هيئة تقويم التعليم والتدريب
Education & Training Evaluation Commission

2023
TP-153

Course Specification
(Bachelor)

Course Title: Design & Analysis of Algorithm
Course Code: COMP-322
Program: Bachelor in Computer Science
Department: Computer Science
College College of Engineering & Computer Science
Institution: Jazan University
Version: V2
Last Revision Date: 08-MAY-2024

Table of Contents

A. General information about the course:

1. 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: Level 6 /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, NP completeness and reduction techniques.

5. Pre-requirements for this course (if any)**: 321-COMP-3 (**Data Structures and Algorithms)

6. Pre-requirements for this course (if any)**:**

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

2. Teaching mode(mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	Traditional classroom	60	100%
2	E-learning		
3	Hybrid • Traditional classroom • E-learning		
4	Distance learning		

3. Contact Hours (based on the academic semester)

No	Activity	Contact Hours
1.	**Lectures**	28
2.	**Laboratory/Studio**	28
3.	**Field**	
4.	**Tutorial**	
5.	**Others (specify)**	4
Total		60

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	• Midterm Exam • Assignment1 • Final Theory Exam
1.2	Describe the fundamentals of algorithmic design paradigms.	K1	• Lectures/Presentations • Media Lectures	• Midterm Exam • Assignment1 • 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	• 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
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, Exhaustive Search, Knapsack Problem, Travel Salesman Problem, Assignment Problem	**4T+4P**
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:** Major variations of transform & conquer Gaussian Elimination, Horner Rule, Exercises	**6T+6P**
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 Kruskal's Algorithm, Dijkstra's Algorithm, Exercises **Limitations of Algorithm Power**: Class P, NP, and NP-complete problem. Reduction.	**4T+4P**
Total		**28T+28P**

D. Students Assessment Activities

No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
1.	Assignment-1	**5th Week**	**10%**
2.	Mid Exam	**9th Week**	**15%**
3.	Group Assignment	**11th Week**	**15%**
4.	Lab Assignment	**11th Week**	**10%**
5.	Final Lab Exam	**As per schedule**	**10%**
6.	Final Theory Exam	**As per schedule**	**40%**

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

E. Learning Resources and Facilities

1. References and Learning

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_analys • https://ocw.mit.edu/courses/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		

Assessors (Students, Faculty, Program Leaders, Peer Reviewer, Others (specify)

Assessment Methods (Direct, Indirect)

G. Specification Approval

COUNCIL /COMMITTEE	DEPARTMENT COUNCIL
REFERENCE NO.	
DATE	