Semester	**1**
Course [*1]	**Major-2**
Paper Code	C1MT230121T
Paper Title	**Algebra-1**
No. of Credits [*2]	**4**
Theory / Practical / Composite	**Theory**
Minimum No. of preparatory hours per week a student has to devote	**4**
Number of Modules	**Nil**
Syllabus	Well-ordering property of positive integers (statement), division algorithm, divisibility and Euclidean algorithm (proofs required) (3). Congruence relation between integers (2) Principles of Mathematical induction, Statement of Fundamental Theorem of Arithmetic (2) Binary Relations. Equivalence relation and Partition: Their Equivalence (2) Functions: Injective, surjective, bijective. Composition of functions, Invertible functions (3). Definition and Properties of Groups (2) Example and properties of groups of nth roots of unity, Permutation groups, group of residue modulo classes, Dihedral groups, Cyclic groups, group of units modulo n. (10) Introduction to Matrix and determinants: Examples of groups like M(n,R), GL(n,R), symmetric, orthogonal, diagonal etc. (5) Properties relating to order of an element of a group, order of a group, Subgroups (3), Cosets, Lagrange's Theorem for finite groups (3) Fermat's Little theorem, Definition and examples of Rings and Fields. (2). Systems of linear equations Ax=b: Homogenous and Non-Homogenous systems (3). Elementary Row Operation: row reduction and echelon forms, rank of a matrix (5). Consistency of a system of linear equations (2). Solution set of linear systems: Gauss Elimination method and Matrix Inversion Method. (5)

Learning Outcomes *3	On successful completion of the course a student will be able to do the following: • Get acquainted to abstract nature of Mathematics. • Learn the abstract group structure and its properties. • Comprehend the basic concepts of matrix Theory and its interconnection with groups. • Learn the Application of Groups in fields like Physics, Chemistry, Biology. • Understand how basic algebra can be used for awareness risks in online transaction. • Understand basic Algebraic structures for counting species in eco systems.
Reading/Reference Lists *4	• Contemporary Abstract Algebra by Joseph Gallian. • Abstract Algebra by Sen, Ghosh, Mukhopadhyay. • Matrix and Linear Algebra Kanti Bhushan Datta. • Linear Algebra by Arnold J. Insel, Lawrence E. Spence, and Stephen H. Friedberg. • Elementary Linear Algebra by Howard Anton, Chris Rorres. • Linear Algebra Done Right by Sheldon Axler. • Abstract Algebra by Dummit and Foote. • Higher Algebra by S.K. Mapa. • Linear Algebra: A geometric Approach by S. Kumaresan. • Topics in Algebra by I.N. Herstein. • Introduction to linear Algebra by Gilbert Strang. • Linear Algebra by K.Hoffman and R.. Kunz. **Online Lectures:** **https://archive.nptel.ac.in/courses/111/106/111106113/** **https://archive.nptel.ac.in/courses/111/104/111104137/**

Evaluation	Theory CIA: 20+5+5=30 Semester Exam:70	Practical (if applicable) CA: Semester Exam:
Paper Structure for Theory Semester Exam	7 questions each carrying 10 marks out of 12 /13 questions.	