Birla Institute of Technology & Science, Pilani
Hyderabad Campus

SECOND SEMESTER 2019-2020

Course Handout Part II

06-01-2020

In addition to part-I (General Handout for all courses appended to the time table) this portion gives further specific details regarding the course.

Course No. : *MATH F243*
Course Title : *Graphs & Networks*
Instructor-in-charge : *P. K. Sahoo*
Instructor : A. Michael Alphonse,

Scope and Objective of the Course: The applications of graph theory are ranging from social sciences to electrical engineering and computer science to management. Every graph theoretic model is supported by a strong mathematical scheme. The objective of the course is, in addition to apply the graph theoretic model to different applications; students can develop a strong concept on the logical foundations, and can develop of a standard mathematical formulation for different real life problems.

Textbooks:

1. Gary Chartrand & Ping Zhang: Introduction to Graph Theory, Mcgraw-hill, Indian Edition 2006.

Reference books

1. E. G. Goodaire & M. M. Parmenter : Discrete Mathematics with graph theory, 3rd edition, Pearson, 2002.
2. Narsingh Deo: Graph theory with applications to engineering & computer science, PHI 1974.
3. G. Agnarsson and R. Greenlaw: Graph Theory Modeling, Applications and Algorithms, Pearson, 2007.

Course Plan:

Lecture No.	Learners objective	Topics to be covered	Chapter in the Text Book
1-4	To introduce the concept of graph and its representation. Distinguish between multigraphs and digraphs.	Graphs and Graph Models, Connected Graphs, Classes of graphs, Multigraphs and Digraphs.	Chapter 1.1-1.4
5-8	Understanding the graph through the degree of the vertices. Relationship between the graphs and matrices.	Degree of a vertex, Regular graphs, Degree Sequence, Graphs and Matrices, Irregular graphs.	Chapter 2.1-2.5
9-12	To appreciate the concept of isomorphism as a concept of an equivalence relation on the set of all graphs.	Isomorphic Graphs, Definition of isomorphism, Isomorphism as a relation	Chapter 3.1-3.3
13-16	Concepts of distance between spanning trees, tree and rooted binary tree	Bridges, Trees, equivalent definitions, spanning tree, Minimal spanning tree, Prim's & Kruskal Algorithm Binary trees, Distance between spanning tree, eccentricity, Centre(s), diameter of tree & connected graph.	Chapter 4.1-4.4

17-20	How spanning tree is connected with concept of special type of cut set & circuit in a connected graph	Cut vertices, Blocks, Connectivity, Menger's Theorem	Chapter 5.1-5.4
21-23	To appreciate the difference between edge traversal & vertex traversal	Eulerian Graphs, Hamiltonian Graphs, Hamiltonian walk and numbers	Chapter 6.1-6.3
24-26	To determine the matching number, covering number.	Matchings, Factorization	Chapter 8.1-8.2
27-30	How simple concept of planarity of a graph is relevant to several problems.	Planar Graphs, Euler identity, Detection of planarity, Embedded graphs on surface. Graph Minors, Embedding graphs in graphs.	Chapter 9.1-9.4
31-34	How graph coloring problem is related to independent sets of graph, scheduling problems.	The four color problem, vertex coloring, edge coloring, chromatic number, chromatic partitioning, domination number.	Chapter 10.1-10.3 13.1
35-36	How concept of isomorphism is different in digraphs ,Difference between different type connected digraphs & spanning tree & directed spanning tree	Directed graph, Euler digraph, Isomorphism in digraph Strongly connected & weakly connected digraphs,	Chapter 7.1-7.2
37- 41	Directed weighted network, relevance of maximum flow	Network flow, Max Flow- Min Cut theorem, Fulkerson Algorithm for Maximum flow, Shortest path problem & Dijkstara Algorithm.	Chapter 14.1, 14.2, 10.4.1-10.4.3 **(R1)**

Evaluation Scheme:

Evaluation Component	Duration	Weightage	Date & Time	Nature of Component
Mid-semester	90 Minutes	30%	2/3 1.30 -3.00 PM	Closed book
Quizes Total : 5 Best 4 will be taken	10 mts during regular class hours	30%		Closed book
Comprehensive	3 Hours	40%	02/05 FN	50%Closed Book 50%Open Book

Chamber Consultation Hour: To be announced in the class.

Notices: All notices about the course will be put on CMS/Mathematics Notice Board.

Make-up Policy: Make up will be granted only in genuine cases. Permission must be taken in advance.

Academic Honesty and Integrity Policy: Academic honesty and integrity are to be maintained by all the students throughout the semester and no type of academic dishonesty is acceptable.

INSTRUCTOR-IN-CHARGE