QF01/0408-4.0E	Course Plan for Bachelor program - Study Plan Development and Updating Procedures/ Department

Study plan No.	**2021/2022**		**University Specialization**		**Software Engineering**	
Course No.	**0114213**		**Course name**		**Data Structure and Algorithm**	
Credit Hours	**3**		**Prerequisite Co-requisite**		**Object Oriented Programming**	
Course type	☐ MANDATORY UNIVERSITY REQUIREMENT	☐ UNIVERSITY ELECTIVE REQUIREMENTS	☐ FACULTY MANDATORY REQUIREMENT	☐ Support course family requirements √	☐ Mandatory requirements	☐ Elective requirements
Teaching style	☐ **Full online learning**		☐ **Blended learning**		☐ **Traditional learning** √	
Teaching model	☐ **2Synchronous: 1asynchronous**		☐ **2 face to face : 1synchronous**		☐ **3 Traditional** √	

Faculty member and study divisions information (to be filled in each semester by the subject instructor)

Name	Academic rank	Office No.	Phone No.	E-mail	
Division number	**Time**	**Place**	**Number of students**	**Teaching style**	**Approved model**

Brief description

An overview of data structure concepts, arrays, stack, queues, trees, and graphs. Discussion of various implementations of these data objects, programming styles, and run-time representations. Course also examines algorithms for sorting, searching and some graph algorithms. Algorithm analysis and efficient code design is discussed.

Learning resources

Course book information (Title, author, date of issue, publisher ... etc)	Jay Wengrow . **A Common-Sense Guide to Data Structures and Algorithms, Second Edition: Level Up Your Core Programming Skills 2nd Edition.** Pragmatic BookShelf **(Sep 1, 2020)**			
Supportive learning resources (Books, databases, periodicals, software, applications, others)	1- Mark Wiess. **Data Structures and Algorithm Analysis in Java** (2011) 2- Adam Drozdek. **Data Structures and Algorithms in Java** (2013)			
Supporting websites	None			
The physical environment for teaching	☐ Class room	☐ Labs √	☐ Virtual educational platform	☐ Others
Necessary equipment and software	**JDK and Java Netbeans**			
Supporting people with special needs				
For technical support	**E-learning Center and Computer Center Department**			

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Course learning outcomes (S= *Skills, C= Competences K= Knowledge,)*

No.	Course learning outcomes	The associated program learning output code
	Knowledge	
K1	Explain and utilize linked lists, stacks, queues, trees and graph.	MK4
K2	Describe the techniques of algorithm analysis.	MK4
K3	Discuss the advantages and disadvantages of various algorithms	MK4
K4	Incorporate algorithmic design know-how and data structures to create reliable and structured programs.	MK4
K5	Describe the design and performance of various searching and sorting algorithms	MK4
	Skills	
S1	Ability to develop algorithms for manipulating stacks, queues, linked lists,.etc	MS4
S2	Ability to identify a problem and analyze it in terms of its significant parts and the information needed to solve it.	MS4
S3	Familiarize the student with the issues of time complexity and examine various algorithms from this perspective.	MS4
S5	Familiarize the student with the issues of time complexity and examine various algorithms from this perspective.	MS4
	Competences	
C1	Ability to solve complex software problems	MC2
C2	Ability to participate in programming competitions	MC1

Mechanisms for direct evaluation of learning outcomes

Type of assessment / learning style	Fully electronic learning	Blended learning	Traditional Learning (Theory Learning)	Traditional Learning (Practical Learning)
Midterm exam	30%	30%	**40%**	30%
Participation / practical applications	0	0	**10%**	30%
Asynchronous interactive activities	30%	30%	**0**	0
Final exam	40%	40%	**50%**	40%

Note: Asynchronous interactive activities are activities, tasks, projects, assignments, research, studies, projects, work within student groups ... etc, which the student carries out on his own, through the virtual platform without a direct encounter with the subject teacher.

Schedule of simultaneous / face-to-face encounters and their topics

Week	Subject	learning style*	Reference **

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1	**Chapter 1: Why Data Structure Matter**	**Lecture**	**Textbook 1 Page: 1-19**
2	**Chapter 2: Why Algorithm Matter**	**Lecture**	**Textbook 1 Page: 21-34**
3	**Chapter 3: O Yes, Big O Notation**	**Lecture**	**Textbook 1 Page: 35-45**
4	**Chapter 4: Speeding Up Your Code with Big O** (Bubble Sort)	**Lecture**	**Textbook 1 Page: 47-60**
5	**Chapter 5: Optimizing Code with and without Big O** (Selection Sort)	**Lecture**	**Textbook 1 Page: 63-76**
6	**Chapter 6: Optimizing with Optimistic Scenarios** (Insertion Sort)	**Lecture**	**Textbook 1 Page: 79-93**
7	**Chapter 9: Crafting Elegant Code with Stack and Queue** (Stack)	**Lecture**	**Textbook 1 Page: 133-143**
8	**Chapter 9: Crafting Elegant Code with Stack and Queue** (Queue)	**Lecture**	**Textbook 1 Page: 144-148**
9	**Chapter 11: Learning to Write Recursive**	**Lecture**	**Textbook 1 Page: 161-181**
10	**Chapter 13: Recursive Algorithm for Speed** (Quick Sort)	**Lecture**	**Textbook 1 Page: 199-224**
11	**Chapter 14 : Node Based Data Structure** (Linked List)	**Lecture**	**Textbook 1 Page: 225-238**
12	**Chapter 14 : Node Based Data Structure** (Doubly Linked Lists)	**Lecture**	**Textbook 1 Page: 238-244**
13	**Chapter 15: Speeding up All Things with Binary Search Tree** (Binary Search Tree)	**Lecture**	**Textbook 1 Page: 247-256**
14	**Chapter 15: Speeding up All Things with Binary Search Tree** (Binary Search Tree Traversal)	**Lecture**	**Textbook 1 Page: 256-276**
15	**Chapter 18: Connecting Everything with Graphs**	**Lecture**	**Textbook 1 Page: 331-361**
16	**Final Exam**		

*** Learning styles: Lecture, flipped learning, learning through projects, learning through problem solving, participatory learning ... etc.**

**** Reference: Pages in a book, database, recorded lecture, content on the e-learning platform, video, website ... etc.**

Schedule of asynchronous interactive activities (in the case of e-learning and blended learning)

Week	Task / activity	Reference	Expected results

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