COURSE INFORMATION SHEET MAT 206GRAPH THEORY	
PROGRAM: **B.Tech**	ACADEMIC YEAR: **2022-2023** SEMESTER: **IV** CREDITS: **4**
COURSE: **GRAPH THEORY**	COURSE TYPE: BASIC SCIENCE COURSE (BSC)
COURSE CODE: **MAT 206** REGULATION:**2019**	CONTACT HOURS: **3+1 (Tutorial) hours/Week**

UNIT	SYLLABUS	HOURS
I	**Introduction to Graphs**: Introduction- Basic definition – Application of graphs – finite, infinite and bipartite graphs – Incidence and Degree – Isolated vertex, pendant vertex and Null graph. Paths and circuits – Isomorphism, sub graphs, walks, paths and circuits, connected graphs, disconnected graphs and components.	8
II	**Eulerian and Hamiltonian graphs**: Euler graphs, Operations on graphs, Hamiltonian paths and circuits, Travelling salesman problem. Directed graphs – types of digraphs, Digraphs and binary relation, Directed paths, Fleury's algorithm..	8
III	**Trees and Graph Algorithms**: Trees – properties, pendant vertex, Distance and centres in a tree - Rooted and binary trees, counting trees, spanning trees, Prim's algorithm and Kruskal's algorithm, Dijkstra's shortest path algorithm, Floyd-Warshall shortest path algorithm.	11
IV	**Connectivity and Planar Graphs**: Vertex Connectivity, Edge Connectivity, Cut set and Cut Vertices, Fundamental circuits, Planar graphs, Kuratowski's theorem (proof not required), Different representations of planar graphs, Euler's theorem, Geometric dual.	9
V	**Graph Representations and Vertex Colouring**: Matrix representation of graphs Adjacency matrix, Incidence Matrix, Circuit Matrix, Path Matrix. Coloring-Chromatic number, Chromatic polynomial, Matchings, Coverings, Four color problem and Five color problem. Greedy colouring algorithm.	9
	TOTAL HOURS	**45**

TEXT/REFERENCE BOOKS:

T/R	BOOK TITLE/AUTHOR/PUBLICATION
T1	Narsingh Deo, Graph theory, PHI,1979

R1	R. Diestel, Graph Theory, free online edition, 2016: diestel-graph-theory.com/ basic.html.
R2	Douglas B. West, Introduction to Graph Theory, Prentice Hall India Ltd.,2001
R3	Robin J. Wilson, Introduction to Graph Theory, Longman Group Ltd.,2010
R4	J.A. Bondy and U.S.R. Murty. Graph theory with Applications

CourseOutcomes: At the end of this course, students are able to:	
CO1	Explain vertices and their properties, types of paths, classification of graphs and trees & their properties.
CO2	Demonstrate the fundamental theorems on Eulerian and Hamiltonian graphs.
CO3	Illustrate the working of Prim's and Kruskal's algorithms for finding minimum cost spanning tree and Dijkstra's and Floyd-Warshall algorithms for finding shortest paths.
CO4	Explain planar graphs, their properties and an application for planar graphs.
CO5	Illustrate how one can represent a graph in a computer.
CO6	Explain the Vertex Colour problem in graphs and illustrate an example application for vertex colouring.

COURSE OUTCOMES	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2										3		
CO2	2	3	3											
CO3	3		3			3								
CO4	3		3							2		2		
CO5	3	2	1							2		3		
CO6	3	2												

1- Low correlation (Low), 2- Medium correlation (Medium), 3-High correlation (High)

PRINCIPAL
Sree Narayana Gurukulam
College of Engineering
Kadayiruppu, Kolenchery-682 311

Program Outcomes & Program Specific Outcomes			
PO1	Engineering Knowledge	PO8	Ethics
PO2	Problem Analysis	PO9	Individual & Team Work
PO3	Design & Development	PO10	Communication Skills
PO4	Investigations	PO11	Project Management & Finance
PO5	Modern Tools	PO12	Life Long Learning
PO6	Engineer & Society	PSO1	
PO7	Environment & Sustainability	PSO2	

JUSTIFICATION FOR MAPPING

MAPPING	LOW/ MEDIUM/ HIGH	JUSTIFICATION
CO1- PO1	H	Fundamental knowledge in graph theory will help to analyze the Engineering problems very easily
CO1- PO2	M	Fundamental knowledge in graph theory will help to analyze the Engineering problems
CO1- PO12	H	The concept of Graph theory has many real-life applications
CO2- PO1	M	Eulerian and Hamiltonian graphs can be used to solve Engineering problems
CO2- PO2	H	Eulerian graphs can be used to solve many practical problems like Konigsberg Bridge problem.
CO2- PO3	H	They can be used to by mail carriers who want to have a route where they don't retrace any of their previous steps.
CO3- PO1	H	Graph theoretic algorithms will help to enrich the analysis of Engineering problems
CO3- PO3	H	Algorithm s for graphs will help to provide valid conclusions to various complex engineering problems
CO3- PO6	H	Graph theoretical algorithms provides an easier access to the solutions in the professional engineering practice
CO4- PO1	H	Planar and non-planar graphs will help to solve problems with high complexity in Engineering
CO4- PO3	H	Difference between planar and non-planar graphs will help to design solutions to various complex engineering problem
CO4- PO10	M	Planar and non-planar graphs can be applicable in communication theory
CO4- PO12	M	Helps to identify real applications of Planar and non-Planar graphs
CO5- PO1	H	Computer aided graphical representations develop engineering knowledge

PRINCIPAL
Sree Narayana Gurukulam
College of Engineering
Kadayiruppu,Kolenchery-682 311

CO5- PO2	M	Many problems of real world can be represented by graphs
CO5- PO3	L	Graphs are used to define the flow of computation.
CO5- PO10	M	Graphs are used to represent network communication and data organization.
CO5- PO12	H	A graph is a basic data structure in computer science. It models relationships between data items. Using graphs to model real-world phenomena.
CO6- PO1	H	Basic knowledge in vertex color problem will help to model various problems in engineering field
CO6- PO2	M	Graph coloring problems helps cognitive development

GAPS IN THE SYLLABUS - TO MEET INDUSTRY/PROFESSION REQUIREMENTS			
SL. No	**DESCRIPTION**	**PROPOSED ACTIONS**	**PO/PSO**
1	Application of graphs in solving various Engineering problems	Reading	PO1, PO6, PO9, PO12
2	Importance of graph theoretic algorithms in different fields of our society	Reading	PO1, PO6, PO9, PO12

TOPICS BEYOND SYLLABUS/ADD -ON TOPICS			
SL.No	**DESCRIPTION**	**PROPOSED ACTIONS**	**PO/PSO**
1	Ramsey theory introduction	https://youtu.be/H6TCPlVP1bI	PO1, PO7, PO12
2	Hall's theorem and Konig's theorem	https://youtu.be/ezmES9Gy_GU	PO1, PO7, PO12

WEB SOURCE REFFERENCES:	
1	http://www.diestel-graph-theory.com/basic.html
2	https://en.wikipedia.org/wiki/Graph_theory

SNG COLLEGE OF ENGINEERING KADAYIRUPPU KOLENCHERY 682 311

PRINCIPAL
Sree Narayana Gurukulam
College of Engineering
Kadayiruppu, Kolenchery-682 311

ASSESSMENT TOOLS			
☑ ASSIGNMENTS	☐ STUD. SEMINARS	☑ TESTS/MODEL EXAMS	☑ UNIV. EXAMINATION
☐ STUD. LAB PRACTICES	☐ STUD. VIVA	☐ MINI/MAJOR PROJECTS	☐ OUTPUT
☐ RECORD	☐ QUIZ	☐ CASE STUDY	☐ GROUP DISCUSSION

WEIGHTAGE FOR DIFFERENT DIRECT ASSESSMENT TOOLS					
TEST1	TEST 2	ASSIGNMENT1	ASSIGNMENT2		UNIV.EXAM
10%	**10%**	**5%**	**5 %**		**70%**

TARGET FOR DIFFERENT DIRECT ASSESSMENT TOOLS					
TEST1	TEST 2	ASSIGNMENT1	ASSIGNMENT2		UNIV.EXAM
60%	**60%**	**90%**	**90%**		**60%**

SNG COLLEGE OF ENGINEERING KADAYIRUPPU KOLENCHERY 682 311

ICT TOOLS:	
1	PPT
2	NPTEL Video: https://youtu.be/5m2UWlqy6ww

PRINCIPAL
Sree Narayana Gurukulam
College of Engineering
Kadayiruppu, Kolencnery-682 311