هيئة تقويم التعليم والتدريب
Education & Training Evaluation Commission

اعتماد
NCAAA
T4
2020

Course Specifications

Course Title:	**ANALYSIS AND DESIGN OF ALGORITHMS**
Course Code:	**501435-3**
Program:	**Bachelor in Computer Science**
Department:	**Department of Computer Science**
College:	**College of Computers and Information Technology**
Institution:	**Taif University**

Table of Contents

A. Course Identification

1. Credit hours: 3

2. Course type

a. University □ College □ Department ☒ Others □

b. Required ☒ Elective □

3. Level/year at which this course is offered: 10th Level/4

4. Pre-requisites for this course (if any)**:**
501324-3

5. Co-requisites for this course (if any)**:**
None

6. Mode of Instruction (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	**Traditional classroom**	5	100
2	**Blended**	0	0
3	**E-learning**	0	0
4	**Distance learning**	0	0
5	**Other**	0	0

7. Contact Hours (based on academic semester)

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

B. Course Objectives and Learning Outcomes

1. Course Description

Algorithm is the central concept of Computer Science. This course provides introduction to algorithm design and analysis. Students study techniques for designing algorithms and for analyzing the time and space efficiency of algorithms. The algorithm design techniques include divide-and-conquer, greedy technique, dynamic programming, backtracking and branch and bound. The algorithm analysis includes computational models, computational complexity, and computation of best, average and worst case complexity. The course also includes study of limits of algorithmic methods (e.g. NP-hard, NP-complete problems).

2. Course Main Objective

Students at the end of this course are able to:

- Understand different algorithm design techniques
- Design an efficient algorithm for a given task using the most suitable design technique
- Understand major classical algorithms available for different tasks

- Analyze the algorithms for different problems.

Ability to differentiate between problems that can be solved by polynomial time algorithm and problems for which no polynomial time algorithm is known.

3. Course Learning Outcomes

	CLOs	Aligned PLOs
1	**Knowledge and Understanding**	
	Describe principles of algorithm design	K1
2	**Skills :**	
2.1	Apply mathematical preliminaries to design and analyze stages of different types of algorithms	S1
2.2	Analyze the performance of different algorithms	S1
2.3	Design an efficient algorithm for a particular task	S2
2.4	Compare problems that can be solved by polynomial time algorithm and problems for which no polynomial time algorithm is known	S2
3	**Values:**	

C. Course Content

No	List of Topics	Contact Hours
1	Algorithm-Introduction, Computational Model, Pseudocode	5
2	Algorithmic Analysis, Growth Rate, Asymptotic Notation	5
3	Recurrence Equations, Solving recurrence equations	10
4	Time and space complexities, Average, best and worst case analysis	5
5	Divide and Conquer Technique	5
6	Greedy Technique, Dynamic Programming	10
7	Backtracking Technique, Branch and Bound Technique	5
8	NP-Complete Problems: Basic Concepts and Problems	5
	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**		
	Understand principles of algorithm design	Lectures/Tutorial	**Direct Assessment Tool** Quizzes / Homework/Excercise / Exams **Indirect Assessment Tool** Course Exit Survey
2.0	**Skills**		

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
2.1	Apply mathematical preliminaries to design and analyze stages of different types of algorithms	Lectures/Tutorial	**Direct Assessment Tool** Quizzes / Homework/ Exams **Indirect Assessment Tool** Course Exit Survey
2.2	Analyze the performance of different algorithms	Lectures/Tutorial	**Direct Assessment Tool** Quizzes / Homework/ Exams **Indirect Assessment Tool** Course Exit Survey
2.3	Design an efficient algorithm for a particular task	Lectures/Tutorial/ Project	**Direct Assessment Tool** Quizzes / Homework/ Exams **Indirect Assessment Tool** Course Exit Survey
2.4	Compare problems that can be solved by polynomial time algorithm and problems for which no polynomial time algorithm is known	Lectures/Tutorial	**Direct Assessment Tool** Quizzes / Homework/ Exams **Indirect Assessment Tool** Course Exit Survey
3.0	**Values**		

2. Assessment Tasks for Students

#	Assessment task*	Week Due	Percentage of Total Assessment Score
1	Project	Week 10	10%
2	Quizzes	Week 2, 3 & 7	20%
3	Mid-Term	Week 6	30%
4	Final Examination	Week 12	40%

***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:

- 6 hours per week in pre-determined office hours
- Consultation by appointment (as needed)
- Through emails
- Through BlackBoard Learn

F. Learning Resources and Facilities

1.Learning Resources

Required Textbooks	Ellis Horowitz, Sartaj Sahni and Sanguthevar Rajasekaran, Computer Algorithms, 2008 ISBN-10: 9788173716126 ISBN-13: 978-8173716126
Essential References Materials	Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest and Clifford Stein, Introduction to Algorithms, MIT Press, 1989. ISBN: 0262533057, 9780262533058
Electronic Materials	● http://openclassroom.stanford.edu/MainFolder/CoursePage.php?course=IntroToAlgorithms ● https://www.tru.ca/distance/courses/comp3051.html https://www.tutorialspoint.com/design_and_analysis_of_algorithms/
Other Learning Materials	

2. Facilities Required

Item	Resources
Accommodation (Classrooms, laboratories, demonstration rooms/labs, etc.)	● Classroom with 25 chairs Lab with 15 PCs and required software tools ●
Technology Resources (AV, data show, Smart Board, software, etc.)	● Video projector / data show ● White board
Other Resources (Specify, e.g. if specific laboratory equipment is required, list requirements or attach a list)	

G. Course Quality Evaluation

Evaluation Areas/Issues	Evaluators	Evaluation Methods
Effectiveness of Teaching	● Students	Students surveys and Students course evaluation ●
Improvement of Teaching	● Course Coordinator	● Deficiencies based on the student Evaluation, faculty input, course file, and program assessment
Verifying Standards of Student Achievement	● Curriculum Committee	● Review CAF (Course assessment file) ● Alumni surveys. ● Periodic exchange and remarking of tests or a sample of assignments with staff at another

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	CS council
Reference No.	Meeting #12
Date	23-10-1443

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