هيئة تقويم التعليم والتدريب
Education & Training Evaluation Commission

T-104
2022

Course Specification

Course Title	: Design & Analysis of Algorithms
Course Code	:322-COMP-3
Program	: Bachelor of Computer Science
Department	: Computer Science
College	: College of Computer Science & 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:	3				
2. Course type					
a.	University ☐	College ☐	Department ☒	Track☐	Others☐
b.	Required ☒	Elective☐			
3. Level/year at which this course is offered:	**Level 9/Year 3**				

4. Course general Description

This course provides to the students a techniques for designing and analyzing algorithms such as brute-force, divide-and-conquer, decrease-and-conquer, Space and Time Trade Off(Boyer Moore Algorithm and Horspool Algorithm); They acquire some understanding on design techniques and algorithms that address an important set of well-defined problems: DFS and BFS shortest-path algorithms (Dijkstra's and Floyd's algorithms); transitive closure (Floyd's algorithm); minimum spanning tree (Prim's and Kruskal's algorithms); topological sort. In addition, the course will provide different complexity characteristics P and NP classes, NPcompleteness and reduction techniques**.**

5. Pre-requirements for this course (if any): None

6. Co- requirements for this course (if any): None

7. Course Main Objective(s)

1. Describe the notion of algorithms, fundamental of algorithm solving and data structures.
2. Analyze different design strategies of algorithms like divide-and-conquer, decrease-and conquer, Space and Time Trade off etc.
3. Demonstrate a familiarity with major algorithms and data structures.
4. Apply important algorithmic design paradigms and methods of analysis.
5. Explain how to discover the limitation of algorithm power as P, NP and NP-complete problem

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.	Distancelearning		
5.	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	Define the basics concepts of algorithmic analysis, data structure, asymptotic notations and efficiency classes.	K1	• Lectures/Presentations • Media Lectures	• Exam 1 • Assignment-1 • Final Theory Exam
1.2	Describe the fundamentals of algorithmic design paradigms.	K1	• Lectures/Presentations • Media Lectures	• Exam -1 • Assignment-1 • Final Theory Exam

Code	Course Learning Outcomes	Code of CLOs aligned with program	Teaching Strategies	Assessment Methods
2.0	Skills			
2.1	Analyze the appropriate algorithm design techniques for solving problems.	S1	• Lectures /Presentations • Media Lectures Tutorials	• Assignment - 1 • Group Assignment • Final Theory Exam • Final Lab
2.2	Implement and Evaluate the existing algorithms for a wide variety of problems.	S3	• Lectures /Presentations • Media Lectures • Tutorials • Lab Demonstration	• Group Assignment • Final Theory Exam • Final Lab Exam
2.3	Distinguish the concept of P and NP Complete Problems.	S2	• Lectures /Presentations • Media Lectures	• Group Assignment • Final Theory Exam
2.4	Apply the algorithm design Strategies like Horspool's Algorithm-Boyer Moore Algorithm for a given problem	S2	• Lectures/Presentations • Media Lectures	• Group Assignment • Final Theory • Final Lab
3.0	Values, autonomy, and responsibility			
3.1	Demonstrate the ability to work as a team member for analyzing, developing and evaluating an algorithm for the given problems.	V2	• Group Discussion	• Group Assignment

C. Course Content

No	List of Topics	Contact Hours
1.	**Introduction:** Notion of Algorithm, Fundamentals of Algorithmic Problem Solving, Exercises	2T+2P
2.	**Fundamentals of the Analysis of Algorithm Efficiency:** Analysis Framework, Asymptotic Notations and Basic Efficiency Classes, Mathematical Analysis of Non-recursive Algorithms, Mathematical Analysis of Recursive Algorithms, Exercises	4T+4P
3.	**Brute Force & Exhaustive Search:** Selection Sort and Bubble Sort, Sequential Search & Brute-Force String Matching, Closest-Pair problem and Convex-Hull Problems. self-study Topic(s): Exhaustive Search, Knapsack Problem, Travel Salesman Problem ,Assignment Problem	2T+2P
4.	**Decrease-and-Conquer:** Variation in decrease and Conquer, Insertion Sort, Topological Sorting, Decrease-by-a-Constant-Factor Algorithms, Binary Search, Exercises	2T+2P
5.	**Divide-and-Conquer:** Divide & Conquer Technique, Master Theorem Merge Sort, Quick Sort, Exercises. **Transform and Conquer technique.** self-study Topic(s): Gaussian Elimination, Horner Rule, Exercises	2T+2P
6.	**Space and Time Trade off:** Input enhancement in String matching, Horspool's Algorithm, Shift table Algorithm, Horspool matching algorithm, Boyer-Moore Algorithm, Exercises	4T+4P
7.	**Dynamic Programming:** Dynamic Programming Technique, Warshall's and Floyd's Algorithms, Exercises	2T+2P
8.	**Greedy Techniques**: Prim's Algorithm, , Huffman Trees and Codes, Exercises self-study Topic(s): Kruskal's Algorithm **Limitations of Algorithm Power:** Decision Tree, Decision trees for Sorting, P, NP, and NP-complete	4T+4P
Total		22T + 22P

D. Students Assessment Activities

No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
1.	Assignment-1	3rd Week	10%
2.	Mid Exam	7th Week	15%
3.	Group Assignment	9th Week	15%
4.	Lab Assignment	9th Week	10%
5.	Final Lab Exam	11th Week	10%
6.	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	Introduction to Algorithms, MIT Press, Third Edition, Thomas H. Cormen, Charles E Leiserson, and Ronald Rivest ,2009, ISBN13 : 978-0262033848
Supportive References	
Electronic Materials	• https://www.javatpoint.com/daa-tutorial • https://www.academia.edu/38287655/Design_and_analysis_of_algorithms_tutorial • https://www.tutorialspoint.com/design_and_analysis_of_algorithms/index.htm • https://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-046j-design-and-analysis-of-algorithms-spring-2015/
Other Learning Materials	Online Tutorials

2. Required Facilities and equipment

Items	Resources
facilities (Classrooms, laboratories, exhibition rooms, simulation rooms, etc.)	Classroom equipped with projector, whiteboard, and sufficient seating arrangements. Lab with software installed and individual computer terminal for each student.
Technology equipment (projector, smart board, software)	Whiteboards and projectors for classroom and lab Following software for lab work: NetBeans IDE 8.2
Other equipment (depending on the nature of the specialty)	None

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 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	28-12-2022