PG Department of Mathematics
Government Degree College, Baramulla

Semester: 3rd **Major/Minor**

Course Title: Theory of Matrices **Course Code: MAT322M**
Total Credits: 4+2 **Contact Hours:**

Theory credits-4

Unit-I

Basics of Matrices. Generalization of reversal law of transpose. Hermitian and skew-Hermitian matrices. Representation of a square matrix as P+iQ, where P is Hermition and Q is skew-Hermition. Adjoint of a matrix, For a square matrix A, A(adjA) = (adjA)A =|A|I. Commutative and associative laws in matrix operations. Necessary and sufficient condition for a square matrix to be invertible. Generalization of reversal law for the inverse of matrices under multiplication.

Unit-II

The operation of transposing and inverting are commutative, Trace of a matrix, trace of AB=trace of BA and its generalization. Matrix polynomials, Annhilating polynomials, Characteristic and minimal equations of a matrix. The minimal polynomial of a matrix divides every annihilating polynomial. Partitioning of matrices, Cayley Hamilton theorem, Eigen values and Eigen vectors. The Eigen values of Hermition/symmetric matrix are purely real.

Unit-III

Rank of a matrix. Elementary row (Column) transformations of a matrix do not alter its rank, Rank of a matrix by elementary transformations, reduction of a matrix to the normal form, Elementary matrices. Every non-singular matrix is a product of elementary matrices, employment of only row (column) transformations. Rank of product of two matrices. Linear combination, Linear dependence and linear independence of Row (Column) vectors, The columns of a matrix A are linearly dependent iff there exists a vector $X \neq 0$ such that AX=0. The columns of a matrix A of order $n \times n$ are linearly dependent iff rank of A< n. The matrix A has rank r if and only if it has r linearly independent columns (analogous results for rows). Augmented matrices.

Unit-IV

Linear homogeneous and non- homogeneous equations, The equation AX=0 has a non-zero solution if and only if rank of A < n, the number of its columns, The number of linearly independent solutions of the equation AX=0 is n-r, where r is the rank of matrix A of order n

× n, The equation AX=B is consistent if and only if two matrices A and [A: B] are of the same rank, Inner product of two vectors, length of a vector, normal vectors, Orthogonal and Unitary matrices, A matrix P is orthogonal (Unitary) if and only it its column vectors are normal and orthogonal in pairs.

Tutorials Credits-2

Unit-I

Symmetric and skew symmetric matrices. Problems based on Hermition and Skew-Hermitian and inverse of matrices. Problems on characteristic roots and characteristic polynomials. Applications of Cayley Hamilton theorem for the inverse of a matrix. Examples of Eigen values and Eigen vectors.

Unit-II

Determining rank of matrices using elementary transformations. System of equations and their solutions. Examples of determination of orthogonal matrices. Examples of system of homogenous and non-homogenous equation having unique, infinite and no solution.

TEXTBOOKS/ SUGGESTED READINGS:

1. A Text Book of Matrices, Aziz and Nisar, Kapoor Book Depot. Srinagar.
2. A textbook of Matrices, Shanti Narayan, S. Chand.
3. A. R. Vasishtha, A. K. Vasishtha, Matrices, Krishna's Educational Publisher.
4. Linear Algebra, K. Hoffman and R. Kunze, Pearson Education.
5. Linear Algebra, Schaum"s outline series, Tata McGraw-Hill.

SEMESTER – 1st to 3rd

MULTIDISCIPLINARY COURSE

MATHEMATICS / APPLIED MATHEMATICS

Course Title: Basic Course in Mathematics **Course Code: BMA22M102**

Credits: 03 (45 Hours)

Objectives: The aim of this course is to prepare the students for the following.

(1) To aware the students about set theory, real and complex numbers.
(2) To understand the basic concepts of coordinate geometry.
(3) To prepare the students for applying basic mathematics for computational purposes.

UNIT – I

Introduction to set theory: Sets, Types of sets, Subsets, Basic operations on sets, Power set, Finite set, Infinite set, Countable and Uncountable sets and their examples, Cartesian product, Basic operations, D'-Morgans laws, Relations, Equivalence relations, Partially ordered sets.

UNIT – II

Real number system, Rational and Irrational numbers, Closure property of reals, Complex numbers, equality of complex numbers, operations on complex numbers, modulus and amplitude of a complex number, polar form of a complex number.

UNIT – III

Rectangular coordinate system, distance and section formulae, equation of straight lines, various forms, angle between lines. Second degree homogenous equations representing straight lines and angle between them. Matrices and their types, algebra of matrices, determinant of a square matrix.

Recommended Books

1. Set theory Schaum's series.
2. Matrices by Aziz, Nisar and Zargar.
3. Complex trigonometry by Aziz, Nisar and Zargar.
4. Matrices by Shanti Narayan.
5. Coordinate geometry by Shanti Narayan.
6. Mathematical Analysis by S.C. Malik.