



MAT 651 – Graph Theory and Combinatorics

Course Code & Number	Course Name	Credit Hours	Lec.	Lab.	Tut.	Prerequisites
MAT 651	Graph Theory and Combinatorics	4	3	0	1	

Syllabus:

Graph Theory: Introduction to Graphs, Subgraphs, Connected Graphs, Trees, Nonseparable Graphs, Tree-Search Algorithms, Flows in Networks, Complexity of Algorithms, Connectivity, Planar Graphs, The Four-Color Problem, Matchings, Hamilton Cycles, Coverings and Packings, Electrical Networks, Integer Flows and Coverings, Stable Sets and Cliques, Colorings, Unsolved Problems.

Combinatorics: Counting principles, Arrangements and combinations, Numerations of object distributions, Generating functions and their coefficients, Partitions, Exponential generating functions and applications, Examples of recurrence relations, Homogeneous recurrence relations, nonhomogeneous recurrence relations, Solving recurrence relation by generating functions, Inclusion-Exclusion formula and applications, Arranging objects with restricted positions, Burside's theorem, The cycle index theorem, Polya's enumeration formula.

References:

1. J. A. Bondy and U. Murty; *Graph Theory*; 1st Edition, Springer Verlag, 2008. **(Main Reference)**
2. A. Tucker; *Applied Combinatorics*; 6th Edition, Wiley and Sons, 2012. **(Main Reference)**
3. R. J. Wilson; *Introduction to Graph Theory*; 4th Edition, Pearson Education, 2003.
4. P. J. Cameron; *Combinatorics: Topics, Techniques, Algorithms*; 1st Edition, Cambridge University Press, 1995.

