

# CS121 Data Structures, Section C, Fall 2021

**Term/Year:** Fall 2021  
**Subject Code and Course Number:** CS121, Section C  
**Course Title:** Data Structures  
**Number of Credits:** 3  
**Instructor Name:** Varduhi Yeghiazaryan  
**Email Address:** vyeghiazaryan@uaa.am  
**Office Location:** 331W  
**Office Hours:** Tuesday, Friday 14.30–15.30, or by appointment

**Teaching Associate:** Diana Gevorgyan  
**TA Email Address:** diana\_gevorgyan2@edu.uaa.am  
**TA Problem Solving Session:** Saturday 12.00–14.00  
**TA Office Hours:** Wednesday 13.00–14.30

**Class Schedule:** Tuesday and Thursday 10.30–11.45  
**Moodle Enrollment Key:** DS21-secC

**Course Description:** The course explores topics including: basic object-oriented programming principles; linear and non-linear data structures – linked lists, stacks, queues, trees, tables and graphs; dynamic memory management; design of algorithms and programs for creating and processing data structures; searching and sorting algorithms. Students are required to complete programming projects in which they design, analyze, and develop complex data structures in at least one programming language. Three hours of instructor-led class time per week including discussions and problem sets.

**Subject to Change to accommodate student needs.**

**Prerequisites:** CS 111 Discrete Mathematics  
CS 120 Introduction to Object-Oriented Programming  
**Co-Requisites:** None

## Required Materials:

**Main textbook:** *Data Structures and Algorithms in Java, 6<sup>th</sup> edition*, by Michael T. Goodrich, Roberto Tamassia, Michael H. Goldwasser. John Wiley and Sons, 2014.

**Alternative version of textbook:** *Data Structures and Algorithms in C++, 2<sup>nd</sup> edition*, by Michael T. Goodrich, Roberto Tamassia, David M. Mount. John Wiley and Sons, 2011.

## Technology:

Computer with JDK8 or later version and an IDE, e.g. IntelliJ IDEA, Eclipse IDE, Visual Studio

## Schedule & Topics:

\*Assignments may be supplemented to address student needs identified through homework assignments, quizzes and the midterm exams.

**Course Syllabus is subject to change to address student needs.**

Week	Topic	Reading	Non-Reading Home Tasks/Due Dates for Assignments
1	Introduction to Data Structures, Asymptotic Analysis	Ch 1–2 Java & OOP review Ch 4	
2	Recursion	Ch 5	
3	Search and Sorting	Sec 3.1, Ch 12	HW1 due
4	Sorting	Ch 12	
5	Linked Lists	Ch 3	HW2 due
6	Stacks, Queues	Ch 6	
7	Vectors/Lists	Sec 7.1–7.3	HW3 due
	<b>Midterm 1</b>		<b>Sat, Oct 9</b>
8	Iterators	Sec 7.4–7.7	

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9	Trees	Sec 8.1–8.3	HW4 due
10	Tree Traversals, Priority Queues	Sec 8.4, Sec 9.1–9.2	
11	Heaps, Heapsort	Sec 9.3–9.4	HW5 due
12	Maps	Sec 10.1, 10.3	
13	Search Trees, Balanced Trees	Sec 11.1–11.2	HW6 due
	<b>Midterm 2</b>		<b>Sat, Nov 20</b>
14	AVL Trees	Sec 11.3	
15	HashTables Review, Q&A	Sec 10.2	HW7 due

### Student Learning Outcomes:

The following chart shows alignment between course-specific and program student learning outcomes and program goals.

<b>Program Goal</b>	<b>Program Student Learning Outcomes</b> <i>Students will be able to:</i>	<b>Course-based Student Learning Outcomes</b> <i>In this course, students will be able to:</i>
1. Equip students with knowledge and advanced skills in mathematical reasoning, problem solving, modeling and scientific computation	1.3 Utilize and adapt software and select and use hardware systems related to computer science (Beginner Level)	Develop in-depth understanding of the concept of data abstraction
3. Prepare students for development of scientific, engineering and industrial software applications	3.1 Design and analyze complex data structures and algorithms (Intermediate Level)  3.2 Develop and implement software applications in one or more programming languages (Intermediate Level)  3.3 Develop and test software tools and methods (Intermediate Level)	Build mastery in important data structures such as lists, stacks, queues, priority queues, heaps, hash tables, trees and graphs  Adapt and apply the basic principles of object-oriented programming  Develop robust and efficient code in at least one programming language
5. Provide students with a broad foundation of knowledge and skills and cultivate a commitment to life-long learning	5.1 Use common software and information technology to pursue inquiry relevant to their academic and professional fields, and personal interests (Advanced Level)	Identify and use appropriate data structures and sorting and searching algorithms

**Course Structure:** Instructor-led class will meet twice a week on Tuesday and Thursday at 10.30–11.45. Students are encouraged to attend these classes, as well as weekly problem solving sessions. Home tasks include reading and programming assignments.

**Method of Evaluation:** Students' progress will be assessed by homework assignments, pop quizzes, midterm exams, and a final exam.

Student learning will be evaluated on the basis of the following weighted components:

- Homework (18%)
- Quizzes (10%)
- Midterm Exams (34%)
- Final Exam (38%)

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A brief explanation of the weighted components:

**Homework:** Homework assignments will be given on a bi-weekly basis. Homework problems will be assigned by the instructor throughout the semester and will be posted on Moodle. You are encouraged to study and discuss PSS problems with fellow students, but you must write and code your own homework by yourself, and make sure you understand how to obtain the solutions to the problems.

**Acknowledged** collaboration in groups of **maximum 2** students or usage of materials (e.g. online sources) will be graded at **70%** of the actual score. The first time **unacknowledged** collaboration or usage of materials is spotted, the whole homework assignment will be graded **zero**, i.e. the student doesn't get any points for the whole assignment even if they cheat in only one problem. A second occurrence of cheating results in a **zero** grade for all homework assignments, i.e. 18% of the course grade. A third cheating attempt will result in an **F** grade for the course.

Students are to submit their work **electronically** before the deadline. Late homework submissions will **not** be graded; students can still submit to get feedback. The format of submitting homework assignments will separately be posted as a PDF on Moodle. Any programming involved in any of the homework assignments must be coded in either Java or C++.

Short feedback of a few sentences will be provided on Moodle. Students should discuss their work in more detail with the TAs during the OH following the submission deadline.

**Quizzes:** The course will include five **pop** quizzes lasting approximately 15–20 minutes. A missed quiz is graded zero. The lowest quiz grade is dropped. The quizzes will be closed-book and closed-device: use of calculators, computers, tablets, phones is prohibited; books and notes may not be consulted. Collaboration during quizzes is strictly forbidden.

**Midterm Exams:** The course will include two midterm exams. The midterms are closed-book and closed-device: use of calculators, computers, tablets, phones is prohibited; books and notes may not be consulted. Collaboration during exams is strictly forbidden.

**Final Exam:** The final exam will cover all topics covered throughout the course. The purpose of the final exam is to assess students' mastery of concepts and terminology as well as their abilities to select appropriate methods and apply this knowledge to solve complex problems.

The final is closed-book and closed-device: use of calculators, computers, tablets, phones is prohibited; books and notes may not be consulted. Collaboration during exams is strictly forbidden.

For quizzes and exams, students are required to choose **only one** of the two languages: Java or C++.

The final grades will be defined according to the ranges given below.

Grade	Grade Point	Percentile Range
A+	4	95 – ≤100
A	4	90 – < 95
A-	3.7	85 – < 90
B+	3.3	80 – < 85
B	3	75 – < 80
B-	2.7	70 – < 75
C+	2.3	66 – < 70
C	2	62 – < 66
C-	1.7	58 – < 62
D+	1.3	55 – < 58
D	1	53 – < 55
D-	0.7	50 – < 53
F	0	0 – < 50

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**Moodle:** You should enroll into the course on Moodle. Homework assignments, learning materials, and students' grades will be posted regularly on Moodle. Thus, please check the course's Moodle page regularly.

**Library and Media/Technology Use:** Students are encouraged to use supplemental online and reference materials available at the library to enhance their overall learning in the course. If students have any questions or need additional support in using library resources or technology, they should confer with library staff, ICT, or the instructor.

**Late Policy:** Students are required to submit homework assignments by the deadline scheduled by the instructor. Homework submitted late will not qualify for grading.

**Make-up Procedures:** Make-up assessment for missed exams can be organized only in exceptional cases at the instructor's discretion. The student must submit convincing evidence of a medical or other emergency that makes taking the exam at the scheduled time impossible. It is also important to notify the instructor in advance in cases when taking exam on time is impossible for whatever reasons.

**Communication:** All course-related announcements and important information will be posted on Moodle. In addition to OH, students can use email and Hangouts chat for Q&A.

### **Policy on Grade Appeal**

Students are entitled to appeal grades in line with the university's *Grade Policies* policy which is available online at <http://policies.aua.am/policy/11>

### **Standards for Academic Integrity**

Students are required to conduct themselves in an academically responsible and ethical manner in line with AUA's *Student Code of Ethics*. Acts of academic dishonesty impair the academic integrity of AUA and create an unfair academic advantage for the student involved and other member(s) of the academic community. These acts are subject to disciplinary measures as prescribed in the AUA Student Code of Ethics, <http://policies.aua.am/policy/10>

The Student Code of Conduct can be found at <http://policies.aua.am/policy/101>

### **Special Needs:**

Students requiring special accommodations for learning should contact the Center for Student Success by the end of the Add/Drop period with such requests. [studentsuccess@aua.am](mailto:studentsuccess@aua.am), <https://studentsuccess.aua.am/disability-support-services/>