

# CSE 1004: INTRODUCTORY GRAPH THEORY

(Classes with effective from 08.01.2020)

## REQUIRED COURSE TEXTBOOKS:

1. INTRODUCTION TO GRAPH THEORY BY DOUGLAS B. WEST (PEARSON)

No Other Textbooks will be used or entertained

**Course format: 3 Classes / week/, 1 hr. / Class, 1 2hr Problem Solving Session/week = 4 credits**

**Grading - external: 45 % Theory Exam+15% In Lab Exam = 60%**

**Grading - internal: 15 % Mid Term + 10% major lab/session assignments/quizzes +10% minor assignments + 5% attendance = 40 %**

## Lesson Plan

Lecture Hour	Topics	Chapters	Problems to be discussed in class and Assignment problems
1	<b>Syllabus</b> Grading, Assignments, Examinations, Attendance <b>Introduction</b> What is a Graph? The Definition	Chapter 1(1.1)	Definition-1.1.2,1.1.4 Example-1.1.1,1.1.3
2	Graphs as Models	Chapter 1(1.1)	Definition-1.1.8,1.1.10,1.1.12,1.1.15,1.1.16 Example-1.1.7,1.1.9,1.1.11,1.1.13,1.1.14,
3	Matrices and Isomorphisms	Chapter 1(1.1)	Definition-1.1.17,1.1.20,1.1.27 Example-1.1.19,1.1.21,1.1.30
4	Decomposition and Special Graphs	Chapter 1(1.1)	Definition-1.1.32 Example-1.1.33,1.1.35
5	Problem solving	EXERCISE(1.1)	Exercise-No.1.1.1,1.1.4,1.1.5,1.1.6,1.1.8,1.1.9,1.1.10,1.1.11,1.1.16 Assignment-No.1.1.18
6	Paths, Cycles and Trails Connection in Graphs	Chapter 1(1.2)	Definition-1.2.2,1.2.6,1.2.8 Example-1.2.3,1.2.4,1.2.9 Lemma-1.2.5 Proposition-1.2.11
7	Connection in Graphs Bipartite Graphs	Chapter 1(1.2)	Definition-1.2.12,1.2.17,1.2.20 Example-1.2.13,1.2.21 Theorem-1.2.14 Theorem-1.2.18(Only statement)

8	Eulerian Circuits	Chapter 1(1.2)	Definition-1.2.24 Lemma-1.2.25 Theorem-1.2.26
9	Problem solving	EXERCISE(1.2)	Exercise- No.1.2.1,1.2.2,1.2.3,1.2.5, 1.2.6,1.2.8,1.2.10
10	Vertex Degrees and Counting Counting and Bijections	Chapter 1(1.3)	Definition-1.3.1,1.3.2 Proposition-1.3.3,1.3.9 Corollary-1.3.5,1.3.6
11	Graphical Sequences	Chapter 1(1.3)	Definition-1.3.27,1.3.29 Example-1.3.30 Proposition-1.3.28 Theorem-1.3.31(Only statement)
12	Problem solving	EXERCISE(1.3)	Exercise- No.1.3.1,1.3.8,1.3.9
13	Directed Graphs Definitions and Examples	Chapter 1(1.4)	Definition- 1.4.2,1.4.3,1.4.6,1.4.9, 1.4.10,1.4.12 Example- 1.4.1,1.4.11,1.4.13
14	Vertex Degrees Eulerian Digraphs Orientations and Tournaments	Chapter 1(1.4)	Definition- 1.4.17,1.4.22,1.4.27 Example-1.4.28 Proposition-1.4.18 Lemma-1.4.23
15	Problem solving	EXERCISE(1.4)	Exercise- No.1.4.1,1.4.3,1.4.7,1.4.8, 1.4.9
16	Trees and Distance Basic Properties Properties of Trees	Chapter 2(2.1)	Definition-2.1.1 Example-2.1.2 Proposition-2.1.6 Lemma-2.1.3 Theorem-2.1.4 Corollary-2.1.5
17	Distance in Trees and Graphs	Chapter 2(2.1)	Definition-2.1.9 Example-2.1.10 Theorem-2.1.11
18	Problem solving	EXERCISE(2.1)	Exercise- 2.1.2,2.1.3,2.1.6,2.1.15, 2.1.19,2.1.22
19	Spanning Trees and Enumeration Enumeration of Trees Spanning Tree in Graphs	Chapter 2(2.2)	Theorem-2.2.3,2.2.12(Only statements for both) Example-2.2.6,2.2.9,2.2.11 Definition-2.2.7 Proposition-2.2.8(Only statement)
20	Problem solving	EXERCISE(2.2)	Exercise-2.2.2,2.2.3
21	Optimization and Trees Minimum Spanning Tree	Chapter 2(2.3)	Algorithm-2.3.1,2.3.5 Example-2.3.2,2.3.6
22	Problem solving	EXERCISE(2.3)	Exercise-2.3.3,2.3.5

23	Matchings and Factors Matchings and Covers	Chapter 3(3.1)	Definition-3.1.1 Example-3.1.2,3.1.3
24	Maximum Matchings	Chapter 3(3.1)	Definition-3.1.4,3.1.6,3.1.7 Example-3.1.5,3.1.8 Lemma-3.1.9
25	Hall's Matching Condition Min-Max Theorems	Chapter 3(3.1)	Theorem- 3.1.11,3.1.16(Only statements for both) Corollary-3.1.13 Definition-3.1.14 Example-3.1.15
26	Independent Sets and Covers	Chapter 3(3.1)	Example-3.1.18,3.1.23 Definition-3.1.19,3.1.20 Lemma-3.1.21 Theorem-3.1.22(Only statement) Corollary-3.1.24
27	Problem solving	EXERCISE(3.1)	Exercise- 3.1.1,3.1.4,3.1.6,3.1.7
28	Matchings in General Graphs Tutte's 1-Factor Theorem	Chapter 3(3.3)	Definition-3.3.1,3.3.6 Remark-3.3.2 Theorem-3.3.3,3.3.9(Only statements for both) Corollary-3.3.8(Only statement) Example-3.3.10
29	Problem solving	EXERCISE(3.3)	Exercise-3.3.1,3.3.2,3.3.3
30	Coloring of Graphs Vertex Coloring and Upper Bounds	Chapter 5(5.1)	Definition- 5.1.1,5.1.4,5.1.6,5.1.9 Remark-5.1.2 Example-5.1.3,5.1.5,5.1.10
31	Vertex Coloring and Upper Bounds	Chapter 5(5.1)	Proposition-5.1.7,5.1.13
32	Problem solving	EXERCISE(5.1)	Exercise-5.1.1,5.1.2,5.1.4, 5.1.12, 5.1.13, 5.1.14
33	Enumerative Aspects	Chapter 5(5.3)	Definition-5.3.1 Example-5.3.2,5.3.5 Proposition-5.3.3,5.3.4
34	Enumerative Aspects	Chapter 5(5.3)	Example-5.3.7 Theorem-5.3.6
35	Problem solving	EXERCISE(5.3)	Exercise-5.3.1, 5.3.2, 5.3.4
36	Planar Graphs Embeddings and Euler's Formula Dual Graphs	Chapter 6(6.1)	Definition-6.1.4, 6.1.7,6.1.11 Example-6.1.1, 6.1.8, 6.1.10,6.1.12 Proposition-6.1.2
37	Embeddings and Euler's Formula Dual Graphs	Chapter 6(6.1)	Proposition-6.1.13 Theorem-6.1.16

38	Euler's Formula	Chapter 6(6.1)	Theorem-6.1.21, 6.1.23 Example-6.1.24, Definition-6.1.25 Proposition-6.1.26
39	Problem solving	EXERCISE(6.1)	Exercise-6.1.1, 6.1.2, 6.1.3, 6.1.5, 6.1.8, 6.1.9, 6.1.10
40	Edges and Cycles Line Graphs and Edge-coloring	Chapter 7(7.1)	Definition-7.1.1, 7.1.3, 7.1.4, 7.1.8, 7.1.11 Example-7.1.2, 7.1.5
41	Problem solving	EXERCISE(7.1)	Exercise-7.1.1, 7.1.3, 7.1.4, 7.1.7, 7.1.8
42	Hamiltonian Cycles	Chapter 7(7.2)	Definition-7.2.1, 7.2.4 Example-7.2.2, 7.2.5 Proposition-7.2.3
43	Hamiltonian Cycles	Chapter 7(7.2)	Definition-7.2.15 Remark-7.2.16 Theorem-7.2.8 Lemma-7.2.9
44	Problem solving	EXERCISE(7.2)	Exercise-7.2.1, 7.2.3, 7.2.4, 7.2.12