MA854 Enumerative Combinatorics 4 -0-0 4

Course Objective: To learn various Combinatorics for the coding theory.

UNIT – I

Introduction to combinatorics: How to count - Sets and multisets - Cycles and inversions – Descents - Geometric representations of permutations.

UNIT II

Combinatorial basics continued: Partition identities - The Twelvefold Way - Two q-analogues of permutations, A q-analogue of permutations as bijections, A q-analogue of permutations as words.

UNIT III

Combinatorial Design: Block Design – balanced incomplete block design (BIBD), symmetric balanced incomplete block design (SBIBD) – Steiner Triple Systems – Latin Squares.

UNIT IV

Combinatorics for Coding Theory: General *t* Design - Matroids – Chains and Chain Groups – Dual Chain Group – Matroids, Graphs, and Coding.

UNIT V

Combinatorics for Coding Theory continued: Perfect Codes and t Designs, Nearly Perfect Codes and t Designs – Balanced Codes and t Designs - Equidistant Codes.

TEXT BOOK

[1] Richard P. Stanley, **Enumerative Combinatorics** - second edition version of 19 May 2011.

[2] Richard A. Brualdi, **Introduction to Combinatorics** – Fourth Edition Pearson Prentice Hall.

[3] Ian F. Blake, Ronald C. Mullin, **An Introduction to Algebraic and Combinatorial Coding Theory**, Academic Press, 1976.

UNIT I [1] Chapter 1 (Section 1.1 – 1.5)
UNIT II [1] Chapter 1 (Section 1.7 – 1.10)
UNIT III [2] Chapter 10 (Section 10.1 –10.4)
UNIT IV [3] Chapter 10 (Section 3.1 - 3.8)
UNIT V [3] Chapter 3 (Section 3.9, 3.10)

REFERENCE(S)

1. George E. Martin , **Counting: The Art of Enumerative Combinatorics**, Springer-Verlag New York, Year: 2001.
2. Miklos, **Combinatorics for Permutations**, Chapman & Hall/CRC, Year: 2004.