KU6DSEMAT301: GRAPH THEORY

Semester	Course Type	Course Level	Course Code	Credits	Total Hours
V	DSE	300-399	KU6DSEMAT301	4	60

Learning Approach (Hours/ Week)			Marks Distribution			Duration of ESE (Hours)
Lecture	Practical/ Internship	Tutorial	CE	ESE	Total	
4		1	30	70	100	2

Course Description

This course provides an introduction to Graph Theory, a fundamental area of discrete mathematics with wide-ranging applications in computer science, engineering, and network analysis. Topics include graphs and subgraphs, paths and cycles, trees, connectivity, Eulerian and Hamiltonian. Students will learn how to model and analyze problems using graphs and apply graph algorithms to real-world scenarios.

Course Prerequisite

Familiarity with sets, relations, functions and basic proof techniques.

Course Outcomes

CO No.	Expected Outcome	Learning Domains
1	Understand a graph, subgraph, different types of graphs and their properties	Understand
2	Understand and represent graph as matrix	Understand
3	Understand a path, cycle, tress, bridge and their properties	Understand
4	Understand cut vertices and connectivity of graphs	Understand
5	Understand Eulerian graphs, Hamiltonian graphs. The Chinese Postman Problem and The Travelling Salesman Problem.	Understand
6	Model real world problems using the concept of graphs	Apply
7	Solve real world problems using the concept of graphs	Apply

Mapping of Course Outcomes to PSOs							
	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7
CO 1	✓						
CO 2	✓		✓				
CO 3	✓		✓				
CO 4	✓		✓				
CO 5	✓			✓		✓	
CO 6	✓			✓		✓	
CO 7	✓			✓		✓	

COURSE CONTENTS

Contents for Classroom Transaction

MODULE	UNIT	DESCRIPTION	HOURS
I		**An Introduction to Graphs**	**13**
	1	Definition of Graphs	
		Graph as Models	
		More Definitions	
		Vertex Degrees	
II		**Subgraphs, Paths and Cycles**	**14**
	1	Sub Graphs	
		Paths and Cycles	
		Matrix Representation	

III	**Trees and Connectivity**		**14**
	1	Definition of Trees and Simple Properties	
		Spanning Trees	
		Bridges	
		Cut vertices and Connectivity	
IV	**Euler Tours and Hamiltonian Cycles**		**14**
	1	Euler Tours	
		The Chinese Postman Problem	
		Hamiltonian Graphs	
		The Travelling Salesman Problem	
V	**Teacher Specific Module**		**5**
	Directions		
	Planarity		

Essential Readings

1. J. Clark and D. A. Dalton, A First Look at Graph Theory, Allied Publishers

Reference Distribution

Module	Reference No.	Sections	Remarks
I	1	Sections 1.1, 1.2, 1.3, 1.4	*Proof of Theorems in 1.4, are omitted*
II	1	Sections 1.5, 1.6, 1.7	Proof of Theorems in Section 1.7 are omitted
III	1	Sections 2.1, 2.2, 2.3, 2.6	Proof of Theorems 2.6, 2.7, 2.9 and 2.13 are omitted. Proof of Theorems 2.20, 2.21 and Corollary 2.22 are omitted.
IV	1	Sections 3.1, 3.2, 3.3, 3.4	Fleury's Algorithm and Proof of Theorems 3.3, 3.4, 3.5, 3.6, 3.7, 3.8 and Corollary 3.9 are omitted. Algorithm in Section 3.4 is omitted.

Suggested Readings

1. R. Balakrishnan and K. Ranganathan, A Text Book of Graph Theory (2nd Edition), Springer.
2. J. A. Bondy and U.S.R. Murthy, Graph Theory with Application, Macmillan.
3. F. Harary, Graph Theory, Narosa.Pub. House
4. K. R. Parthasarathy, Basic Graph Theory, Tata-McGraw Hill.

Assessment Rubrics

Evaluation Type		**Marks**
End Semester Evaluation		**70**
Continuous Evaluation		**30**
a)	Test Paper *	12
b)	Assignment	12
c)	Seminar, Viva-Voce	6
Total		**100**

* A student has to appear for at least two written tests. Average mark of best two tests is to be considered for internal mark.