Syllabus: **MATHS** (Subject Code: P03)

Unit-I - Algebra

Groups – Examples – Cyclic Groups- Permulation Groups – Lagrange's theorem- Cosets – Normal groups - Homomorphism – Theorems – Cayley's theorem - Cauchy's Theorem - Sylow's theorem - Finitely Generated Abelian Groups – Rings- Euclidian Rings- Polynomial Rings- U.F.D. - Quotient - Fields of integral domains- Ideals- Maximal ideals - Vector Spaces - Linear independence and Bases - Dual spaces - Inner product spaces - Linear transformation – rank - Characteristic roots of matrices - Cayley Hamilton Theorem - Canonical form under equivalence – Fields - Characteristics of a field - Algebraic extensions - Roots of Polynomials - Splitting fields - Simple extensions – Elements of Galois theory- Finite fields.

Unit-II - Real Analysis

Cardinal numbers - Countable and uncountable cordinals - Cantor's diagonal process - Properties of real numbers - Order - Completeness of R-Lub property in R-Cauchy sequence - Maximum and minimum limits of sequences - Topology of R.Heine Borel - Bolzano Weierstrass - Compact if and only if closed and bounded - Connected subset of R-Lindelof's covering theorem - Continuous functions in relation to compact subsets and connected subsets- Uniformly continuous function – Derivatives - Left and right derivatives - Mean value theorem - Rolle's theorem- Taylor's theorem- L' Hospital's Rule - Riemann integral - Fundamental theorem of Calculus –Lebesgue measure and Lebesque integral on R'Lchesque integral of Bounded Measurable function - other sets of finite measure - Comparison of Riemann and Lebesque integrals - Monotone convergence theorem - Repeated integrals.

Unit-III - Fourier series and Fourier Integrals

Integration of Fourier series - Fejer's theorem on (C.1) summability at a point - Fejer's-Lebsque theorem on (C.1) summability almost everywhere – Riesz-Fisher theorem - Bessel's inequality and Parseval's theorem - Properties of Fourier co-efficients - Fourier transform in L (-D, D) - Fourier Integral theorem - Convolution theorem for Fourier transforms and Poisson summation formula.

Unit-IV - Differential Geometry

Curves in spaces - Serret-Frenet formulas - Locus of centers of curvature - Spherical curvature - Intrinsic equation – Helices - Spherical indicatrix surfaces – Envelope - Edge of regression - Developable surfaces associated to a curve - first and second fundamental forms - lines of curvature - Meusnieu's theorem - Gaussian curvature - Euler's theorem - Duplin's Indicatrix - Surface of revolution conjugate systems - Asymptritic lines - Isolmetric lines – Geodesics.

Unit-V - Operations Research

Linear programming - Simplex Computational procedure - Geometric interpretation of the simplex procedure - The revised simplex method - Duality problems - Degeneracy procedure - Peturbation techniques - integer programming - Transportation problem – Non-linear programming - The convex programming problem - Dyamic programming - Approximation in function space, successive approximations - Game theory - The maximum and minimum principle - Fundamental theory of games - queuing theory / single server and multi server models (M/G/I), (G/M/I), (G/G1/I) models, Erlang service distributions cost Model and optimization - Mathematical theory of inventory control - Feed back control in inventory management - Optional inventory policies in deterministic models - Storage models - Damtype models - Dams with discrete input and continuous output - Replacement theory - Deterministic Stochostic cases - Models for unbounded horizons and uncertain case - Markovian decision models in replacement theory - Reliability - Failure rates - System reliability - Reliability of growth models - Net

work analysis - Directed net work - Max flowmin cut theorem - CPM-PERT - Probabilistic condition and decisional network analysis.

Unit-VI - Functional Analysis

Banach Spaces - Definition and example - continuous linear transformations - Banach theorem - Natural embedding of X in X - Open mapping and closed graph theorem - Properties of conjugate of an operator - Hilbert spaces - Orthonormal bases - Conjugate space H - Adjoint of an operator - Projections- l^2 as a Hilbert space – l^p space - Holders and Minkowski inequalities - Matrices – Basic operations of matrices - Determinant of a matrix - Determinant and spectrum of an operator - Spectral theorem for operators on a finite dimensional Hilbert space - Regular and singular elements in a Banach Algebra – Topological divisor of zero - Spectrum of an element in a Branch algebra - the formula for the spectral radius radical and semi simplicity.

Unit-VII - Complex Analysis

Introduction to the concept of analytic function - limits and continuity - analytic functions - Polynomials and rational functions elementary theory of power series – Maclaurin's series - uniform convergence power series and Abel's limit theorem - Analytic functions as mapping - conformality arcs and closed curves - Analytical functions in regions - Conformal mapping - Linear transformations - the linear group, the cross ratio and symmetry - Complex integration - Fundamental theorems - line integrals - rectifiable arcs - line integrals as functions of arcs - Cauchy's theorem for a rectangle, Cauchy's theorem in a Circular disc, Cauchy's integal formula - The index of a point with respect to a closed curve, the integral formula - higher derivatives - Local properties of Analytic functions and removable singularities- Taylor's theorem - Zeros and Poles - the local mapping and the maximum modulus Principle.

Unit-VIII - Differential Equations

Linear differential equation - constant co-efficients - Existence of solutions – Wrongskian - independence of solutions - Initial value problems for second order equations - Integration in series - Bessel's equation - Legendre and Hermite Polynomials - elementary properties - Total differential equations - first order partial differential equation - Charpits method.

Unit-IX - Statistics - I

Statistical Method - Concepts of Statistical population and random sample - Collections and presentation of data - Measures of location and dispersion - Moments and shepherd correction – cumulate - Measures of skewness and Kurtosis - Curve fitting by least squares – Regression - Correlation and correlation ratio - rank correlation - Partial correlation - Multiple correlation coefficient - Probability Discrete - sample space, events - their union - intersection etc. - Probability classical relative frequency and axiomatic approaches - Probability in continuous probability space - conditional probability and independence - Basic laws of probability of combination of events - Baye's theorem - probability functions - Probability density functions - Distribution function - Mathematical Expectations - Marginal and conditional distribution - Conditional expectations.

Unit-X - Statistics-II

Probability distributions – Binomial, Poisson, Normal, Gama, Beta, Cauchy, Multinomial Hypergeometric, Negative Binomial - Chehychev's lemma (weak) law of large numbers - Central limit theorem for independent identical variates, Standard Errors - sampling distributions of t, F and Chi square - and their uses in tests of significance - Large sample tests for mean and proportions - Sample surveys - Sampling frame - sampling with equal probability with or without replacement - stratified sampling - Brief study of two stage systematic and cluster sampling methods - regression and ratio estimates - Design of experiments, principles of experimentation - Analysis of variance - Completely randomized block and latin square designs.