product spaces, orthonormal basis, quadratic forms

Algebra

1. Basic group theory review-symmetric groups-Isomorphism theorems -Group actions-Sylow theorems
2. Field theory-algebraic and transcendental elements-degree of field extension-Finite fields-Finite extension
3. Rings-ideals-integral domains

Real Analysis

1. Metric spaces-Compactness-Connectedness-differentiability-mean value theorem-continuity and compactness-continuity and connectedness-Riemann Stieltjes integral.
2. Sequence and series of functions-uniform convergence-functions of several variables-directional derivative, partial derivatives.

Complex Analysis

1. Analytic functions, Cauchy-Riemann equations, Contour integral, Cauchy's theorem, Cauchy integral formula, Liouville's theorem
2. Meromorphic functions-classification of singularities, calculus of residues-Riemann mapping theorem-Harmonic functions

Topology

1. Topological spaces-subspaces-product spaces-continuous functions-homeomorphisms-connectedness-compactness.
2. Separable and second countable spaces-separation axioms
3. Introduction to manifolds on surfaces

Measure and Integration Theory

1. Lebesgue outer measure, Measurable sets, Measurable functions, Borel and Lebesgue Measurability.
2. Integration of non- negative functions, the general integral, Integration of series, Riemann and Lebesgue integrals.
3. Differentiation, Integration with respect to a measure, Measure spaces, Measurability in a product space