MANIPAL UNIVERSITY JAIPUR

School of Basic Sciences

Department of Mathematics and Statistics

Course Hand-out

Graph Theory| MA1652 | 3 Credits | 3 0 0 3

Session: Jan 18 – June 18 | Faculty: Dr. Kalpna Sharma | Class: B. Sc.

COURSE OUTCOMES: At the end of the course, students will be able to

[1551.1]. Understand the basic concepts of graphs, different kinds of graph and able to present a graph in different ways like matrix forms etc.

[1551.2]. Understand the properties of trees and able to estimate a minimal spanning tree for a given weighted graph.

[1551.3]. Determine strength, planarity of a given graph.

[1551.4]. Represent real-life situations with mathematical graphs which enhance their analytical and logical skills.

[1551.5]. Recognize patterns that arise in various graph problems.

A. SYLLABUS

Fundamental concepts: basic definitions, operations, properties, proof styles; **Trees:** properties, distances and centroids, spanning trees, enumeration; **Matching:** bipartite graphs, general graphs, weighted matching; **Connectivity:** vertex and edge connectivity, cuts, blocks, k-connected graphs, network flows; **Traversibility:** Eulerian tours, Hamiltonian cycles; **Coloring:** vertex and edge coloring, chromatic number, chordal graphs; **Planarity:** duality, Euler's formula, characterization, 4-color theorem; **Advanced topics:** perfect graphs, matroids, Ramsay theory, external graphs, random graphs, Applications.

B. TEXT BOOKS

1. Narsingh Deo "Graph Theory with Applications to Engineering and Computer Science", *Prentice Hall of India*, 1993.

2. B. West, "*Introduction to Graph Theory*", Prentice Hall of India, 2012

3. R. Ahuja, T. Magnanti, et al., "*Network Flows: Theory, Algorithms, and Applications*", Prentice-Hall, 2009

4. Wilson R.J., "Introduction to Graph Theory", *Longman*, 1975