



Block

1

ALGEBRA - I

UNIT 1

Determinants **5**

UNIT 2

Matrices – I **29**

UNIT 3

Matrices – II **66**

UNIT 4

Mathematical Induction **89**

COURSE INTRODUCTION

BCS-012 is a 4-credit course that introduces the students to some basic mathematical concepts, tools and techniques, for solving problems, including *determinants, matrices, sequences & series, vectors, three-dimensional geometry, Principle of Mathematical Induction* and *linear programming*.

The objective of the course is to make students capable of formulating problems in terms of the concepts and applying the tools and techniques to so-obtained formulations for solving the problems.

The course is structured and developed in the form of four blocks, each block containing four units. Block 1 includes discussion of *determinants, matrices and Principle of Mathematical Induction*. In Block 2, *sequences & series, complex numbers* and methods for solving *equations* and *inequalities* are discussed. Introductory *differential calculus & integral calculus* and their applications constitute Block 3. Finally, *vectors, 3-dimensional geometry* and elements of *linear programming* are discussed in Block 4.

The course material includes a number of solved examples for each topic followed by exercises. In order to have good grasp of the topics, the students should try to solve as many exercises as possible.

BLOCK INTRODUCTION

The block consists of four units. In Unit 1, first, the concept of *determinant* is introduced and then, the properties of determinants are discussed. Next, methods for evaluating a determinant as a number are illustrated. Finally, how to use the determinant as a tool for solving problems is explained.

Matrices are discussed in Units 2 & 3. In Unit 2, after introduction of the concept of a matrix, various relations and operations on matrices are defined and illustrated. Next, how to use matrix as a tool for solving linear equations, is explained.

In Unit 3, concepts of elementary row operation, rank of a matrix, normal form and inverse of a matrix are introduced. Next, methods for calculating the rank of a matrix, the normal form of a matrix and the inverse of a matrix, if it exists, are explained.

In Unit 4, one of the most important mathematical techniques, viz., Principle of Mathematical Induction is introduced and then, it is illustrated how the principle can be used in solving problems through a number of examples.