الجامعة الافتراضية السورية
SYRIAN VIRTUAL UNIVERSITY

Algorithms Analysis and Design

Course Definition

Information

Technology

Engineering

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Syrian Arab Republic		الجمهورية العربية السورية
Ministry of Higher Education and Scientific Research		وزارة التعليم العالـــي والبحث العلمي
Syrian Virtual University		الجامعة الافتراضية السورية

1. Basic Information:

Course Name	Algorithms Analysis and Design
Course Code	SAD601
Number of Presentational Sessions*	20
Number of Synchronous Sessions**	10
Number of Shorter Tests***	2
Number of Exams***	1
Theoretical Sessions Work Load (hrs.)	60
Practical Sessions Work Load (hrs.)	30
Credit Hours	6

***Each presentational session comprises both recorded lecture (1.5 hrs.) and interactive learning content (1.5 hrs.).**

****Each synchronous session comprises the interactive lecture carried out in real time in a virtual class (1.5 hrs.).**

*****Each shorter test is 0.5 hr. long. The final exam is 2 hrs. long.**

N.B.

Generally, each chapter requires two presentational sessions: one for the recorded content and one for the interactive content (unless the chapter is too long, in which case it may require more sessions (. This note applies to synchronous sessions as well, where each chapter requires one synchronous session generally.

2. Prerequisites courses:

Course	Code
Data Structures & Algorithms 2	SDA601

3. Course Objectives:

The aim of this course is to provide all necessary data structures in Python in order to implement advance algorithms. The course focuses on advanced topic in graphs, dynamic programing, geometrical algorithms and networks flow algorithms.

4. Learning Outcomes (LO):

Upon completion of the course, the student is expected to acquire and learn the following:

- Choosing adequate data structures in Python when implementing algorithms.
- Understanding and implementing basic and advanced graph algorithms.
- Understanding and implementing basic and advanced dynamic programming algorithms.
- Understanding and implementing basic and advanced geometrical algorithms.
- Understanding and implementing basic and advanced networks flow algorithms.

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5. Assessment Results:

Chapter Number	Chapter Title	General Objectives	Assessment Type				
			Interactive Content & Recorded Sessions	Applied Activities (Synch. Sessions)	Final Exam*/ Shorter Tests**	Presentations and Interviews***	Reports****
CH1	**Basic Data Structures in Python**	Comprehension –Analytical Thinking – Tools and Application Hands– On	√	√	√	√	√
CH2	**Complex Data Structures in Python**	Comprehension –Analytical Thinking – Tools and Application Hands– On	√	√	√	√	√
CH3	**Advanced Graph Algorithms**	Comprehension –Analytical Thinking –	√	√	√	√	√

		Tools and Application Hands– On					
CH4	**Advanced Dynamic Programming**	Comprehension –Analytical Thinking – Tools and Application Hands– On	√	√	√	√	√
CH5	**Geometrical Algorithms**	Comprehension –Analytical Thinking – Tools and Application Hands– On	√	√	√	√	√
CH6	**Flow Algorithm**	Comprehension –Analytical Thinking – Tools and Application Hands– On	√	√	√	√	√

***The final exam is two hours long and is given at the end of the course.**

****Shorter tests are about 30 minutes long and are given after three or four lectures throughout the semester during synchronous sessions.**

*****Presentations, interviews, and reports are submitted once after each three or four lectures throughout the semester during synchronous sessions.**

6. Course Syllabus:

Chapter	Subject	Content	Number of Learning Objects	Number of synchronous Learning Objects
CH1	**Basic Data Structures in Python**	1. Python basics revision 2. List 3. Tuple 4. Set 5. Frozen Sets 6. String 7. Dictionary 8. Matrix 9. Bytearray	9	4
CH2	**Complex Data Structures in Python**	1. Linked List 2. Stack 3. Queue 4. Priority Queue 5. Heap	8	4

		6. Binary Tree 7. Binary Search Tree 8. Graphs		
CH3	**Advanced Graph Algorithms**	1. Breadth First Search or BFS for a Graph 2. Depth First Search or DFS for a Graph 3. Shortest Paths from Source to all Vertices using Dijkstra's Algorithm 4. Floyd Warshall Algorithm 5. Prime's Algorithm for Minimum Spanning Tree (MST) 6. Kruskal's Minimum Spanning Tree (MST) Algorithm 7. Topological Sorting 8. Johnson's algorithm for All-pairs shortest paths 9. Bridges in a graph	**9**	**4**
CH4	**Advanced Dynamic Programming**	1. Edit Distance 2. Minimum Partition 3. Count number of ways to cover a distance 4. Longest Path in Matrix 5. Subset Sum Problem 6. Optimal Strategy for a Game	**6**	**3**

CH5	**Geometrical Algorithms**	1. Convex Hull 2. Graham Scan 3. Line Intersection 4. Interval Tree	**4**	**2**
CH6	**Flow Algorithm**	1. Ford–Fulkerson Algorithm for Maximum Flow Problem 2. Minimum cut in a flow network	**2**	**1**

7. Practical Activity:

- **Tools and Labs:**

Tool Name	Description
Python	Programming Language

- **Practical Activities per Chapters:**

Chapter	Activities Type	Remarks
CH1	☑ Exercises ☑ Homework ☑ Webinars ☑ Project ☐ Experiment ☑ Other	
CH2	☑ Exercises ☑ Homework ☑ Webinars ☑ Project	

	☐ Experiment ☑ Other	
CH3	☑ Exercises ☑ Homework ☑ Webinars ☐ Project ☐ Experiment ☑ Other	
CH4	☑ Exercises ☑ Homework ☑ Webinars ☐ Project ☐ Experiment ☑ Other	
CH5	☑ Exercises ☑ Homework ☑ Webinars ☐ Project ☐ Experiment ☑ Other	
CH6	☑ Exercises ☑ Homework ☑ Webinars ☑ Project ☐ Experiment ☑ Other	

8. References:

- Levitin, A. (2017). Introduction To Design And Analysis Of Algorithms, 2/E. Pearson Education India.