هيئة تقويم التعليم والتدريب
Education & Training Evaluation Commission

T-104
2022

Course Specification

Course Title:	**Graph Theory and its Applications**
Course Code:	**324COMP-3**
Program:	**Bachelor in Computer Science**
Department:	**Computer Science**
College:	**College of Computer Science and Information Technology**
Institution:	**Jazan University**
Version:	**V2**
LastRevision Date:	**12 September 2021**

Table of Contents:

A. General information about the course:

Course Identification	
1. Credit hours:	
2. Course type	
a.	University ☐ College ☐ Department☒Track☐ Others☐
b.	Required ☒ Elective☐
3. Level/year at which this course is offered:	6
4. Course general Description	The course covers basic of Graph theory and applications in the field of computing science. The areas that will be studied are graphs, trees and networks. Topics related to graphs will include graph models, graph isomorphism, connectivity and traversability, planarity, distance in graphs, digraphs and networks. Tree related topics will include properties of trees, tree traversal, minimum spanning trees and use of trees in sorting and prefix codes. Algorithms on networks such as shortest path algorithm, minimal spanning tree algorithm and min-flow max-cut algorithm.
5. Pre-requirements for this course (if any): None	
6. Co- requirements for this course (if any): None	
7. Course Main Objective(s)	• Explain the basic concepts of graph theory. • Describe the graph representations and their usage in computer-based algorithms. • Identify graph operations like connectivity, isomorphism and traversability and distances and their use in basic algorithms. • Explain trees and their properties and use of tree algorithms in solving practical problems.

1. Teaching mode(mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1.	Traditional classroom	44	80%
2.	E-learning		
3.	Hybrid • Traditional classroom • E-learning		
4.	Distance learning (Self Learning)	11	20%

2. Contact Hours (based on the academic semester)

No	Activity	Contact Hours
1.	Lectures	22

2.	Laboratory/Studio	22
3.	Field	
4.	Tutorial	
5.	Others (specify)	8
	Total	52

B. Course Learning Outcomes (CLOs), Teaching Strategies and Assessment Methods

Code	Course Learning Outcomes	Code of CLOs aligned with program	Teaching Strategies	Assessment Methods
1.0	Knowledge and understanding			
1.1	**Demonstrate**thestructural types of graph and tree models.	K1	Class lectures and lecture notes	Midterm/ Assignment 1 / Final Exam/Final Lab
1.2	**Relate** recent trends and current research of graph applications with ICT.	K2	Class lectures and lecture notes	Midterm/ Assignment 1/ Final Exam
2.0	Skills			
2.1	**Apply**tree properties and algorithms techniques in different computing problems.	S1	Class lectures and lecture notes	Midterm/ Assignment 1 / Final Exam/Final Lab
2.2	**Create** and **compare** the shortest distance algorithms in graph networks.	S2	Class lectures and lecture notes	Midterm/ Assignment 2 / Final Exam/Final Lab
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3.0	Values, autonomy, and responsibility			
3.1	**Demonstrate** the ability to work in team to solve a common problem.	V2	Group Discussion, Team Activity	Assignments
3.2				
...				

C. Course Content

No	List of Topics	Contact Hours
1	**Graphs and Its Basic Terminology** Course contents, course distribution along the semester marks Introduction to graph theory and applications of combinatorics in the field of computing science. Graphs and graph models, connected graphs, common classes of graphs, multigraphs and digraphs, degree of vertex, regular graphs, degree sequences.	4T+4P
2	**Representation of Graphs, Isomorphism and connectivity:** Graphs and its representations, definition of isomorphism, isomorphism as a relation, determine whether two graphs are isomorphic by	4T+4P

	examples. Connectivity, cut vertices, edge vertices, vertex connectivity and edge connectivity. Strongly and weekly connected graphs and determine the length of path.	
3	**Traversability and planarity** Eulerian graphs, Hamiltonian graph and related Theorems with applications.Planar graphs, embedding graphs on surface, Euler's Formula, Kuratowski's Theorem.	4T+4P
4	**Distance in Graphs** Distance properties, locating numbers, radio numbers, weighted graphs, length of shortest path of weighted graphs.	4T+4P
5	**Trees** Trees and its basic properties, Balanced trees and m-ary trees, Application of tree, Decision tree, Huffman coding	4T+4P
6	**Tree Traversal and its algorithms** universal address, traversal algorithms, Spanning and minimum spanning trees and use of trees in sorting and prefix codes.	2T+2P
Total		22T+22P

D. Students Assessment Activities

No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
1.	Midterm Exam	6th-7th week	15%
2.	Assignment I	3rd week	10%
3.	Assignment II (Group assignment)	6th-7th week	15%
4.	Lab Exam/ Lab Assignment	As per schedule	20%
5.	Final Theory Exam	As per schedule	40%

*Assessment Activities (i.e., Written test, oral test, oral presentation, group project, essay, etc.)

E. Learning Resources and Facilities

1.References and Learning Resources

Essential References	• G. Chartrand and P. Zhang, "Introduction to graph theory", McGraw-Hill Publishing Company Limited, ISBN-13: 9780070616080, 2006. • Kenneth H. Rosen, "Discrete Mathematics and its applications", 7th Edition, McGraw-Hill, ISBN 978-0-07-338309-5, 2012.
Supportive References	• Reinhard Diestel, "Graph Theory", 5th Edition, Springer Verlag, ISBN: 978-3-662-53621-6, 2016. • S.S. Ray, Graph Theory with Algorithms and its Applications: In Applied Science and Technology, Springer, ISBN: 978-81-322-0750-4.
Electronic Materials	•
Other Learning Materials	Online tutorial

2. Required Facilities and equipment

Items	Resources
facilities (Classrooms, laboratories, exhibition rooms, simulation rooms, etc.)	• Classroom equipped with projector and whiteboard and sufficient seating arrangements.
Technology equipment (projector, smart board, software)	Whiteboards and projectors for classroom.
Other equipment (depending on the nature of the specialty)	

F. Assessment of Course Quality

Assessment Areas/Issues	Assessor	Assessment Methods
Effectiveness of teaching	Students	Indirect (Course evaluation survey form)
Effectiveness of students assessment	CRC / QAU / HoD	Direct (Course reports / result analysis)
Quality of learning resources	Track leaders / CRC	Indirect(Review, meetings and star rating with suggestions for further modification and improvements)
The extent to which CLOs have been achieved	CRC / QAU	Direct(CLO assessment template further verified

Assessment Areas/Issues	Assessor	Assessment Methods
		at course coordinator, Track leader and QAU level)
Other		

Assessor (Students, Faculty, Program Leaders, Peer Reviewer, Others (specify)
Assessment Methods(Direct, Indirect)

G. Specification Approval Data

COUNCIL /COMMITTEE	DEPARTMENT COUNCIL
REFERENCE NO.	
DATE	15/10/2022