

**CSIS-210 – Data Structures and Algorithms**

**Section: 01&02**

**Spring 2018**

**Course Syllabus**

---

**1. General Course Information**

Instructor	Aaron R. Rababaah
Office	A301
Phone	X3702
Email	arababaah@auk.edu.kw
Office Hours	UTR: 10:00am-12:00pm
Classroom	A101 & A201
Class time	UTR 01:00-1:500pm & 05:00-05:50pm

**2. Course Description**

This course is designed to introduce students to basic data structures. The course discusses appropriate use of built-in data structures and common applications for each of the following data structures; stack, queue, priority queue, trees, graphs and lists. The course includes a compare and contrast analysis of the costs and benefits of dynamic and static data structure implementations. Basic algorithm analysis issues are introduced. Recursion applications are introduced and analyzed. Prerequisite: CSIS 130 and MATH 110. Co-requisite: MATH 213.

**3. Course Prerequisites**

Prerequisite: CSIS 130 (Computer Programming II)

Co-requisite: MATH 213 (Discrete Math).

**4. Course Outcomes**

Upon completion of this course the student should:

- 1) Discuss the appropriate use of built-in data structures [ABET 6 ]
- 2) Describe common applications for each of the following data structures: stack, queue, priority queue, trees and lists [ABET 6]
- 3) Write programs that use each of the following data structures: arrays, strings, linked lists, stacks, queues. [ABET 2]
- 4) Compare alternative implementations of data structures with respect to performance [ABET 6]

- 5) Implement simple search algorithms and explain the differences in their time complexities. [ABET 2].
- 6) Compare and contrast the costs and benefits of dynamic and static data structure implementations [ABET 6]
- 7) Choose the appropriate data structure for modeling a given problem [ABET 6]
- 8) Discuss factors other than computational efficiency that influence the choice of algorithms, such as programming time, maintainability, and the use of application-specific patterns in the input data [ABET 6]
- 9) Explain how tree balance affects the efficiency of various binary search tree operations [ABET 6]
- 10) Construct efficient algorithms for small problems, and demonstrate the ability to evaluate algorithms. [ABET 2, 6]
- 11) Understand and implement recursive programs. [ABET 6]

## 5. Textbook and Course Material

### ▪ Required text

Data Structures and Abstractions with Java, 4<sup>th</sup> Edition. Frank Carrano. Pearson 2016. ISBN: 978-1292077185

### ▪ Recommended Texts & Other Readings

Other readings will be made available in the course Web site.

### ▪ Communication and Course Material

All supportive course material, assignments, and communication will be done through email and moodle. Make sure you regularly check your email/Moodle accounts.

### ▪ Grading Scheme

Assessment	Percentage
Programs	20%
Exam-1	20%
Exam-2	20%
Final:	40%

### ▪ Grade Assignment

Letter grades will be determined using a standard percentage point evaluation as outlined below

	<b>A:</b> 94-100	<b>A-:</b> 90-93
<b>B+:</b> 87-89	<b>B:</b> 84-86	<b>B-:</b> 80-83
<b>C+:</b> 77-79	<b>C:</b> 74-76	<b>C-:</b> 70-73
<b>D+:</b> 67-69	<b>D:</b> 64-66	<b>D-:</b> 60-63
<b>F:</b> 0-59	<b>FN:</b> 0-59	

## 6. Tentative Course Outline

Week	Topic
Week 1	1.1 Software Engineering 1.2 Object Orientation 1.3 Classes, Objects, and Applications 1.4 Organizing Classes 1.5 Data Structures 1.6 Basic Structuring Mechanisms 1.7 Comparing Algorithms: Big-O Analysis
Week 2-4	2.1 Recursive Definitions, Algorithms, and Programs 2.2 The Three Questions 2.3 Towers of Hanoi 2.4 Counting Blobs 2.5 Recursive Linked-List Processing 2.6 Removing Recursion 2.7 Deciding whether to Use a Recursive Solution
Week 5-6	3.2 Lists 3.3 Formal Specification 3.4 Array-Based Implementation 3.5 Applications: Poker, Golf, and Music 3.6 The Binary Search Algorithm 3.7 Reference-Based Implementations
Week 7	4.1 Circular Linked Lists 4.2 Doubly Linked Lists 4.3 Linked Lists with Headers and Trailers 4.4 A Linked List as an Array of Nodes 4.5 A Specialized List ADT
Week 8-9	Stacks 5.1 Linked implementation 5.2 Array implementation 5.3 Applications
Week 10-11	6.1 Queues 6.2 Formal Specification 6.3 Application: Palindromes 6.4 Array-Based Implementations 6.6 Link-Based Implementations 6.7 Case Study: Average Waiting Time
Week 12-13	7.1 Trees 7.2 The Logical Level 7.3 The Application Level 7.4 The Implementation Level: Basic

	7.5 Iterative verses Recursive Method Implementation 7.6 The Implementation Level: Remaining Operations 7.7 Comparing Binary Search Tree and Linear Lists 7.8 Balancing a Binary Search Tree 7.9 A Nonlinked Representation of Binary Trees
Week-14	8.1 Overview of Graphs 8.2 Adjacency matrix 8.3 Implementation of graphs
Week-15	Review

## **7. Course Policies and Strategies**

### **▪ Attendance**

The American University of Kuwait recognizes that class attendance is an important element of students' classroom success. Students are expected to attend all classes, laboratories, and/or required fieldwork. Because excessive absences prevent students from receiving full course benefit, and disrupt orderly course progress, AUK has established the following policy on class attendance:

Any student who misses MORE THAN 15% of the class sessions of any course during a semester should expect to fail, unless s/he submits documented evidence to the course instructor of inpatient medical care, death of an immediate family member, academic instructional activities, or national athletic activities. If excused, students are required to satisfy all coursework due or assigned during their absences, as determined by the course instructor. If a student does not submit documented evidence for her/his absences exceeding the limit, it is the student's responsibility to withdraw from the course by the specified deadline, as indicated on the Academic Calendar. Students who withdraw from a course receive a grade of "W." Students who do not withdraw from a course nor submit supporting documents for excessive absences will receive a grade of "FN" (failure for non-attendance).

### **▪ Exams**

Students will not be allowed to join exams after 10 minutes of the scheduled time.

### **▪ Makeup Exams**

No makeup exam will be given unless all of the following three steps are performed: (1) The student notifies the course instructor (in writing or by email) about the reasons for missing the exam at least 24 hours before the set exam date, (2) The instructor permits the makeup exam at another date and lists the papers (medical or otherwise) required for the makeup, and (3) The student submits the required papers.

### **▪ Disability Accommodation**

If you believe that you need accommodations for a disability, kindly arrange for an appointment with Dr. Huda Shaaban (hshaaban@auk.edu.kw) at the Counseling Center located in front of Gate 2. All disability-related accommodations require registration with the Counseling Center and are not applied retroactively, so contact Dr. Huda Shaaban as soon as possible.

### **▪ Mobile Phones**

The use of mobile phones is strictly prohibited during class.

### **▪ Plagiarism**

The term "plagiarism" includes, but is not limited to, an attempt of an individual to claim the work of another as the product of his/her own thoughts, regardless of whether that work has been published. Plagiarism includes, but is not limited to, quoting improperly or paraphrasing text or other written materials without proper citation on an exam, term paper, homework, or other written material submitted to an Instructor as one's own work. Plagiarism also includes handing in a paper to an Instructor that was purchased from a term paper service or downloaded from the Internet and presenting another person's academic work as one's own.

- **Cheating**

The term “cheating,” includes but is not limited to, copying homework assignments from another student; working together with another individual on a take-home test or homework when specifically prohibited from doing so by the Instructor, looking at and/or copying text, notes or another person's paper during an examination when not permitted to do so. Cheating also includes the giving of work information to another student to be copied and/or used as his/her own. This includes but is not limited to giving someone answers to exam questions either when the exam is being given or after having taken an exam; informing another student of specific questions that appear or have appeared on an exam in the same academic semester; giving or selling a term paper, report, project or other restricted written materials to another student.

- **Dishonesty in Papers**

Papers submitted in courses must be the original work of the student with appropriate citations and references. Papers or other reports prepared by another person or purchased from another person or company and submitted as one’s own work is a violation of academic honesty.

- **Dishonesty in Exams**

This includes the use of unauthorized materials, receipt of information and/or answers from others during the examination, or the transferal of unauthorized materials, information or answers to another student.

- **Work for One Course Submitted for Another**

Work submitted for one course may not be submitted for another. It is a violation of academic integrity to submit the same work in more than one course. The incorporation by students of past writing or research into current projects must be clearly indicated.

- **Adjudication of Academic Dishonesty and Integrity**

The University reserves the right of imposing on the violators of academic honesty disciplinary action ranging from a failing grade in the exam, paper or course to suspension or dismissal from the University. For more information refer to the "Academic Dishonesty" policy in the University Undergraduate Catalog, refer to the following link:

[http://www.auk.edu.kw/about\\_auk/Student\\_Code\\_of\\_Conduct11OCT10.pdf](http://www.auk.edu.kw/about_auk/Student_Code_of_Conduct11OCT10.pdf)