اعتماد
NCAAA

T4

2020

Course Specifications

Course Title:	Advanced Algorithm Design and Analysis
Course Code:	501PMAI-3
Program:	Professional Master of Artificial Intelligence
Department:	Computer Science
College:	Computer Science and information systems
Institution:	Najran University

Table of Contents

A. Course Identification

1. Credit hours:	

2. Course type

a.	University	☐	College	☐	Department	√	Others	☐
b.		Required	√	Elective	☐			

3. Level/year at which this course is offered: Year 1/ Level 1
4. Pre-requisites for this course (if any)**: N/A**
5. Co-requisites for this course (if any)**: N/A**

6. Mode of Instruction (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	**Traditional classroom**	50	100%
2	**Blended**		
3	**E-learning**		
4	**Distance learning**		
5	**Other**		

7. Contact Hours (based on academic semester)

No	Activity	Contact Hours
1	**Lecture**	30
2	**Laboratory/Studio**	20
3	**Tutorial**	
4	**Others** (specify)	
	Total	50

B. Course Objectives and Learning Outcomes

1. Course Description
This course is on the design, analysis and complexity of algorithms. It introduces students to advanced techniques for solving problems (divide and concurrent backtracking, greedy, etc.) Sorting algorithms, graph algorithms, and NP completeness.

2. Course Main Objective
The objective of this course is twofold: studying in depth main concepts in computational complexity and strengthen the level of students in terms of understanding, designing and analyzing some advanced and complex problems related especially to graphs, operation research, and computational Geometry.

3. Course Learning Outcomes

	CLOs	Aligned PLOs
1	**Knowledge and Understanding**	
1.1	Describe the key concepts of algorithm design strategies.	K1
1.2	Explain different algorithm techniques and their practical implementations.	K1, K2
1.3		
2	**Skills :**	
2.1	Design algorithms for a specific problem.	S1, S4
2.2	Apply algorithm design approaches in a problem specific manner.	S2
2.3	Develop appropriate algorithm design for solving real problems.	S2, S4
3	**Values:**	
3.1	Communicate clearly and effectively using the technical language of the field.	C2
3.2		
3.3		

C. Course Content

No	List of Topics	Contact Hours
1	Review of Basic algorithms design and analysis	3
2	Randomized Algorithms	3
3	Lower Bounds on Sorting Problem	3
4	Sorting in Linear Time	3
5	Median and Order Statistics	3
6	Heaps, Priority Queues	3
7	Divide and Conquer Paradigm	3
8	Dynamic Programming	4
9	Greedy Algorithms	5
10	Amortized Analysis	5
11	Graph Algorithms	6
12	Geometric Algorithms	3
13	Complexity and Approximation	6
Total		50

D. Teaching and Assessment

1. Alignment of Course Learning Outcomes with Teaching Strategies and Assessment Methods

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
1.0	**Knowledge and Understanding**		
1.1	Describe the key concepts of algorithm design strategies	Lectures, Group Discussion and Case studies	Quiz Assignment Midterm Examination Final Examination
1.2	Explain different algorithm techniques and their practical implementations		
2.0	**Skills**		

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
2.1	Design algorithms for a specific problem.	Lectures, Group Discussion and Case studies	Quiz Assignment Midterm Examination Final Examination
2.2	Apply algorithm design approaches in a problem specific manner.		
2.3	Develop appropriate algorithm design for solving real problems		
3.0	**Values**		
3.1	Communicate clearly and effectively using the technical language of the field.		Mini-Project

2. Assessment Tasks for Students

#	Assessment task*	Week Due	Percentage of Total Assessment Score
1	Quiz1	3rd week	5%
2	Midterm	6th week	20%
3	Mini-Project	13th week	15%
4	Assignments	2nd ,4th ,7th, 11th week	15%
5	Quiz2	10th week	5%
7	Final Exam	12th or 13th week	40%
8			

Assessment task (i.e., written test, oral test, oral presentation, group project, essay, etc.)

E. Student Academic Counseling and Support

Arrangements for availability of faculty and teaching staff for individual student consultations and academic advice:

- Weekly office hours
- Pre-booked Appointments
- Additional office hours prior exams
- Weekly academic advising hours

F. Learning Resources and Facilities

1.Learning Resources

Required Textbooks	• T. Cormen, C. Leiserson, R. Rivest, and C. Stein. Introduction to Algorithms, 3rd Edition, McGraw-Hill, 2009
Essential References Materials	• J. Kleinberg, E. Tardos. Algorithm Design, Pearson, 2009 • S. Dasgupta, C. Papadimitrou, U. Vazirani. Algorithms, McGraw-Hill, 2006

Electronic Materials	
Other Learning Materials	

2. Facilities Required

Item	Resources
Accommodation (Classrooms, laboratories, demonstration rooms/labs, etc.)	
Technology Resources (AV, data show, Smart Board, software, etc.)	Data show, PCs.
Other Resources (Specify, e.g. if specific laboratory equipment is required, list requirements or attach a list)	• Printer is important to print reports and some snapshots. • Projector and PC for the instructor is required.

G. Course Quality Evaluation

Evaluation Areas/Issues	Evaluators	Evaluation Methods
Online course survey	Students	Indirect
course learning outcomes achievement survey	Students	Indirect
achievement of course learning outcomes	instructor	Direct

Evaluation areas (e.g., Effectiveness of teaching and assessment, Extent of achievement of course learning outcomes, Quality of learning resources, etc.)
Evaluators (Students, Faculty, Program Leaders, Peer Reviewer, Others (specify)
Assessment Methods (Direct, Indirect)

H. Specification Approval Data

Council / Committee	Computer Science Department council
Reference No.	00002-0185-14440203
Date	1st Sep, 2022