

Compiled & Shared By: ✨ Hassan Sardar Naveed

👤 "Please remember me and my family in your prayers." 🌸

📖 Bachelor of Science in Computer Science

🎓 University of the People

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Syllabus for Data Structures

3 Credits

CS 3303

Instructor Contact Information:

You can also always send your instructor a private message through the Moodle Messaging system. Once logged into your course, click your instructor's Moodle profile page to be provided the ways in which to communicate with your instructor. Your instructor's email will also be listed in their profile.

Course Description

This course provides a comprehensive exploration of fundamental data structures and algorithms, emphasizing efficient programming and problem-solving skills. Students will learn to evaluate and optimize algorithms through the analysis of time and space complexity using Big-O notation. Core topics include arrays, linked lists, stacks, queues, trees, graphs, recursion, searching, sorting, and hashing techniques. Practical applications, such as graph traversal and shortest path algorithms, demonstrate their relevance to software development. By the course's conclusion, students will develop a solid foundation in data structure operations and algorithmic efficiency, equipping them for advanced challenges in software engineering.

Learning Objectives

Program Learning Objectives

Program student learning outcomes (PLO) are the skills and knowledge students will be able to demonstrate after completing the program.

1. Students will be able to Provides a framework in applying strategies for the effective design of computing systems.
2. Students will be able to explain apply appropriate methods in the planning, development, and management of design projects (B.S. level).
3. Students will be able to covers the knowledge and skills needed to analyze problems from multiple perspectives and seek resolution through multiple methods and tools.
4. Students will be able to apply mathematics methods effectively to analyze and resolve problems (B.S. level).
5. Students will be able to communicate effectively using well organized arguments and credible supporting evidence (B.S. level).
6. Students will be able to enhance a command of critical thinking with respect to computer ethics, privacy, and security.

Course Learning Objectives

By the end of this course, students will be able to:

1. Explain fundamental data structures, algorithms, and their time and space complexities using Big-O notation.
2. Implement linear and non-linear data structures to solve computational problems.



3. Design recursive algorithms to optimize them using dynamic programming techniques.
4. Apply graph algorithms and tree data structures to solve real-world problems.

Co/Prerequisites

The prerequisite course is **CS 1103 – Programming 2**.

Course Materials

UoPeople courses use open educational resources (OER) and other materials specifically donated to the University with free permissions for educational use. Therefore, students are not required to purchase any textbooks or sign up for any websites that have a cost associated with them. The main required textbooks for this course are listed below and can be readily accessed using the provided links. There may be additional required/recommended readings, supplemental materials, or other resources and websites necessary for lessons; these will be provided for you in the course's General Information and Forums area, and throughout the term via the weekly course Unit areas and the Learning Guides.

1. Cutajar, J. (2018). Beginning java data structures and algorithms : Sharpen your problem solving skills by learning core computer science concepts in a pain-free manner. Packt Publishing, Limited. (Accessed through LIRN)
2. AbiramiR, A., & Priya, L. (2023). *Advanced data structures and algorithms: Learn how to enhance data processing with more complex and advanced data structures (English edition)*. BPB Publications. (Accessed through LIRN)

Technology Requirements

Data Structures is a theory-intensive course that focuses on developing a deep understanding of fundamental data structures and algorithms rather than extensive software development. The emphasis is on core computer science concepts, ensuring that students gain a strong conceptual foundation without requiring extensive programming.

While programming is not the primary focus, this course presents the implementation of data structures and basic algorithms through **pseudo-code** and **Java code**. Several key algorithms are demonstrated using **Java** to illustrate their practical applications. Students are encouraged to use **Java** for assignments, but they may also choose an alternative language, such as Python, based on their familiarity and preference.

Students entering this course have already been introduced to programming concepts in prerequisite courses, ensuring they possess the necessary foundational skills for implementation. While no specific software is mandated, access to a modern development environment that supports Java or Python is recommended for writing and testing code.

Campus Tech Support Email for English programs: support@uopeople.edu

Regular and Substantive Interaction

As your instructor, they will interact and engage with each of you on a regular basis throughout the term to support your learning. They will provide direct instruction related to the course's learning objectives,



respond to your questions, grade and/or provide feedback on your submitted coursework, post regular announcements, and engage in the course discussion areas regarding academic course content when appropriate.

Course Expectations and Learning Activities

Discussions

Some units in this course require that you complete a Discussion Assignment. You are required to develop and post a substantive response to the Discussion Assignment in the Discussion Forum. A substantive response is one that fully answers the question that has been posed by the instructor. In addition, you must extend the discussion by responding to at least two (2) of your peers' postings in the Discussion Forum. Grading rubrics are provided in the Discussion Forum for each week. Discussion Forums are only active for each current and relevant learning week, so it is not possible to contribute to the forum once the learning week has come to an end.

Assignments Activities

The assignment activities are graded by your instructor. The grading rubric is listed under the assignment instructions. The grading rubric is a document that outlines the criteria that your instructor will use to grade your work.

Class Introductions

This section is your opportunity to introduce yourself to your classmates and create a vibrant learning community. By sharing your background, interests, and goals, you can create meaningful connections and discover commonalities with your peers.

Quizzes

This course will contain three types of quizzes – the Self-Quiz, the Graded Quiz, and the Review Quiz. These quizzes may contain multiple-choice, true/false, or short answer questions. The results of the Self-Quiz will not count towards your final grade. However, it is highly recommended that you complete the Self-Quiz to ensure that you have adequately understood the course materials. Along with the Reading Assignments, the results of the Self-Quiz should be used as part of an iterative learning process, to thoroughly cover and test your understanding of course material. You should use the results of your Self-Quiz as a guide to go back and review relevant sections of the Reading Assignments. Likewise, the Review Quiz will not count towards your final grade but should also be used to assist you in a comprehensive review and full understanding of all course material, in preparation for your Final Exam. Lastly, the results of the Graded Quiz will count towards your final grade. Specific instructions on the format and content of the Graded Quiz will be provided by your instructor.

Final Exam

The Final Exam will take place during the Thursday and Sunday of Week/Unit 9, following the completion of eight units of work. The format of the Final Exam is similar to that of the quizzes and may contain a combination of different question types. You will have one attempt to take the exam, and it will be graded electronically. Specific instructions on how to prepare for and take the Final Exam will be provided during Week 8 (located inside the Unit 9 Learning Guide). Final Exams must be taken without the use of course learning materials (both those inside and outside the course). If particular materials are allowed for use during the exam, these will be noted in the exam's instructions.

The Final Exam for this course must be done under the supervision of a proctor. Since you already secured your proctor before registering for this course, this is a reminder that you should coordinate with him/her before you take the exam. As a reminder, students are required to successfully complete

proctored exams spaced throughout their program of study at UoPeople, in order to verify the student's identity in confirming a degree and diploma upon graduation.

Course Forum

The Course Forum is the place to raise issues and questions relating to the course. It is regularly monitored by the instructors and is a good place to meet fellow students taking the same course. While it is not required to participate in the Course Forum, it is highly recommended.

Participation Expectations

- Be involved and active in your courses.
- Be highly motivated and disciplined.
- Check the course homepage, calendar and assignment page, the course syllabus, your UoPeople email, and the Moodle course discussion forums several times a week.
- Post the required comments and responses to the discussion forum for your course.
- Keep up with your assignments and online quizzes/exams (as applicable) and manage your time well. These quizzes test your knowledge and comprehension of the new content.
- Participate actively in class discussions.
- Be polite and respectful.
- Use good grammar and correct spelling.
- Be honest and original. Plagiarism will not be tolerated in any online course.

Non-participation is characterized by lack of any assignment submissions, inadequate contributions to the Discussion Forums, and/or lack of peer feedback to Discussion/Written Assignments. Also, please note the following important points about course participation:

- Assignments must be submitted on or before the specified deadline. A course timeline is provided in the course schedule, and the instructor will specify deadlines for each assignment.
- Occasionally there may be a legitimate reason for submitting an assignment late. Most of the time, late assignments will not be accepted and there will be no make-up assignments.
- All students are obligated to inform their instructor in advance of any known absences which may result in their non-participation.

Feedback and Suggestions

We value your input and would encourage you to complete the end of course survey to provide us with course feedback and suggestions, and report issues

Evaluation and Grading Scale

Grading Weights:

Category	% of Grade	Grade Items (Learning Activities)	Associated Learning Objectives/Outcomes
Discussion	30%	1. Unit 1 – Discussion Forum	• Unit 1 – CLO 1



Forums		2. Unit 3 – Discussion Forum 3. Unit 4 – Discussion Forum 4. Unit 5 – Discussion Forum 5. Unit 6 – Discussion Forum 6. Unit 8 – Discussion Forum	• Unit 3 – CLO 2 • Unit 4 – CLO 2 • Unit 5 – CLO 2,3 • Unit 6 – CLO 2 • Unit 8 – CLO 4
Assignment Activities	40%	1. Unit 2 – Assignment Activity 2. Unit 4 – Assignment Activity 3. Unit 5 – Assignment Activity 4. Unit 7 – Assignment Activity	• Unit 2 – CLO 1,2 • Unit 4 – CLO 2 • Unit 5 – CLO 2,3 • Unit 7 – CLO 2
Graded Quiz	10%	1. Unit 3 – Graded Quiz 2. Unit 6 – Graded Quiz	• Unit 3 – CLO 2 • Unit 6 – CLO 2
Final Exam	20%	1. Unit 9 – Final Exam	• Unit 9 – CLO 1, 2, 3, 4
TOTAL	100%		

Grading Scale:

Letter Grade	% Grade	Grade Points
A	98%-100%	4.00
A	93-97%	4.00
A-	90%-92%	3.67
B+	88%-89%	3.33
B	83%-87%	3.00
B-	80%-82%	2.67
C+	78%-79%	2.33
C	73%-77%	2.00
C-	70%-72%	1.67
D+	68-69%	1.33
D	63%-67%	1.00
D-	60%-62%	0.67
F	<60	0.00
W	N/A	N/A

Students may also be granted Withdrawal (W), if they withdraw from the course, or an Incomplete (I) should their circumstances permit.

A student who feels they were graded unfairly, or who seeks to dispute a grade, may initiate a grade appeal process. Refer to [University Policies](#) for more information on withdrawals and appeals.



Course Schedule

UNIT 1: Fundamentals of Data Structures and Algorithm Analysis

- Watch/Read the reading assignments due 3rd – 4th day of the week (recommended)
- Discussion first response due 4th day of the week
- Discussion replies due 7th day of the week
- Self-quiz due 7th day of the week

UNIT 2: Arrays and Linked Lists

- Watch/Read the reading assignments due 3rd – 4th day of the week (recommended)
- Assignment activity due 7th day of the week
- Self-quiz due 7th day of the week

UNIT 3: Stacks and Queues

- Watch/Read the reading assignments due 3rd – 4th day of the week (recommended)
- Discussion first response due 4th day of the week
- Discussion replies due 7th day of the week
- Self-quiz due 7th day of the week
- Graded quiz due 7th day of the week

UNIT 4: Binary Trees and Tree Traversals

- Watch/Read the reading assignments due 3rd – 4th day of the week (recommended)
- Discussion first response due 4th day of the week
- Discussion replies due 7th day of the week
- Assignment activity due 7th day of the week
- Self-quiz due 7th day of the week

UNIT 5: Advanced Tree Structures and Recursion Techniques

- Watch/Read the reading assignments due 3rd – 4th day of the week (recommended)
- Discussion first response due 4th day of the week
- Discussion replies due 7th day of the week
- Assignment activity due 7th day of the week
- Self-quiz due 7th day of the week

UNIT 6: Searching and Pattern Matching techniques

- Watch/Read the reading assignments due 3rd – 4th day of the week (recommended)
- Discussion first response due 4th day of the week
- Discussion replies due 7th day of the week
- Self-quiz due 7th day of the week
- Graded quiz due 7th day of the week

UNIT 7: Sorting Algorithms

- Watch/Read the reading assignments due 3rd – 4th day of the week (recommended)
- Assignment activity due 7th day of the week
- Self-quiz due 7th day of the week

UNIT 8: Exploring Graphs and Advanced Graph Algorithms

- Watch/Read the reading assignments due 3rd – 4th day of the week (recommended)
- Discussion first response due 4th day of the week
- Discussion replies due 7th day of the week
- Self-quiz due 7th day of the week

- Review quiz due 7th day of the week

UNIT 9: Final Exam

- Final exam due 7th day of the week

University Policies & Processes**Late Work/Make-up Policy**

Please review the [Late Work](#) policy in the University Catalog.

Code of Conduct

University of the People expects that students conduct themselves in a respectful, collaborative, and honest manner at all times. Harassment, threatening behavior, or deliberate embarrassment of others will not be permitted. Any conduct that interferes with the quality of the educational experience is not allowed and may result in disciplinary action, such as course failure, probation, suspension, or dismissal. For more information on this topic, please review the [General Code of Conduct](#) in the University Catalog.

Procedures for Resolving Academic Grievances/Appeals

If you believe that the final grade you received for a course is erroneous, unjust, or unfair, please contact your course instructor. This must be done within seven days of the posted final grade. For more information on this topic, please review the [Grievance Policy](#) and [Grade Appeals](#) Procedure in the University Catalog.

Withdrawal and Drop Date Policy

Please review the [Course Drops and Withdrawals](#) policy of the University Catalog.

Academic Integrity and Plagiarism

Please review the [Code of Academic Integrity](#) in the University catalog.

Intellectual Property

UoPeople respects the intellectual property rights of others who seek to create, preserve, and disseminate knowledge through teaching, collective learning, and continued research at the University at large. For more information on this topic, please review the [Intellectual Property](#) policy in the University catalog.

Reasonable Accommodations

Contact your Program Advisor to open a request for support.

Student Support Services & Resources**English Programs**

Academic Advising: advising@uopeople.edu

Financial Aid: financial.aid@uopeople.edu

Library Resources: library@uopeople.edu

Payment Processing: payments@uopeople.edu



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Student Services: student.services@uopeople.edu

Technical Support: support@uopeople.edu