



**Future Academy**  
**Higher Future Institute for Specialized Technological Studies**

**Course Specification**

**1- Course information:**

<b>Course Code:</b>	CSC211
<b>Course Title:</b>	Data Structures
<b>Year/level</b>	2 <sup>nd</sup>
<b>Academic Programs</b>	Computer Science Program (B.Sc.)
<b>Contact hours/ week</b>	(Theoretical = 2, Practical = 2, Total = 4)

**2- Course aims:**

This course aims to provide students with comprehensive knowledge to study data structures and algorithms for their manipulation, as well as, analyzing basic data structure operations. This course introduces and develops methods for designing and implementing abstract data types and structures. Through this course a lot of topics will be covered such as array, stack, queues, Linked lists, Sorting Algorithms, Trees, Dynamic allocation and Graphs.

**3- Intended learning outcomes of the course (ILOs):**

**a- Knowledge and understanding:**

**On successful completion of this course, the student should be able to:**

- a1- **Identify** the main categories and basic types of data structures, as well as, the main concept of abstract datatype.
- a2- **Outline** the importance of using recursion methodology in building different data types.
- a3- **Recognize** how to use pointers to pointing to primitive datatypes and user defined data types.
- a4- **Define** the main characteristics, as well as, the advantages and disadvantages of linked list
- a5- **Recognize** the importance of using stack and Queue data structure
- a6- **Outline** different techniques for sorting data.
- a7. **Define** the importance of using tree and graph algorithms and how to build it.

#### **b- Intellectual skills:**

**On completing this course, the student should be able to:**

- b1- **Develop** more programs using dynamic array, recursion and pointer concepts.
- b2- **Solve** a wide range of problems using different types of data structure.
- b3- **Compare** the different methods for constructing stack and queue data structures.
- b4- **Construct** different tree and graph algorithms to daily life problems.

#### **c- Professional and practical skills:**

**At the end of this course, the student will be able to:**

- c1- **illustrate** the mechanism of recursion and pointer in building data structure
- c2- **Examine** building programs using different data structure techniques and sorting algorithms.
- c3- **Prepare different** techniques for building linked list, stack, tree and graph.

#### **d- General and transferable skills:**

**On successful completion of this course, the student should be able to:**

- d1- **Compute** the personal responsibility by working to multiple deadlines in relation to the course requirements.
- d2- **Working in groups** to the deployment of communication skills.

#### **4- Course contents**

<b>Week No.</b>	<b>Topics/units</b>	<b>Number of hours</b>		<b>ILO's</b>
		<b>Lecture hours</b>	<b>Practical hours</b>	
1	Introduction to data Structures and abstract data types	2	2	a1, b1, b2, d1
2	Using Recursion and Backtracking	2	2	a2, b1, c1, d1
3	Using Pointers, Pointer to Primitive variables, arrays and structure	2	2	a3, b1, c1, d1
4	Introduction to linked list data structures+ Quiz 1	2	2	a1, a4, b2, c2, d1
5	Build the basic operations of Linked list	2	2	a1, a4, b2, c2, c3, d1, d2
6	Build an advanced operations of Linked list	2	2	a1, a4, b2, c2, c3, d1, d2
7	Midterm Exam			
8	Introduction to using Stack and building it using built-in functions	2	2	a5, b2, b3, c2, c3
9	Implementing Stack using Array "Advanced Level"	2	2	a5, b2, b3, c2, c3, d2

10	Introduction to Queue and building it using built-in functions	2	2	a5, b2, b3, c2, d1
11	Using Sorting algorithms + Quiz 2	2	2	a6, b2, c2, d1
12	Introduction to tree and building Binary tree	2	2	a7, b2, b4, c3, d2
13	Introduction to graph Algorithms	2	2	a7, b2, b4, c3, d2
14	Final Revision	2	2	

## 5- Teaching and learning methods

Methods																
	a1	a2	a3	a4	a5	a6	a7	b1	b2	b3	b4	c1	c2	c3	d1	d2
Lectures	√	√	√	√	√	√	√	√		√		√		√	√	
Training visits																
Practical sections			√			√			√	√	√	√	√	√		
Self-learning																√
Summer training																
Problem solving	√			√				√	√			√				
Assays and reviews																
Discussion groups																√
Brainstorming																
Blended-learning																
E-learning																

## 6- Teaching and learning methods for Low-achieving students

- Additional teaching hours for those who need help.
- More assignments to assess their ability for understanding the course.
- Encourage the teamwork for those students with other advanced ones to increase their participation and understanding.

## 7- Student assessment

Assessment method	Time	Grade weight (%)	Week	ILOs
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<b>Course Work ( Tutorial Exercise and Assignments)</b>	<b>Through the semester</b>	15	Every Week	a1,a3, b1, b2, b3, c2, c3
<b>Quiz 1</b>	<b>Through the lecture</b>	5	Week#4	a2, a3, b1
<b>Mid-term exam</b>	<b>1 hours</b>	10	Week#7	a3, a4, c1, c2
<b>Quiz 2</b>	<b>Through the lecture</b>	5	Week#11	b3, b4
<b>Practical exam</b>	<b>2 hours</b>	5	Week#14	a3, a4, a3, b4,
<b>Final Written exam</b>	<b>2 hours</b>	60	Week# 15-16	a1, a3, a4, a5, a6, b2, b3, b4, c3

## 8-List of references

### 8.1. Student notebooks:

- Data Structures and Algorithms Made Easy: Data Structures and Algorithmic Puzzles, Narasimha Karumanchi, Fifth Edition, ISBN-13: 978-8193245279, 2017

### 8.2. Essential textbooks:

- Data Structures and Algorithms in C++, Michael T. Goodrich, Roberto Tamassia and David M. Mount, Second Edition, ISBN-13: 978-0470383278, 2011

### 8.3. Recommended textbooks:

- Problem Solving with Algorithms and Data Structures Using Python, Brad Miller, David Ranum, Second Edition, ISBN-13: 978-1590282571, 2013

### 8.4. Journals, Periodical and Reports .....etc.

### 8.5. Websites

- <https://www.geeksforgeeks.org/data-structures/>
- [https://www.w3schools.com/dsa/dsa\\_intro.php](https://www.w3schools.com/dsa/dsa_intro.php)
- <https://www.javatpoint.com/data-structure-tutorial>

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