Subject Code	Subject Name	Credits
26CS503	MATHEMATICS FOR COMPUTING	4

Course Objectives

1. To introduce fundamental mathematical structures used in computing such as relations, functions, and Mathematical Logic.
2. To develop an understanding of Boolean Algebra and its applications in digital logic design and computing systems.
3. To study graph theory concepts including Graph Theory, trees, and spanning trees for modelling computational problems.

Learning Outcomes

After the completion of the course, the graduate will be able to:

1. Apply concepts of relations, functions, recurrence relations, and Mathematical Logic to solve computational problems.
2. Understand error detection and correction techniques using Hamming Code, generator matrices, and syndrome decoding.
3. Apply algebraic structures such as groups, rings, and homomorphisms in theoretical and computational contexts.
4. Develop mathematical reasoning skills required for advanced topics in computer science and computing systems.

Unit 1 – Relations and Functions (12 Hrs.):

Relations and Functions, Equivalence Relations, Partial Order, Recurrence Relations, Solutions of Linear homogeneous Recurrence Relations, Introduction to Mathematical Logic, Propositional Calculus.

Unit 2 - Lattices and Boolean algebra (12 Hrs.):

Lattices and Boolean algebra, Boolean Functions, Canonical Form of a Boolean function, Karnaugh Maps

Unit 3 – Graph Theory (12 Hrs.):

Graphs and their representations, Walk, Path, Cycle, Circuit, Eulerian Graphs, Connected Graphs, Planar Graphs, Trees, Spanning trees, Binary Tree Traversals.

Unit 4 - Linear codes (12 Hrs.):

Linear codes, Hamming Code, Generator and parity check matrix, Hamming distance standard array and Syndrome decoding, introduction to cyclic codes.

Unit 5 – Group (12 Hrs.):

Groups, Subgroups, Normal Subgroups, Quotient Groups, Right Co-sets, Homomorphism, Kernel of Homomorphism, Isomorphism, Fundamental theorem of Homomorphism. Ring, Subring, Ideal, Integral domain and their Properties, Ring Homomorphism, Isomorphism, Quotient Ring, Euclidian Ring, Rings of Polynomial and their properties.

References:

1. Discrete Mathematics K.A. Ross, Charles R.W. Wright, Prentice Hall Inc.
2. Discrete Mathematical Structure for Computer Sciences Bernard Kolman / Robert C. Busby Prentice Hall of India.
3. Theory of Error Correcting Codes F.J. Mac. Williams / N.J.A.Sloane, North Holland Pub. Co.
4. Graph Theory with Applications to Engineering and Computer Science Narsingh Deo, Prentice Hall of India.
5. N. Herstein, Topics in Algebra. • Surjeet Singh & Q Zameeruddin, Modern Algebra.