Course Code:	UMAT0004T	Course title:	Combinatorics
Course Credits:	4	L-T-P:	3-1-0

Objectives. The aim of this course is to introduce the students to the basics of combinatorics.

Learning Outcomes. After completing this course, the students shall be able to:

CO1:	understand the Pigeonhole Priciple and basic counting principles
CO2:	understand the Permutation and combination of multisets, their generations
CO3:	undertand the Binomial coefficients, binomial theorem and its various extensions
CO4:	undestand the inclusion-exclusion principle, its applications and solving linear homogeneous recurrence relations
CO5:	study some special counting sequences

Unit-1

- What is combinatorics? Examples, The Pigeonhole Principle: Simple form and strong form, Applications, Four basic counting Principles, Exercises based on above topics.

Unit-2

- Permuation and combination of sets, Permuation and Combination of multisets, Generating Permuations, Inversions in Permutations, Generating Combinations, Generating r-combinations, Exercises based on the above topics

Unit-3

- The Binomial Coefficients: Pascal's formula, The Binomial theorem, Binomial identities, Unimodality of Binomial Coefficients, The multinomial theorem, Newton's binomial theorem, Exercises based on the above topics

Unit-4

- The Inclusion-Exclusion principle, combinations with repetition, Derangements, Linear homogeneous recurrence relations, Exercises based on above topics

Unit-5

- Special Counting sequences: Catalan numbers, Stirling numbers, Partition numbers, Lattice Paths and Schröder numbers, Exercises based on above topics

Recommended Texts.

1. Richard A. Brualdi, Introductory Combinatorics, 14th edition, Pearson Education, 2014.
2. Ralph P. Grimaldi, Discrete and Combinatorial Mathematics: An Applied Introduction, 5th edition, Pearson Education, 2003.
3. Sebastian M. Cioaba and M. Ram Murty, A first Course in Graph Theory and Combinatorics(Texts and Readings in Mathematics), Hindustan Book Agency, 2009.