

Course No.	Course Name	L-T-P Credits	Year of Introduction
CS309	GRAPH THEORY AND COMBINATORICS	2-0-2-3	2015
Course Objectives <i>To introduce the fundamental concepts in graph theory, including properties and characterization of graphs/ trees and Graphs theoretic algorithms</i>			
Syllabus Introductory concepts of graphs, Euler and Hamiltonian graphs, Planar Graphs, Trees, Vertex connectivity and edge connectivity, Cut set and Cut vertices, Matrix representation of graphs, Graphs theoretic algorithms.			
Expected Outcome Student is able to <ol style="list-style-type: none"> <i>Demonstrate the knowledge of fundamental concepts in graph theory, including properties and characterization of graphs and trees.</i> <i>Use graphs for solving real life problems.</i> <i>Distinguish between planar and non-planar graphs and solve problems.</i> <i>Develop efficient algorithms for graph related problems in different domains of engineering and science.</i> 			
Text Books <ol style="list-style-type: none"> NarasinghDeo, Graph theory, PHI. Douglas B. West, Introduction to Graph Theory, Prentice Hall India Ltd. Robin J. Wilson, Introduction to Graph Theory, Longman Group Ltd. 			
References <ol style="list-style-type: none"> R. Diestel, Graph Theory, free online edition: diestel-graph-theory.com/basic.html. 			
Course Plan			
Module	Contents	Hours	Sem. Exam Marks %
I	Introductory concepts - What is graph - Application of graphs - finite and infinite graphs - Incidence and Degree - Isolated vertex, pendent vertex and Null graph. Paths and circuits - Isomorphism, sub graphs,	09	15 %

	walks, paths and circuits, Connected graphs, disconnect graphs.		
II	Euler graphs, Hamiltonian paths and circuits, Dirac's theorem for Hamiltonicity, Travelling salesman problem. Directed graphs - types of digraphs, Digraphs and binary relation	10	15 %
FIRST INTERNAL EXAM			
III	Trees - properties, pendent vertex, Distance and centres - Rooted and binary tree, counting trees, spanning trees.	07	15 %
IV	Vertex Connectivity, Edge Connectivity, Cut set and Cut Vertices, Fundamental circuits, Planar graphs, Different representation of planar graphs, Euler's theorem, Geometric dual, Combinatorial dual.	09	15 %
SECOND INTERNAL EXAM			
V	Matrix representation of graphs- Adjacency matrix, Incidence Matrix, Circuit matrix, Fundamental Circuit matrix and Rank, Cut set matrix, Path matrix	08	20 %
VI	Graphs theoretic algorithms - Algorithm for computer representation of a graph, algorithm for connectedness and components, spanning tree, shortest path.	07	20 %
END SEMESTER EXAM			

Question Paper Pattern

1. There will be *five* parts in the question paper - A, B, C, D, E
2. Part A
 - a. Total marks : 12
 - b. Four questions each having 3 marks, uniformly covering modules I and II; All four questions have to be answered.
3. Part B

ktubtechquestions.com

- a. Total marks : 18
 - b. Three questions each having 9 marks, uniformly covering modules I and II; Two questions have to be answered. Each question can have a maximum of three subparts.
4. Part C
- a. Total marks : 12
 - b. Four questions each having 3 marks, uniformly covering modules III and IV; All four questions have to be answered.
5. Part D
- a. Total marks : 18
 - b. Three questions each having 9 marks, uniformly covering modules III and IV; Two questions have to be answered. Each question can have a maximum of three subparts.
6. Part E
- a. Total Marks: 40
 - b. Six questions each carrying 10 marks, uniformly covering modules V and VI; four questions have to be answered.
 - c. A question can have a maximum of three sub-parts.
7. There should be at least 60% analytical/numerical questions.

ktubtechquestions.com