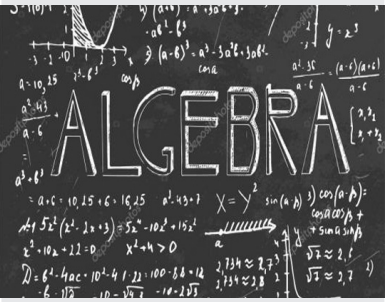

Source: https://pll.harvard.edu/course/college-algebra.

22MT106 ALGEBRA

Hours Per Week :

L	T	P	C
3	2	0	4

PREREQUISITE KNOWLEDGE: Basics of sets, Relations and Functions.

COURSE DESCRIPTION AND OBJECTIVES:

This course emphasizes on motivation and justification for the algorithmic usage of group theory in different domains. The objective of this course is to introduce the concepts of Groups, Rings, Integral domains and Fields. Develop the ability to form and evaluate group theory and its actions. Understand the fundamental concepts of algebra. The fundamental notions viz. linear dependence, basis and dimension and linear transformations on these spaces have to be studied thoroughly.

MODULE-1

UNIT-1 **12L+8T+0P=20 Hours**

GROUP THEORY

Algebraic structures with binary operations, Semigroup, Monoid, Group, Subgroup, Cosets, Lagrange's theorem, Normal subgroup, Quotient group.

UNIT-2 **12L+8T+0P=20 Hours**

APPLICATIONS OF GROUP THEORY

Introduction to Rings, Integral Domains, Fields with examples.

Properties of groups, order of an element in a group, homomorphism, isomorphism.

PRACTICES:

- List all the properties for group.
- Give examples for groups and other binary structures.
- In a group of even order there is an element a e such that a2 = e.
- For any two subgroups discuss the possibility of their intersection and union being a subgroup.
- Any two groups of order 6 are isomorphic, Verify.

MODULE-2

UNIT-1 **12L+8T+0P=20 Hours**

VECTOR SPACES

Vector space, Subspace, linear span, linearly independent and dependent vectors, Bases, Dimension, Linear transformations, Inner product spaces.

UNIT-2 **12L+8T+0P=20 Hours**

SKILLS:

- ✓ *Identifying identity elements of an Algebraic structure and inverses of elements.*
- ✓ *Evaluate the rank and nullity of a Linear Transformation.*

APPLICATIONS OF VECTOR SPACES

Matrix of Linear Transformation, Change of Coordinates, Rank and Nullity, Orthogonality, Cauchy's Schwartz Inequality, Gram Schmidt Orthogonalization.

PRACTICES:

- Examine whether or not a given algebraic structure is a vectorspace.
- Verify whether a given set forms a basis or not of R3.
- Testing orthogonality of given set of vectors.
- Finding Rank and Nullity of linear transformation.

COURSE OUTCOMES:

Upon successful completion of this course, students will have the ability to:

CO No.	Course Outcomes	Blooms Level	Module No.	Mapping with POs
1	Apply the concepts of cosets to study properties of subgroups.	Apply	1	1, 2, 9, 10, 12
2	Outline the various properties and apply group actions critically.	Apply	1	1, 2, 9, 10, 12
3	Understand and apply the concepts of vector spaces, subspaces, bases, dimension and their properties.	Apply	2	1, 2, 9, 10, 12
4	Analyse inner product spaces for their orthogonality.	Analyse	2	1, 2, 9, 10, 12

TEXT BOOKS:

1. Tremblay, J.P. and Manohar. R, "Discrete Mathematical Structures with Applications to Computer Science", 30th Reprint, Tata McGraw Hill Pub. Co. Ltd, New Delhi, 2017.
2. Rosen, K.H., "Discrete Mathematics and its Applications", 7th Edition, Tata McGraw Hill Pub. Co. Ltd., New Delhi, 2018.

REFERENCE BOOKS:

1. R.P. Grimaldi, "Discrete and Combinatorial Mathematics: An Applied Introduction", 4th Edition, Pearson Education Asia, Delhi, 2017.
2. S. Lipschutz and Mark Lipson., "Discrete Mathematics", Schaum's Outlines, Tata McGraw Hill Pub. Co. Ltd., New Delhi, 2021.
3. T. Koshy, "Discrete Mathematics with Applications", Elsevier Publications, 2015.
4. S B Singh. "Discrete Structures", Khanna Book Publishers Co-Pvt. Ltd. 2019