SECOND SEMESTER 2015-2016

COURSE HANDOUT(PART-II) Date: 3/1/2016

In addition to part-I, portion here give specific details about the course.

COURSE NO. : MATH F 243

COURSE TITLE : Graphs & networks
INSTRUCTOR IN CHARGE : RAJIV KUMAR

COURSE DESCRIPTION : Course deals with basics of graphs, simple graphs, types of graph , isomorphism in graphs, Euler & Hamiltonian graphs, trees & their properties, directed tree, spanning tree, number of spanning trees & Matrix representation of graph, colouring of graph, independence number, Chromatic number of simple graphs, connectivity, cut set, directed graph, shortest path & maximal flow in a network. Kirchhoff matrix & number of spanning trees in a graph.

SCOPE & OBJECTIVE: The importance of graph theory can never be exaggerated considering the wide range of its applications, from social sciences to electrical engineering and computer science to management. The rigorous foundation of the subject is thus desirable. The objective of the course is, in addition to logical foundations, development of the basic skills to tackle problems in Graph theory. It is also aimed at understanding how various problems arising from real life or sciences as well as recreational puzzles can be converted to graph theoretic problems like shortest paths, network flows, chromatic numbers, connectivity etc.

TEXT BOOK :

1. G. Agnarsson and R. Greenlaw : Graph Theory Modeling, Applications and Algorithms, Pearson Education

REFERENCE BOOKS:

R1 Gary Chartrand & Oellerman : Applied & Algorithmic Graph Theory , Tata Mcgraw hill 1993

R2 Gary Chartrand & Ping Zhang : Introduction to Graph Theory , Tata Mcgraw-hill, Indian Edition 2006

R3 E. G. Goodaire & M. M. Parmenter : Discrete Mathematics with graph theory, 2nd edition, Pearson, 2002

R4 Narsingh Deo: Graph theory with applications to engineering & computer science, PHI 1993.

Course Plan :

Lecture n.	Learners objective	Topics	Ref.
1-2	appreciate concept and basic definition of graph	Definitions of graphs and digraphs, degree sequence, common graphs subgraphs,	Chapter 1
3-6	Important properties of graphs and their use to distinguish the graphs from each other.	Paths and cycles, connectivity, isomorphism's of graphs and digraphs sub graphs	Chapter 2
7-10	Appreciate different equivalent definitions of tree , special classes of trees	Tree, equivalent definitions, centers, rooted and binary trees	Ch.3
11-13	Spanning trees	Spanning trees and forests in graphs, counting of spanning trees using matrix representation of graphs, minimal spanning trees	Ch.4
14-16	Vertex and edge traversals	BFS and DFS algorithms, Eulerian and Hamiltonian graphs and digraphs, travelling salesman problem	Sections 5.2 to 5.5, 13.4
17-21	Robustness of networks, network flows and the relationship with robustness.	Edge and vertex connectivity, Network flows, Ford-Fulkerson theorem, Menger's theorem	Ch. VI
22-26	Planarity of graphs	Planar embeddings, Euler's formula, plane duality, crossing numbers	Sections 7.1 to 7.3, 7.5 7.6, 7.9
27-31	Concept of graph colouring	Bipartite and multipartite graphs, chromatic number, bounds on chromatic numbers, map coloring and four- color theorem	Sections 5.1, 8.1, 8.2, 8.3, 8.4
32-37	Appl. of graph colourings and related concepts	Independence and domination of vertices, matchings, vertex and edge coverings	Chapter 10, Chapter 11 section 1

38-40	Graph algorithms	DFS mBFS Dijkstra's shortest path algorithm	Sections 13.4 to 13.7

Evaluation Scheme :

COMPONENT	DURATION	% percentage	DATE &TIME	VENUE	Nature
Test	90 minute	35	18/3 2:00 -3:30 PM		Closed
QUIZ	regular	20			open
Comprehensive	3 hours	45	13/5 FN		closed book/open book

CHAMBER CONSULTATION HOUR : to be announced in class

NOTICES : All notices about the course will be put on Math dept. NB.

Make-up : Prior permission needed for make up,

Rajiv Kumar

Instructor In charge

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