

# FUNDAMENTAL APPLICATION OF ALGEBRA

(3+0 Cr. Hr.)

## COURSE OBJECTIVES

To prepare the students, not majoring in mathematics, with the essential tools of algebra to apply the concepts and the techniques in their respective disciplines.

## COURSE CONTENTS:

- i. **Preliminaries**
  - a. Real-number system
  - b. Complex numbers
  - c. Introduction to sets, set operations, functions, types of functions.
  - d. *Matrices*: Introduction to matrices, types, matrix inverse, determinants, system of linear equations, Cramer's rule.
- ii. **Quadratic Equations**
  - a. Solution of quadratic equations, qualitative analysis of roots of a quadratic equation, equations reducible to quadratic equations, cube roots of unity, relation between roots and coefficients of quadratic equations.
- iii. **Sequences and Series**
  - a. Arithmetic progression, geometric progression, harmonic progression.
  - b. **Binomial Theorem**: Introduction to mathematical induction, binomial theorem with rational and irrational indices.
  - c. **Trigonometry**: Fundamentals of trigonometry, trigonometric identities.

## Recommended Books

1. Schafer, R. D. (2017). *An introduction to nonassociative algebras*. Courier Dover Publications.
2. Voiculescu, D. V., Stammeier, N., & Weber, M. (2016). *Free probability and operator algebras*.
3. Saltman, D. J. (2016). Genus one curves from division algebras of degree 3.
4. Rordam, M., Thom, A., Vaes, S., & Voiculescu, D. V. (2017).  $C^*$ -Algebras. *Oberwolfach Reports*, 13(3), 2269-2345.
5. Isaev, A. P., & Rubakov, V. A. (2018). *Theory of groups and symmetries: finite groups, Lie groups, and Lie algebras*. World Scientific Publishing Co Pte Ltd.