هيئة تقويم التعليم والتدريب
Education & Training Evaluation Commission

2023
TP-153

Course Specification
(Bachelor)

Course Title:	Analysis and Design of Algorithms
Course Code:	501435-3
Program:	Bachelor of Computer Science
Department:	Department of Computer Science
College:	College of Computers and Information Technology
Institution:	Taif University
Version:	1
Last Revision Date:	19-01-2024

Table of Contents

A. General information about the course:

1. 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: (7th Level/4)					
4. Course general 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).					
5. Pre-requirements for this course (if any)**:**					
501324-3					
6. Co-requirements for this course (if any)**:**					
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7. Course Main Objective(s):					

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.**

2. Teaching mode (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	Traditional classroom	3	100%
2	E-learning		
3	Hybrid Traditional classroom E-learning	0	0
4	Distance learning	0	0

3. Contact Hours (based on the academic semester)

No	Activity	Contact Hours
1.	**Lectures**	45
2.	**Laboratory/Studio**	-
3.	**Field**	-
4.	**Tutorial**	-
5.	**Others (specify)**	-
Total		45

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	Understand principles of algorithm design	**K1**	Lectures Tutorials	**Direct Assessment Tool** Quizzes / Homework/Project/ Exams **Indirect Assessment Tool** Course Exit Survey
1.2				
1.3				
2.0	**Skills**			
2.1	Apply mathematical preliminaries to design and analyze stages of different types of algorithms	**S1**	Lectures Tutorials	**Direct Assessment Tool** Quizzes / Homework/Project/ Exams **Indirect Assessment Tool** Course Exit Survey
2.2	Analyze the performance of different algorithms	**S1**	Lectures Tutorials	**Direct Assessment Tool** Quizzes / Homework/Project/ Exams **Indirect Assessment Tool** Course Exit Survey

Code	Course Learning Outcomes	Code of CLOs aligned with program	Teaching Strategies	Assessment Methods
2.3	Design an efficient algorithm for a particular task	**S2**	Lectures Tutorials Project	**Direct Assessment Tool** Quizzes / Homework/Project/ 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	**S2**	Lectures Tutorials	**Direct Assessment Tool** Quizzes / Homework/Project/ Exams **Indirect Assessment Tool** Course Exit Survey
3.0	**Values, autonomy, and responsibility**			
3.1				
3.2				

C. Course Content

No	List of Topics	Contact Hours
1.	**Algorithm-Introduction, Computational Model, Pseudocode**	**3**
2.	**Algortihmic Analysis, Growth Rate, Asymptotic Notation**	**3**
3.	**Recurrence Equations, Solving recurrence equations**	**3**
4.	**Time and space complexities, Average, best and worst case analysis**	**6**
5.	**Divide and Conquer Technique**	**6**
6.	**Greedy Technique, Dynamic Programming**	**12**
7.	**Backtracking Technique, Branch and Bound Technique**	**6**
8.	**NP-Complete Problems: Basic Concepts and Problems**	**6**
Total		**45**

D. Students Assessment Activities

No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
1.	Project	**Week 12**	**10%**
2.	Quizzes	**Week 3, 5 & 9**	**20%**
3.	Mid-Term	**Week 7**	**30%**
4.	Final Examination	**Week 16**	**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	**Ellis Horowitz, Sartaj Sahni and Sanguthevar Rajasekaran, Computer Algorithms, 2008** **ISBN-10: 9788173716126** **ISBN-13: 978-8173716126**
Supportive References	**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. Required Facilities and equipment

Items	Resources
facilities (Classrooms, laboratories, exhibition rooms, simulation rooms, etc.)	• Classroom with 25 chairs • Lab with 15 PCs and required software tools
Technology equipment (projector, smart board, software)	• Video projector / data show • White board
Other equipment (depending on the nature of the specialty)	

F. Assessment of Course Quality

Assessment Areas/Issues	Assessor	Assessment Methods
Effectiveness of teaching	• Students • Faculty members • Coordinator • Council • Curriculum Committees	• Course exit survey • Feedback from Faculty members • Feedback from Course Coordinator • Feedback from council • Feedback from Curriculum Committees
Effectiveness of Students assessment	• Students • Faculty members • Coordinator	• Course exit survey • Feedback from Faculty members

Assessment Areas/Issues	Assessor	Assessment Methods
	• Council • Curriculum Committees	• Feedback from Course Coordinator • Feedback from council • Feedback from Curriculum Committees
Quality of learning resources	• Students • Faculty members • Coordinator • Council • Curriculum Committees	• Course exit survey • Feedback from Faculty members • Feedback from Course Coordinator • Feedback from council • Feedback from Curriculum Committees
The extent to which CLOs have been achieved	• Students • Faculty members • Coordinator • Council • Curriculum Committees	• Course exit survey • Feedback from Faculty members • Feedback from Course Coordinator • Feedback from council • Feedback from Curriculum Committees
Other		

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

Assessment Methods (Direct, Indirect)

G. Specification Approval

COUNCIL /COMMITTEE	CS council
REFERENCE NO.	Meeting #11
DATE	07/03/2024