Course specification

(2102 Data structures)

Faculty:	HICIT- **Higher Institute for Computers & Information Technology**-*El Shorouk Academy*
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	2nd Year – 1st semester
Date of specification approval	1/8/2022

A- Basic Information

Title: Data structures		*Code:* 2102	
Weekly Hours:			
Lecture : 3	**Exercise: 2**	**Practical :**2	**Total:** 7

B- Professional Information

1.   Course Aims:

The objective of CS2102 is to teach ways and techniques of efficiently organizing and manipulating data in main memory.

After completing this course, the student should be able to:

 a. Build and manipulate linear and non-linear data structures, including stacks, queues, linked lists, trees, and graphs.
 b. Sort, and search data.
  c. Choose the appropriate data structure to use in solving typical computer science problems.

2.   Program ILOs Covered by Course

Program Intended Learning Outcomes			
Knowledge and understanding	**Intellectual Skills**	**Professional and practical skills**	**General and Transferable skills**
A2, A13, A14, A21	**B1, B2, B3**	**C1, C5, C6, C16**	**D5**

3. Intended learning outcomes of course (ILOs)
a. Knowledge and Under-Standing:

a1. Identify and understand Programming concepts, Object Oriented concepts and different Data Structures. [A2,A13,A14]
a2. Clarify and understand the problem and use skills for analysis of programming problems of data structure and select the appropriate data structure .[A13,A21]

b. Intellectual Skills:

b1. Compare and analyze algorithms as fundamental tools of data structures and program design.[B1]
b2. Analyze and breakdown the tasks into understandable and manageable subtasks.[B1,B2]
b3. Explain clearly and precisely stated solutions for problems.[B2,B3]

c- Professional and practical skills

c1) Practice on use case studies to show how all the tools are used together to build a complete program.[C1]
c2) Apply methods to reduce program errors, verify used algorithms, and efficiently debug programs.[C6]
c3) Operate on large projects.[C5,C16]

d- General and transferable skills

d1) Join a team to produce reports. [D5]
d2) Cope with a team to find a solution for practical problems and projects. [D5]
d3)Write structural reports. [D5]

4. Contents

Topic	Hours	Lec.	Exc/Lab
Introduction to Data Structures	7	3	4
Recursion	7	3	4
Arrays, Pointers, and Structures	14	6	8
Linked lists	14	6	8
Stacks	7	3	4
Queues.	7	3	4
Trees	14	6	8
Graphs.	10	6	4
Selected Topics	3	3	-
Course project	11	3	8

5. Teaching and learning methods

Teaching and learning methods	Used
Active Learning	
Lectures(blending learning – online learning using virtual classroom)	√

Tutorial Exercises (hybrid learning – online learning)	√
Practical Lab(blending learning– online learning)	√
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	√

6. 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. (online on e-learning hub , FTF)	√
Electronic 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)	√
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
Electronic Mid Term Exam	8
Final Exam	16
Electronic / hard copy Course Project	3-14
Electronic / hard copy Course Work &Quizzes	2-14
Practical Exam	15

Assessment Weight

Assessment	Weight %
Participation	5%
Electronic Mid Term Exam	
Final Exam	70%
Electronic / hard copy Course Project	10%
Electronic / hard copy Course Work &Quizzes	5%
Practical Exam	10%
Total	100

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

7. List of references

Essential books (text books)	• Barnett, Granville, and Luca Del Tongo. "Data structures and algorithms: annotated reference with examples." (2021). • Jamro, Marcin. C# Data Structures and Algorithms: Explore the possibilities of C# for developing a variety of efficient applications. Packt Publishing Ltd, 2018. • Data Structures and Algorithms Using C#, By Michael McMillan, Cambridge University Press, 2007.
Course notes	– http://www.owlnet.rice.edu/~comp320/2005/notes/tut03-data_structures/ – http://docs.linux.cz/programming/algorithms/Algorithms-Morris/
Recommended books	• Mehta, Dinesh P., and Sartaj Sahni. Handbook of data structures and applications. Chapman and Hall/CRC, 2004. • Navarro, Gonzalo. Compact data structures: A practical approach. Cambridge University Press, 2016.

	Powerpoint presentations of all course materials
Periodicals,website	Powerpoint presentations of all course materials All labs material [https://moodle.sha.edu.eg/course/view.php?id=1358]

8. Required Facilities

To assess professional and practical skills given the following facilities:

a. Tools & SW (Technologies facilities):
  – **Microsoft Visual Studio 2019 .**
  – **Microsoft TEAMS to create virtual classrooms for lectures, discussions for project**
  – **portal(MOODLE) to make electronic quizzes and electronic midterm exam**
  – **portal(MOODLE) to upload project deliverable and assignment**
  – **academy portal(MOODLE) to upload electronic material**

b. Teaching facilities:

	Lecture	*class*	*Lab*
Whiteboard	used	-	used
Pc/laptop	used	-	used
Data show	used	-	used
Webinars	MS TEAMS	-	MS TEAMS
SocialMedia	Facebook Page for 3rd year	-	Facebook Page for 3rd year
ChatRoom	ChatTeams	-	ChatTeams
Videos	Stream-MOODLE	-	Stream-MOODLE
Website	MOODLE	-	MOODLE

9. Course Matrices

9.1 Course Content/ILO Matrix

Course Contents	Knowledge & understanding		Intellectual skills			Professional and practical skills			General		
	a1	**a2**	**b1**	**b2**	**b3**	**c1**	**c2**	**c3**	**d1**	**d2**	**d3**
Introduction to Data Structures	√	√		√			√				
Recursion	√	√		√			√				
Arrays, Pointers, and Structures	√	√		√			√				
Linked lists	√	√	√	√	√	√	√				
Stacks	√	√	√	√	√	√	√				
Queues.	√	√	√	√	√	√	√				
Trees	√	√	√	√	√	√	√				
Graphs.	√	√	√	√	√	√	√				
Selected Topics	√			√							
Course project		√	√	√	√	√	√	√	√	√	√

9.2 Learning Method /ILOs Matrix

Learning Methods	Knowledge & understanding		Intellectual skills			Professional and practical skills			General		
	a1	a2	b1	b2	b3	c1	c2	c3	d1	d2	d3
Lectures	X	X	X	X	X	X	X	X			
Tutorial Exercises	X	X	X	X	X	X	X	X			
Reading material	X	X	X	X	X	X	X	X			
Websites search	X	X	X	X	X		X		X	X	X
Research and reporting	X	X							X	X	
Problem solving/problem solving learning based	X	X			X						
Group work	X	X				X	X	X	X	X	X
Presentations		X	X								
Practical Lab	X	X	X	X	X	X	X	X			
Discussions.	X	X	X	X	X	X	X	X	X	X	X

9.3 Assessment Methods /ILOs Matrix

Assessment Methods	Knowledge & understanding		Intellectual skills			Professional & practical skills			General		
	a1	a2	b1	b2	b3	c1	c2	c3	d1	d2	d3
Electronic Mid Term Exam	X	X	X	X	X						
Final Exam	X	X	X	X	X						
Electronic Course Project	X	X	X	X	X	X	X	X	X	X	X
Electronic Course Work &Quizzes	X	X	X	X	X	X	X	X	X	X	X
Practical Exam	X	X	X	X	X	X	X	X			

a. **Course ILOs Vs Program ILOs**

Learning Methods		Knowledge & understanding				Intellectual skills			Professional and practical skills				General
		A2	A13	A14	A21	B1	B2	B3	C1	C5	C6	C16	D5
K&U	a1	√	√	√									
	a2		√		√								
Int.	b1					√							
	b2					√	√						
	b3						√	√					
P. &P.	c1								√				
	c2										√		
	c3									√		√	
General	d1												√
	d2												√
	d3												√

Course Coordinator: Dr.Osama Shafik **(** **)**
Head of Department: Dr. Ahmed El-Abbassy **(** **)**
Date: 1/8/2022