GIC- LECTURER SYLLABUS

Mathematics

Relation and functions :-

Types of relations :-

Reflexive, Symmetric, transitive and equivalence relations. Equivalence class. One-one and onto functions, composite of functions, inverse of a function, Binary operation.

Algebra :-

Matrices :-

Types of matrices, zero matrix, transpose of a matrix, symmetric and skew symmetric matrices. Addition, multiplication & scalar multiplication of matrices. Singular and non-singular matrices. Invertible matrices.

Determinants :-

Determinant of a square matrix (up to 3 × 3 matrix) Properties of determinants, Adjoint and inverse of a square matrix. Consistency and number of solutions of system of linear equations by examples. Solving system of linear equations in two or three variables having unique solutions. Theory of equations of degree greater than or equal to two. Arithmetical, Geometrical and Harmonical progressions. Permutations and combinations, Bionomical theorem. Sum of exponential and logarithmic series.

Prabability :-

Multiplication theorem on probability, Condition probability, Independent events , Total probability, Bayes theorem distribution.

Calculus :-

Limit of a function :-

Continuity & differentiability, derivative of composite functions, and differentiation of different types of functions. Chain rule, Rolle's theorem and Lagrange mean value theorem. Maclaurin's & Taylor's series. L. Hospitals rule, partial differentiation, successive differentiation, Leibnitz theorem, equation of tangent & normal to a given curve, Maxima, minima, increasing and decreasing functions.

Integration :-

Various methods of integration, definite integration as a limit of sum, Basic properties of definite integrals & evaluation of definite integrals. Application in finding the area under simple curves of spheres, cones & cylinders. definite integrals. Application in finding the area under simple curves of spheres, cones & cylinders.

Differential Equations :-

Order and degree of a differential equations. Formation of differential equations whose general solution is given. Solution of differential equations of Ist order & Ist degree. Linear differential equations with constant coefficients. Homogeneous differential equations.

Coordinate geometry of two dimensions :-

Equation of the pair of straight lines in homogeneous and non-homogeneous form. Conditions when homogeneous equation of 2- degree represents circle, parabola, ellipse &

hyperbola, Equation of tangents & normals to the above conics. Common tangents to the two conics, Pair of tangents. Chord of contacts, polar lines to the above conics.

Vectors and three dimensional geometry :-

Vectors :-

Vector & scalars. Unit vectors, Direction cosines/ ratios of a vector. Multiplication of a vector by scalar, dot product, cross product of vector and their in physics (work done & moments, angular velocity) , Projection of a vector on a line , Angle between two vector.

Three dimension Geometry :-

Direction cosine/ ratios of line joining two points, Cartesian and vector equation of a line. Coplanar and skew lines, shortest distance between two lines, Cartesian and vector equation of a plane. Angle between (a) two lines (b) two planes (c) A line and a plane. Distance of a point from a plane. Intersection of two line, Intersection of a line of plane & intersection of two plane. Equation of a plane passing through the intersection of two planes. Equation of a sphere, cones, cylinders.

Group Theory :-

Examples - specially the group of nth roots of unity, group of residue class modulo n and modulo p where p is a prime. Subgroups, Homomorphism and isomorphisms properties of Homomorphism. Subgroups generated by a subset. Order of element in a group, Cyclic group, Symmetric group S_n . Lagrange theorem, Fermat's theorem with application point of view. Normal subgroups, Fundamental theorem of Homomorphism, Endomorphism, automorphism, First Isomorphism theorem and second Isomorphism theorem.

Ring and Field :-

With simple examples as $(Z_n, +)$ & $(Z_p, +)$.

Linear Algebra :-

Vector space with examples, subspace, linear dependence and independence, Basis and dimension of a vector space, Quotient space, Sum and direct sum of spaces. Linear transformation, Kernel and image of a linear transformation, Rank and nullity of linear transformations, Rank nullity theorem, Composite of linear transformations and its rank & nullity. Singular and non-singular linear transformations, Transpose of a linear transformations, Matrix of a linear transformation. Vector differentiation: Gradient, divergence, curl, first order vector identities. Directional derivatives (with application point of view)

Vector Calculus :-

Line integral, surface integral, volume integral, Green's theorem, Gauss divergence theorem, Stokes's theorem, (From application point of view) Riemann integration: Integration of discontinuous functions, Lower and upper integrals of a bounded functions, Integration of a step function and signum function.

Statices :-

Equilibrium of a body under the action of three forces, coplanar forces, Equilibrium of a body under the action of a system of coplanar forces, Centre of gravity, common catenary Friction.

Dynamics :-

Motion of a projectile in vertical plane under gravity, work power and energy, Direct impact of smooth bodies, Radial and transverse velocity and acceleration, Tangential and normal acceleration.

Trigonometry :-

Trigonometric equations, Properties of triangles Inverse circular functions, Height and distance, Complex Numbers , D -Moivers theorem & its application , n^{th} roots of unity.