جمهورية مصر العربية
وزارة التعليم العالي والبحث العلمي
Ministry of Higher Education and Scientific Research

SH. A.
أكاديمية الشروق

المعهد العالى للحاسبات وتكنولوجيا المعلومات
مدينة الشروق ـ القاهرة
شعبة علوم الحاسب

Course specification

Course Code: CS 312

Course Title: **Analysis of algorithms**

Academic Year: 2023/2024

Course specification

(CS 312 - Analysis of algorithms)

Course Outline	
Faculty:	*HICIT- (**Higher Institute for Computers & Information Technology**-El Shorouk Academy)*
Programme(s) on which the course is given:	Undergraduate program in Computer Science
Major or minor element of programme:	Compulsory
Department offering the program	Department of Computer Science
Department offering the course:	Department of Computer Science
Level	Third Level
Date of specification approval	08/08/2023

Basic Information				
Code:	CS 312	***Title:***	**Analysis of algorithms**	
Prerequisites:		CS 201 Data Structure		
Weekly Hours:				
Lecture: 2		**Exercise: -**	**Practical: 2**	**Total:** 3 credit hours

Professional Information
Course Aims:
Upon completing this course, the student will have learned, through appropriate classroom and laboratory experiences, the following. - The main classic algorithms in various domains. -Techniques for designing efficient algorithms. - Applying the algorithms and design techniques to solve problems. - Having a sense of the complexities of various problems in different domains.

a4	Demonstrate basic knowledge and understanding of a core of analysis, algebra, applied mathematics and statistics.
a14	Demonstrate strong knowledge of fundamentals of Data Warehousing, data structures and algorithms.
a21	Identify Modeling and design of computer-based systems bearing in mind the trade-offs
b1	Define traditional and non-traditional problems, set goals towards solving them, and observe results.
b2	Perform comparisons between (algorithms, methods, techniques, etc.).
b3	Perform classifications of (data, results, methods, techniques, algorithms, etc.).
b4	Identify attributes, components, relationships, patterns, main ideas, and errors.
b5	Summarize the proposed solutions and their results.
b6	Restrict solution methodologies upon their results.
b7	Establish criteria, and verify solutions.
b17	Synthesize ideas, proposals and designs effectively using rational and reasoned arguments for presentation to a range of audiences.
c5	Specify, design, and implement and manage computer-based systems.
c6	Evaluate systems in terms of general quality attributes and possible trade-offs presented within the given problem.
c10	Deploy effectively the tools used for the construction and documentation of software, with particular emphasis on understanding the whole process involved in using computers to solve practical problems.
c16	Apply tools and techniques for the design and development of applications.
d9	Manage one's own learning and development.

Program ILOs Covered by Course			
Knowledge and understanding	**Intellectual Skills**	**Professional and practical skills**	**General and Transferable skills**
A3,A4, A5, A9, A14, A21	**B1, B2, B3, B4**	**C5, C6, C10**	**D1, D2, D8, D9**

Intended learning outcomes of course (ILOs)

a. <u>Knowledge and Under-Standing:</u>

On successful completion of the course, graduates should be able to:

a1. Understand the concept of asymptotic notation of time analysis and complexity.
a2. Comprehend variety of useful algorithms.
a3. Understand the principles and techniques for algorithm design.
a4. Comprehend the essential mathematics relevant to algorithms.
a5. Understand the analysis and applied mathematics relevant to the topic.

b. <u>Intellectual Skills:</u>

On successful completion of this course, graduates should be able to:

b1. Prove the correctness of simple algorithms. []
b2. Define traditional and nontraditional problems, set goals towards solving them. []
b3. Perform comparisons between (algorithms, methods, techniques, etc.)[]
b4. Perform classifications of (methods, techniques, algorithms, etc.)[]
b5. Summarize the proposed solutions and their results arguments.[]

c. <u>Professional and practical skills</u>

On successful completion of this course, graduates should be able to:

c1. Use the divide-and-conquer, greedy, and dynamic programming paradigms to design algorithms.
c2. Evaluate algorithms in terms of their time analysis within the given problem.
c3. Specify and apply the main methodologies for designing algorithms.
c4. Evaluate systems in terms of general quality attributes and possible tradeoffs presented within the given problem.
c5. Deploy effectively the tools used for designing and analyzing the algorithms.

d. General and transferable skills

On successful completion of this course, graduates should be able to:

d1. Manage tasks effectively.
d2. Manage one's own learning and development, including time management.
d3. Search for information and adopt life-long self-learning.
d4. Communicate effectively by oral, written and visual means.
d5. Work effectively as an individual and as a member of a team

Contents		
Topic	**Contact Hours**	
	lecture	**Lab**
Algorithm concept. Analysis & complexity.	2	2
Design methods such as Divide & conquer, concept passing through, binary search.	2	2
merge sort, quick sort.	4	4
selection and matrix multiplication..	2	2
Greedy method concept passing through,	4	4
shortest paths, Minimum spanning tree.	4	4
optimal search trees. Backtracking: the general method,	2	2
8 queens	4	4
Distributed algorithms.	4	4

Teaching and learning methods	
Teaching and learning methods	**Used**
Lectures	√
Tutorial Exercises	√
Practical Lab	√
Discussions.	√
Self – Learning (Reading material, Websites search,)	-
Self-studies	-

Group work	-
Presentation	-
Problem solving/problem solving learning based	
Case study	-
Synchronous E-Learning	-
Video lectures	-
Asynchronous E-Learning	-

Student assessment methods & Schedule		
Methods	**Used**	**Week#**
Midterm Exam	√	**8**
Final Exam	√	**16**
Course Work & Quizzes	√	**2-14**

Assessment Weight	
Assessment	Weight %
Mid Term Exam	10%
Final Exam	80%
Course Work & Quizzes	10%
Total	100

Course Work &Quizzes
Short Exams, Assignments, Research, Reports, Presentations
Class/Project discussion

List of references	
Essential books (textbooks)	(Textbooks)S. Dasgupta, C. H. Papadimitriou, and U. V. Varian, Algorithms, McGraw-Hill, 2007.
Course notes	E-Learning Portal
Recommended books	Cormen, Leiserson, Rivest, Stein, Introduction to Algorithms, (second edition) MIT Press, 2002.
Periodicals, website	
Videos link	

Required Facilities		
Tools & SW (Technology facilities):	- Visual studio.Net - Microsoft TEAMS to create virtual classrooms for lectures, discussions for project. - Academy Portal (MOODLE) to make electronic quizzes and electronic midterm exam. - Academy Portal (MOODLE) to upload project deliverable and assignment. - Academy portal (MOODLE) to upload electronic material.	
Teaching facilities:	Whiteboard	√
	Computer Lab	-
	Data show	√
	E-Learning	√
	Videos	√
	Website	√

Course Content/ILO Matrix																				
Course Contents	**Knowledge & understanding**					**Intellectual skills**					**Professional and practical skills**					**General**				
	a1	**a2**	**a3**	**a4**	**a5**	**b1**	**b2**	**b3**	**b4**	**b5**	**c1**	**c2**	**c3**	**c4**	**c5**	**d1**	**d2**	**d3**	**d4**	**d5**
Algorithm concept. Analysis & complexity.	x	X	x	x	x							x	x	x	x				X	
Design methods such as Divide & conquer, concept passing through, binary search.	x	X	x	x	x	x		x			x	x	x	x	x			x	x	
merge sort, quick sort.	x	X	x	x	x	x	x					x	x	x	x		X			X
selection and matrix multiplication..	x	x	x	x	x	x	x					x	x	x	x			x		
Greedy method concept passing through,	x	x	x	x	x			x				x	x	x	x			X		X
shortest paths, Minimum spanning tree.	x	x	x	x	x	x				x		x	x	x	x		X		X	X
optimal search trees. Backtracking: the general method,	x	x	x	x	x				x			x	x	x	x		x	X	X	
8 queens	x	x	x	x	x							x	x	x	x			X	x	

Learning Method /ILOs Matrix																				
Learning Methods	Knowledge and understanding					Intellectual skills					Professional and practical skills					General				
	a1	a2	a3	a4	A5	b1	b2	b3	b4	B5	c1	c2	c3	c4	c5	d1	d2	d3	d4	d5
Lectures	x	x	x	x		x	x	x	x		x	x	x	x	x					
Tutorial Exercises						x	x	x	x		x	x	x	x	x					
Reading material																				
Websites search																				
Research and reporting																				
Problem solving																				
Group work																				
Case study																				
Practical Lab						x	x	x	x		x	x	x	x	x					
Discussions.						x	x	x	x		x	x	x	x	x	x	x	x	x	x

Assessment Methods /ILOs Matrix																				
Assessment Methods	Knowledge & understanding					Intellectual skills					Professional & practical skills					General				
	a1	a2	a3	a4	a5	b1	b2	b3	b4	b5	c1	c2	c3	c4	c5	d1	d2	d3	d4	d5
Mid Term Exam	x	x	x	x		x	x	x	x		x	x	x	x	x					
Final Exam	x	x	x	x		x	x	x	x		x	x	x	x	x					
Course Project																				
Course Work &Quizzes	x	x	x	x		x	x	x	x		x	x	x	x	x	x	x	x	x	x
Practical Exam																				

Course ILOs Vs Program ILOs																		
Prog ILOs / *Course ILOs*		Knowledge & understanding						Intellectual skills				Professional and practical skills			General			
		A3	A4	A5	A9	A14	A21	B1	B2	B3	B4	C5	C6	C10	D1	D2	D8	D9
Knowledge and Understanding	a1		√		√													
	a2			√		√	√											
	a3	√			√		√											
	a4			√			√											
	a5	√		√														
Intellectual skills	b1						√	√	√									
	b3									√	√							
	b3							√	√		√							
	b4							√			√							
	b5							√	√									
Professional and practical skills	c1											√	√	√				
	c2												√	√				
	c3											√						
	c4											√	√	√				
	c5												√	√				
General skills	d 1														√	√	√	√
	d2														√		√	√
	d3															√		
	d4														√		√	√
	d5															√		√

Course Coordinator : Dr. Salah Elewa ( )
Head of Department : Dr. Ahmed El-Abbassy **( )**
Date: --/--/2023