

Course specification

(3205 Analysis & design of algorithms)

Faculty:	<i>HICIT- Higher Institute for Computers & Information Technology-El Shorouk Academy</i>
Programme(s) on which the course is given:	Under graduate program in Computer Science
Major or minor element of programme:	Compulsory
Department offering the programme	Department of Computer Science
Department offering the course:	Department of Computer Science
Year / Class	3 rd Year – 2 nd semester
Date of specification approval	1/1/2022

A- Basic Information

Title : Analysis & design of algorithms	Code: 3205		
Weekly Hours:			
Lecture : 3	Exercise: -	Practical :3	Total: 6

B- Professional Information

1- Course Objectives:

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.

2- Program ILOs Covered by Course

Program Intended Learning Outcomes			
Knowledge and understanding	Intellectual Skills	Professional and practical skills	General and Transferable skills
A4, A14, A21	B1, B2, B3, B4, B5, B6, B7, B17	C5, C6, C10, C16	D9

2. Intended Learning Outcomes (ILOs) of the course

a. Knowledge and Understanding Skills

- a1. Explain asymptotic notation of time analysis and complexity. [A4]
- a2. Discuss a variety of useful algorithms. [A4, A14]
- a3. Identify the principles and techniques for algorithm design. [A4, A14, A21]

- a4. Define the essential mathematics relevant to algorithms. [A4]
- a5. Outline a core of analysis and applied mathematics. [A4,A14]

b. Intellectual Skills

- b1. Prove the correctness of simple algorithms. [B2, B7]
- b2. Define traditional and non-traditional problems, set goals towards solving them. [B1]
- b3. Perform comparisons between (algorithms, methods, techniques, etc.) [B2]
- b4. Perform classifications of (methods, techniques, algorithms, etc.) [B3]
- b5. Summarize the proposed solutions and their results arguments. [B4, B5, B6, B7, B17]

c. Professional and Practical Skills

- c1. Use the divide-and-conquer, greedy, and dynamic programming paradigms to design algorithms. [C5]
- c2. Evaluate algorithms in terms of their time analysis within the given problem.[C5]
- c3. Specify and apply the main methodologies for designing algorithms. [C5, C16]
- c4. Evaluate systems in terms of general quality attributes and possible tradeoffs presented within the given problem. [C6]
- c5. Deploy effectively the tools used for designing and analyzing the algorithms.[C10, C16]

d. General and Transferable Skills

- d1. Manage tasks effectively. [D9]
- d2. Manage one's own learning and development, including time management. [D9]
- d3. Search for information and adopt life-long self-learning. [D9]
- d4. Communicate effectively by oral, written and visual means. [D9]
- d5. Work effectively as an individual and as a member of a team. [D9]

3- Contents

Topic	Hours	Lec.	Exc/Lab
Algorithm concept. Analysis & complexity.	6	3	3
Design methods such as Divide & conquer, concept passing through, binary search.	6	3	3
Merge sort, quick sort.	12	6	6
Selection and matrix multiplication..	6	3	3
Greedy method concept passing through,	9	3	6
Shortest paths, Minimum spanning tree.	9	6	3
Optimal search trees. Backtracking: the general method,	12	6	6
8 queens	6	3	3
Distributed algorithms.	9	3	6
Selected Topics	3	3	-

4 -Teaching and learning methods

Teaching and learning methods	Used
Active Learning	
Lectures	√
Tutorial Exercises	√
Practical Lab	√
Exercises	-
Discussions.	-
Self – Learning strategy	
Reading material	√
Websites search	-
Research and reporting	-
Self-studies	-
Experimental strategy	
Group work	-
Presentation	-
Problem solving strategy	
Problem solving/problem solving learning based	√
Case study	-
Synchronous E-Learning	
Virtual lab	-
Virtual class	-
Chat Room	-
Video lectures	-
Asynchronous E-Learning	
E-Learning	√

5 -Student assessment methods

Methods	Assessment	Used
Electronic Midterm Exam	To assess the knowledge and understanding achieved by the student during the previous weeks. (Online on e-learning hub)	√
Pencil-to-Paper Final Exam	To evaluate what the student gain at the end of the course, and to assess: the knowledge and understanding, general skills, and intellectual skills.	√

Course Project	To allow students work in team, and to evaluate knowledge, understanding, intellectual, and transferable skills.	-
Course Work & Quizzes	To keep the student always in the course, and to evaluate knowledge, understanding, intellectual, and transferable skills. (online on e-learning hub, FTF)	√
Practical Exam	to measure the ability of students to design and implement a software program (FTF).	-
Participation	To assess the knowledge and understanding achieved by the student during the previous weeks.	√

Assessment Schedule

Assessment	Week #
Participation	3-14
Mid Term Exam	8
Final Exam	16
Course Work & Quizzes	2-14

Assessment Weight

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

- Course Work & Quizzes:
 - o Short Exams, Assignments, Researches, Reports, Presentations on e-learning hub
 - o Class/Project discussion in a virtual classroom

7 -List of references

Essential books (text books)	Oswald, Joe, editor. <i>Introduction to Algorithms</i> . 2022
Recommended books	o Sen, Sandeep, and Amit Kumar. <i>Design and Analysis of Algorithms: A Contemporary Perspective</i> . 2019.
Periodicals, website	https://moodle.sha.edu.eg/course/view.php?id=2265

8- Required Facilities

To assess professional and practical skills given the following facilities:

- a. Tools & SW (Technologies facilities):

b. Teaching facilities:

	<i>Lecture</i>	<i>class</i>	<i>Lab</i>
Whiteboard	used	-	used
Pc/laptop	used	-	used
Data show	used	-	used
Webinars	-	-	-
Social Media	Facebook Page for 3 rd year	-	Facebook Page for 3 rd year
Chat Room	-	-	-
Videos	Stream-MOODLE	-	Stream-MOODLE
Website	MOODLE	-	MOODLE

9-Course Matrices

9.1-Course Content/ILO Matrix

Course Contents	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
Algorithm concept. Analysis & complexity.	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					
merge sort, quick sort.	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					
Greedy method concept passing through,	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					
optimal search trees. Backtracking: the general method,	x	x	x	x	x				x			x	x	x	x					
8 queens	x	x	x	x	x							x	x	x	x					
Selected Topics		x						x												

9.2-Learning Method /ILO Matrix

Learning Methods	Knowledge and understanding				Intellectual skills				Professional and practical skills					General				
	a1	a2	a3	a4	b1	b2	b3	b4	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	x	x	x	x	x	x	x	x	x	x	x	x	x					

Websites search												X			X	X	X	X	
Research and reporting															X	X			
Problem solving/problem solving learning based							X	X											
Group work	X	X	X	X	X	X	X	X											
Presentations	X	X	X	X	X	X	X	X											
Practical Lab					X	X	X	X	X	X	X	X	X						
Discussions.	X	X	X	X											X	X	X	X	X

9.3-Assessment Methods /ILO Matrix

Assessment Methods	Knowledge and understanding				Intellectual skills				Professional and practical skills					General				
	a1	a2	a3	a4	b1	b2	b3	b4	c1	c2	c3	c4	c5	d1	d2	d3	d4	d5
Electronic Mid Term Exam	X	X	X	X	X	X	X	X										
Final Exam	X	X	X	X	X	X	X	X										
Course Work & Quizzes	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X

10. Course ILOs Vs Program ILOs

Prog ILOs / Course ILOs		Knowledge and understanding			Intellectual skills							Professional and practical skills				General		
		A4	A14	A21	B1	B2	B3	B4	B5	B6	B7	B17	C5	C6	C10	C16	D9	
k&u	a1	√																
	a2	√	√															
	a3	√	√	√														
	a4	√																
	a5	√	√															
int.	b1				√	√					√							
	b2					√												
	b3						√											
	b4							√		√	√	√						
	b5								√	√	√	√						
p. & p.	c1												√					
	c2												√					
	c3												√					
	c4													√				
	c5														√			

general	d1																√
	d2																√
	d3																√
	d4																√
	d5																√

Course Coordinator: Dr Salah Eilwa ()

Head of Department: Dr. Ahmed El-Abbassy ()

Date: 1/8/2022