



MANGALORE UNIVERSITY

DEPARTMENT OF MATHEMATICS

MSC MATHEMATICS

MTH 401	Algebra- I	4 Credits (48 hours)
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Course Outcome: To introduce the concepts and to develop working knowledge on fundamentals of algebra. Students will have the knowledge and skills to apply the concepts of the course in pattern recognition in the field of computer science and also for diverse situations in physics, chemistry and other streams. This course is a foundation for next course in Algebra.

Course Specific Outcome: At the end of the course students will have the knowledge and skills to understand, explain in depth and apply the fundamental concepts-

- Groups
- Structure of Groups
- Rigid motions, isometries
- Rings and integral domains.

Unit I - Groups and Subgroups:

Binary operations, Isomorphic binary operations, Groups, Subgroups, Cyclic groups, **Generating sets and Cayley digraphs, Groups of permutations,** Orbits, Cycles and alternating groups, Cosets and Lagrange's theorem.

(12 Hours)

Unit II - Product Groups, Homomorphism and Quotient Groups:

Direct products and finitely generated abelian groups, Homomorphisms, Factor groups, Factor group computations and simple groups, **Isomorphism theorems. Series of groups.**

(12 Hours)

Unit III - Advanced Group Theory:

Symmetry of plane figures, Isometries, Isometries of the plane, Finite groups of orthogonal operators on the plane. Group actions on a set, **Applications of group actions to counting,** Cayley's theorem, **The class equation, p -Groups, Conjugation in the symmetric group,**

Normalizers, **The Sylow theorems,** The groups of order 12.

(18 Hours)

Unit IV - Rings and Fields:

Definitions of rings, subrings, integral domains, fields and their basic properties, Homomorphisms and Factor Rings, Prime and Maximal Ideals. Fields of quotients of an integral domain, Rings of Polynomials.

(6 Hours)

References

- [1] J. B. Fraleigh, *A First Course in Abstract Algebra*, 7th Ed., Addison Wesley, 2003.
- [2] Michael Artin, *Algebra*, 2nd Ed., Prentice Hall of India, 2013.
- [3] I. N. Herstein, *Topics in Algebra*, 2nd Ed., John Wiley & Sons, 2006.
- [4] Joseph A. Gallian, *Contemporary Abstract Algebra*, 8th Ed., Cengage Learning India, 2013.
- [5] Paul B. Garrett, *Abstract Algebra*, CRC press, 2007.
- [6] Thomas W. Hungerford, *Algebra*, Springer, 2004.
- [7] David S. Dummit and Richard M. Foote, *Abstract Algebra*, 3rd Ed., Wiley, 2004.
- [8] Serge Lang, *Algebra*, 3rd Ed., Springer, 2005.