SYLLABUS FOR LECTURER 10+2 MATHEMATICS

REAL ANALYSIS

Resume of sequences, series and Riemann integration, continuity, uniform contijity. Fundamental theorem of integral calculus, classes of R-integrable functions. Functions of bounded variation. Riemann stieltjes integration. Cauchy's general principle of uniform convergence, uniform convergence and integration, uniform convergence and differentiation, weierstras theorem.

COMPLEX ANALYSIS

Complex numbers and functions. Cauchy integral formula, Liouvilles theorem, Taylor's and Laurent's theorems, classification of singularities. Removable singularities, Riemann's theorem, essential singularity, Weierstrass theorem on essential singularity. Calculus of residues, Cauley's residue theorem, Integration by the method of residues, evaluation of $\int e^{-x^2}dx$ by residue calculum. The argument Princiiple of Maximum Modulus theorem, for bounded regions.

GROUPS

Review of the product of two subgroups. Structure theorem for cyclic groups, automorphisms, inner automorphisms. Cauchy's and sylow's theorem for Abelian groups. Cayley's theorem. Simplicity of the alternating groups. Sylow's theorem and Cauchy's theorem. Finite Abelian groups, Fundamental theorem on finite Abelian groups. Composition series. The Jordan-Holder theorem for finite groups.

RINGS

Definition and examples of rings. Integral domains and fields Homomorphisms, Principal ideals, Prime ideals and maximal ideals, Fields of quotients of an integral domains, Polynomial rings, Einstien's criterion.

FIELDS

Prime fields and their structure. Extensions of fields. Algebraic numbers and algebraic extensions of a field. Normal extensions and fundamental theorem of Galois theory.

ADVANCED CALCULUS

Fourier series: Expansion of function f(x) in the interval (- ,). Fourier sine series and Fourier Cosine series of f(x) in (- ,). Fourier series of sine and cosine in any interval (-c, c)

DIFFERENTIAL EQUATIONS

An initial value problem, singular solutions, P-discriminant, C-discriminant. Equations of the second degree with variable coefficients. Total differential equation.

Pdx+Qdy+Rdz = O. Necessary and sufficient conditions that such a differential equation may be integrable.

Partial differential equation of the first order, Lagrange's linear equation Pp+Qq+R.
Charpits method.

DIFFERENTIAL GEOMETRY:

Curves with torsion, curvature, Frenet formulae, spherical curvature, spherical indicatrices, Involutes and evolutes. Bertrand curves. Envelopes of one and two parameter family of surfaces, Developable surfaces, Developable associated with a curve. Curvilinear coordinates. Fundamental magnitudes of first and second order, the two fundamental forms; curvature of normal section, Meunier's theorem, Euler's theorem, Dupin's indicatrix, Rodrigue's formulae. Conjugate systems. Asymptotic lines, Isometric lines, null lines. The Gauss characteristic equation, Minardi-Codazzi Relations. Geodesic curves in relation to Geodesies. Bonnet's theorem. Geodesic curvature.

TOPOLOGY

Metric spaces: Definition and examples, open sets, completeness, convergence, continuous mapping, completion of a metric space, Cantor's intersection theorem. Banach's contraction Principle.

TOPOLOGICAL SPACES

Definition and examples, Elementary properties, Kuratowski's axioms, continuous mappings and their characterisation. Bases and subbases, concept of first countability, second countability, separability, Tychnoffs theorem, competness, Lebasgue's covering lemma, continuous maps on compact spaces, Connectedness, local connectedness, their relationship. Urysohn's lemma., Urysohn's Metrization theorem. Separation axioms, one point compactification.

BANACH SPACES

Definition and examples, Quotient spaces, Dual of a normaed linear space. Duals of L, I, I I (P 1).
Hahn Banach Theorem.

HILBERT SPACES

Definition and examples, Cauchy-Schwarx inequality Bessel's inequality, orthonormal systems. Riesz representation theorem, inner product spaces, Adjoint of a Hilbert space, operators, Normal operators.

MEASURE THEORY

Lebesque outer measure, Lebesque measurable set, Measurable functions, algebra of measurable functions. Borel Measurability. Convergence in measure, almost uniform convergence and Egorov's theorem. Lebvesgue integration; Levesgue integral of non-negative measurable function. Fatou's lemma, Lebesgues Monotone convergence, Lebesgue's Dominated convergence theorem. Riemann and Lebesgue integrals. R-integrability of bounded functions. Lebesgue integrability of bounded functions. Lebesque integrability L^p - spaces. Fubim's theorem.

PRIME NUMBERS

Diophantine equations, solvability of linear Diophantive equations. Congruences, Fermat's theorem, Wilson's theorem, Primitive roots.

COMPLEX ANALYSIS

The maximum, modulus theorem. Schwarz lemma Hadamard's three circle theorem, Theorem of Borel and caratheodory, Theorem of Phragman lindelof. Power series, Hadamard formulla for the radius of convergence, a power series represents an analytic function within the circle of convergence. Handamard Pringsheim, theorem i.e. If $f(z) = \sum a_n z^n$ has radius of convergence equal to 1, and a_n is real with $\sum a_n z^n$ properly divergent; then z = 1 is a regularity. Rouch's theorem, the fundamental theorem of algebra. Morera"s theorm is Poissons integral formula for a circled and half plane, Poisson-jenson formula.

ENTIRE FUNCTIONS

Factorization of integral functions. The theorem of weierstrass. The order of an entire function. Hadareards factorization theorem, thenorder of a canonical product is equal to the exponent of convergence of its zeros. Order of the derived function. Pichard's theorem.

UNIFORM SPACES

Definition and examples, Uniform Topology; Uniformity and metrizability, complete regularity of uniform spaces, compactness in uniform spaces, uniform continuity, Homotopy theory; Brouwer's fixed point theorem.

BANACH ALGEBRA

Preliminaries on Banach Algebras, Invertible elements, the spectrum, spectral radius and a formula for the spectral radius, Gelfand-Mazur theorem, Gelfard mapping, Maximal ideal space and its characterisation, continuity of multiplicative functions on Banach Algebra. Gelfand-Naimark theorem. Ideals in CCX and application to stone-ceeh compactification. Spectral theorem for normal operators.

MODULES

Definitions, fundamental concepts, chain conditions, Noetherian rings, Prime and primary ideals, Sequencess theorms.

LATTICES

Partially ordered sets, Lattices, modular lattices, complemented modular lattice.

RING THEORY

Rings, Hilbert basis theorem for Noetherian rings, Matrix rings and their ideals. Direct sums of rings, Prime radical of a ring.

Random Variables, Mathematical Expectation, cheboyshev's Inequality. Conditional probability, Baye's Theorem; The correlation, coefficient; Independence.

Binomial, Gamma and Chi-square distributions. Bivariate Normal Distributions., The t and F distributions. The moment Generating Function Technique.

The central Limit Theorem, Point Estimation, The Rao-Blockwell Theorem.

Further topics in point estimation Maximum likelihood Estimation statistical Hypothesis; Examples and definition, Uniformly most powerful Tests; Likelihood Ratio Tests.

Sd/-
Secretary & COE
JK PSC