

<b>Devi Ahilya University, Indore, India</b> <b>Institute of Engineering &amp; Technology</b>				<b>MSc – I Year (Applied Mathematics)</b> with Specialization in Computing & Informatics <b>Semester- I</b>			
<b>Subject Code &amp; Name</b>	<b>Instructions Hours per Week</b>			<b>Credits</b>			
<b>AM1PC1: Algebra</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>Total</b>
	<b>3</b>	<b>1</b>	<b>-</b>	<b>3</b>	<b>1</b>	<b>-</b>	<b>4</b>
<b>Duration of Theory Paper: 3 Hours</b>							

**Objective:** To study the abstractions such as groups, rings, fields, vector space and linear transformations.

**Prerequisite(s):** Matrices, Determinants, Polynomials.

### COURSE OF CONTENTS

#### UNIT I

Preview of Groups, subgroups, cosets, Lagrange's theorem, normal subgroups, quotient groups, homomorphism, isomorphism theorems, Cayley's theorem and Permutation groups. Conjugacy, Sylow theorems, Direct products, Structure theorem for finite abelian groups, Normal and Subnormal series, composition series, Jordan holder theorem, Solvable and Nilpotent groups.

#### UNIT II

Rings, Integral domains, Ideals, Prime ideals, Maximal ideals, homomorphisms, Quotient rings, Fields, characteristic of an integral domain, Prime fields. Euclidean domains, Unique factorization domains, Principal ideal domain, Polynomial rings, Unique factorization in polynomial rings, Eisenstein's criterion of Irreducibility, Noetherian and Artinian rings.

#### UNIT III

Review of Basic Concepts of Vector space, Bases, Dimension, Nullity theorem and Rank of a matrix. Linear transformation, Quotient space, Direct sums, dimension of a direct sum, Characteristic polynomials, theorems on Eigen values & Eigen vectors, Cayley- Hamiltonian theorem, Jordan form, Diagonalization, Dual space, Annihilators.

#### UNIT IV

Modules, Sub modules, Direct Sum, Homomorphism and Isomorphism theorems, Quotient modules, Cyclic modules, simple modules, Free modules, Schur's lemma.

#### UNIT V

Finite Field Extension, algebraic and transcendental extension, splitting fields, separable and inseparable extension, perfect field, normal extensions, Galois group, solvability by radicals.

#### BOOKS RECOMMENDED:

- [1] I.N.Herstein, Topics in Algebra, Wiley Eastern Ltd., New Delhi, 1975.
- [2] Fraleigh J.B, A First Course in Abstract Algebra, Seventh Edition, Pearson Education, 2002.
- [3] S.Kumaresan, Linear Algebra, A Geometric Approach, Prentice - Hall of India, 2000.
- [4] S. Lang, Linear Algebra, Undergraduate Texts in Mathematics, Springer-Verlag, New York, 1989.
- [5] A.R. Vasishtha, Modern Algebra, Prakashan Media Ltd, Meerut, India, 2002
- [6] Artin Michael , Algebra , Pearson Education Inc. , 2007 .