

CS-22-01-32191 and CS-22-06-33968

Data Structures and Algorithms

(Spring 2023, 3 credits)

Welcome to the Course!

Computer software is the foundation of many modern systems. Learning how software algorithms and data structures work and why they are important will prepare you for more advanced topics in computer science. **Please read this syllabus in its entirety so you'll be informed of the requirements for success.**

I'm looking forward to helping each of you complete this course successfully—think of me as your guide in reaching that goal. -Karen Thurston, Instructor

Course Format

The course begins Monday, March 6 and ends Sunday, June 4.

Section 01-32191 has no scheduled meetings. It is an “asynchronous online” course, meaning that students will have access to recorded lectures and other curriculum and will be required to submit work each week according to published due dates just as they would for a class with scheduled meeting times.

Students will be required to interact with other students and with the instructor to complete certain assignments such as discussions. Additionally, the instructor keeps office hours and students are strongly encouraged to attend if they have questions or need assistance with the course, the college in general, or personal matters they would prefer to discuss in person.

Although there are no class meetings, students are strongly encouraged to access the online Learning Management System (Canvas) multiple times each week on your own schedule and to budget enough time each week to completing the week's assignments to stay current with due dates.

The instructor will provide a weekly video posted on the Canvas “Modules” page for each section introducing the topic and the assignments for the week.

Section 06-33968 meets Monday/Wednesday 1-2:30pm in M-213 on the LAC campus.

Class meetings will include similar material to the recorded videos but with additional demonstrations of the weekly assignments and opportunities to ask questions and discuss the material during class.

This course is a 3 credit course and will require 9-10 hours per week to complete the assignments. Three hours are devoted either to class attendance or to viewing the videos and other Canvas information independently.

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Instructor

Instructor Name: Karen Thurston (I go by Mrs. Thurston or Professor Thurston)

Office Phone: 562-938-4012 **Zoom:** <https://lbcc-edu.zoom.us/j/8838956396>

Office Hours (LAC M229): Tuesday 4-6pm and Wednesday 9am-noon (subject to change)

During office hours I monitor my Canvas inbox and will be available by Zoom and telephone.

Canvas profile: Contains my background information.

Important Dates

Please refer to the spring 2023 important dates document at the link below

https://www.lbcc.edu/sites/main/files/file-attachments/drop_deadlines_spring.pdf?1668616881

The document at the link above provides critical information for receiving refunds and withdrawing with or without a 'W' on your transcript. For the 12-week online course March 21 is the last day to drop for a full refund and no 'W'. For the on campus course March 19 is the deadline.

Course Description

Student Learning Outcomes (SLO)

Upon completion of the course the student should be able to:

1. Design, implement, test, and debug simple programs in an object-oriented programming language and explain the advantage of abstraction mechanisms.
2. Write programs that use each of the following data structures: arrays, linked lists, stacks, queues, trees, and hash tables and be able to discuss their performance in Big-O notation.
3. Implement, test, and debug simple recursive functions and procedures.

Objectives

Upon completion of the course the student should be able to:

1. Summarize the basic concepts of abstract data types, algorithms, and software engineering.
2. Write programs to demonstrate OOP concepts of inheritance, polymorphism, and OOP design principles
3. Analyze algorithms using Big-O notation, for both speed and memory use
4. Demonstrate an understanding and implement stacks in various problems, including prefix and postfix expressions.
5. Construct and implement queues and dequeues, as well as analyze their performance.
6. Construct and implement different types of linked lists and analyze their performance.
7. Distinguish, implement and analyze the classic searching and sorting algorithms.

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8. Summarize, implement and analyze the classic tree data structures and priority queues.
9. Propose appropriate design strategies and good software engineering techniques.

Prerequisites and course sequencing

CS-22 is a required course for the A.S. degree in computer science. Either CS11 “Introduction to Computer Science-C++”, CS21 “Introduction to Computer Science-Java”, or “Introduction to Computer Science-Python” are required prerequisites.

Course Materials and Resources (Required)

Textbook	<ol style="list-style-type: none"> 1. Sign in or create an account at learn.zybooks.com 2. Enter zyBooks code: LBCCCS22ThurstonSpring2023 3. Subscribe
Integrated Development Environment Options (pick one)	<p>No cost options:</p> <ol style="list-style-type: none"> 1) Code::Blocks version 20.03 Integrated Development Environment http://www.codeblocks.org/downloads/26 (Download for Windows) 2) Citrix Student Labs on the Viking Portal at LBCC.edu https://vlabs.lbcc.edu/Citrix/LBCCHTML5Web/. Choose the “COS Programming Lab” and the Code::Blocks software will be available on the virtual desktop. Use this option if you have a non-Windows computer or prefer not to install Code::Blocks onto your computer. 3) Visual Studio (for Windows, a Microsoft product) or Xcode (for Mac users) if you have experience with one of these and don’t require support from the instructor. 4) Repl.it (A web-based platform, not recommended unless you have experience with this platform)
C++ Compiler (if you install an IDE on your computer)	<p>The Code::Blocks installer will usually install the C++ compiler, but if there is an issue, you can download and install the MinGW C++ compiler: (Installer program) mingw-w64-install.exe</p>
Canvas	<p>CS-22-01-32191 https://lbcc.instructure.com/courses/81403 OR CS-22-06-33968 https://lbcc.instructure.com/courses/86839</p>

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Communicating with the Instructor

Please note that questions about the course such as content questions, or due date clarifications should be posted to the **“Course Questions” discussion thread** in the Canvas course website so all students can benefit from the answer (more details below).

To reach me regarding **questions that are personal in nature** (such as a request for an extension due to a family emergency or a request for an incomplete grade), please use the Canvas message feature for the course.

I prioritize Canvas messages and do not use campus email to communicate with students.

I respond to messages Monday-Friday, 8am-5pm, usually on the same day unless the message was sent over the weekend or after 5pm. After hours responses may be delayed, but if I am able, I will respond.

Posting & answering questions in the “Course Questions” discussion thread

I encourage students to help each other with basic instructions or sources of information, but not to provide answers to assignment, quiz, or exam questions or problems. This course does not include team assignments.

Post questions or answers about issues with the Cloud Academy or AWS Academy curriculum or technical issues.

In addition to your question or answer, if pertinent:

- Attach any related files and/or screenshots, especially of error messages
- Describe what you’ve tried to resolve the issue
- Describe what computer(s) and operating system(s) you’re using

Grading

Course grades are updated in Canvas as assignments are graded, so check often on your progress. I will reach out to students below a passing grade at the end of any week to meet with me to discuss a plan for their success in the class.

This is a fast-paced course and there will be multiple assignments to submit every week. Opportunities to attend office hours or communicate through Canvas should allow for multiple ways to stay in touch throughout the week.

Early/Late work

If you complete an assignment early, you will earn extra credit equal to 5% of the points for each day early. All assignments must be completed; extra credit cannot be used to substitute for a missed assignment. Students with extra credit points may use them to reverse deductions on another assignment as long as all assignments have been submitted.

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Points

Your course grade will be based on completing assignments in the following categories:

Category	Percentage
zyBooks active reading (100% complete = 11 pts.)	9%
10 Programming Assignments (6 pts. each, 60 pts.)	51%
10 Quizzes (1 pt. each, 10 pts.)	8%
9 Discussions (2 pts. each, 18 pts.)	15%
Final exam (20 pts.)	17%
TOTAL (119 pts.)	100%

Each week will include active reading in the zyBooks e-book (including very short programming exercises) and a programming assignment. Some programming assignments will stretch over more than one week. There will be 10 weekly quizzes and one comprehensive final exam to be given on the last Friday of the course, June 2.

Final Grades

Final grades will be calculated using the following scale:

GRADE	PERCENTAGE
A	90-100+
B	80-89
C	70-79
NP	69-0
D	60-69
F	59-0

Assignment Rubrics (How assignments are graded)

All assignments are graded based on points received for correct answers on quizzes or exams or for programming assignments completed correctly (each will have a rubric).

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Course Schedule and Outline

Week	zyBooks Sections & Topics
3/6	Section 1: Introduction to Data Structures and Algorithms: Data structures, Introduction to Algorithms, Relation between data structures and algorithms, abstract data types(ADTs), applications of ADTs, Algorithm efficiency Data Structures in C++: Basic data types: collection datatypes, I/O & string formatting, control structures
3/13	Section 2: Search and Algorithm Analysis: Searching and algorithms, Binary search, C++: Linear and binary search, Constant time operations, Growth of functions and complexity, Big O notation, Algorithm analysis Review Data Structures in C++: Abstract data types: functions & classes, object creation, inheritance, overloading, overriding & polymorphism, OOP design principles, OOP case study, software engineering
3/20	Section 2: Search and Algorithm Analysis: Recursive definitions, Recursive algorithms, Analyzing the time complexity of recursive algorithms
3/27	Section 3: Sorting Algorithms: Sorting: Introduction, Selection sort, C++: Selection sort, Insertion sort, C++: Insertion sort, Shell sort, C++: Shell sort, Quicksort, C++: Quicksort, Merge sort, C++: Merge sort, Radix sort, C++: Radix sort, Overview of fast sorting algorithms, C++: Sorting with different operators
4/3	* * * SPRNG BREAK * * *
4/10	Section 4: Lists, Stacks, and Queues: List abstract data type (ADT), Singly linked lists, Singly linked lists: Insert, Singly linked lists: Remove, Linked list search, C++: Singly linked lists
4/17	Section 4: Lists, Stacks, and Queues: Doubly linked lists, Doubly linked lists: Insert, Doubly linked lists: Remove, C++: Doubly linked lists
4/24	Section 4: Lists, Stacks, and Queues: Sorting linked lists, C++: Sorting linked lists, Linked list dummy nodes, Linked lists: Recursion, Stack abstract data type (ADT), Stacks using linked lists
5/1	Section 4: Lists, Stacks, and Queues: Queue abstract data type (ADT), Queues using linked lists, C++: Stacks and queues, Deques, abstract data types (ADT), Array-based lists, C++: Array-based lists
5/8	Section 5: Hash Tables: Hash tables, Chaining, Linear probing, Quadratic probing, Double hashing, Hash table resizing, Common hash functions, Direct hashing, Hashing Algorithms: Cryptography, Password Hashing, C++: Hash tables
5/15	Section 6: Trees: Binary trees, Applications of trees, Binary search trees, BST search, insert, and remove algorithms
5/22	Section 6: Trees: BST in order traversal, BST height and insertion order, BST parent node pointers, C++: Binary search tree
5/29	Standard Template Library (LBCC campus closed Monday 5/29 for Memorial Day holiday, no class) Comprehensive Final Exam (June 2)

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Campus Resources

Learning and Academic Resources (LARS) Department

Free tutoring, study skills assistance, computers, and more are available at both campuses. For more information visit: <https://www.lbcc.edu/lar>

Computer and Office Studies (COS) Department Study Center Help Desk

See this web page for hours and details: <https://www.lbcc.edu/post/cos-study-center>

COS Loaner Laptop Program

Students enrolled in Cloud Program courses may request a loaner laptop:

<https://forms.gle/vENeajNzyqPvoh8x6>

Student Technology Help Desk

The LBCC Student Technology Help Desk (STHD) supports Long Beach City College technology. Knowledgeable and friendly student team members provide peer support in areas such as **FREE** Office365 for LBCC students, Canvas LMS, Student Viking Email, and more.

Phone: (562) 938-4250

Email: sthd@lbcc.edu

Web page: www.lbcc.edu/sthd

LBCC Network Use

Please adhere to the acceptable use policy when using the LBCC campus network which is for campus-related business only.

Assistance and Disabilities

If you choose to identify yourself as having a disability requiring accommodations and would like to be evaluated for an accommodation, contact the LBCC Disabled Students Programs and Services (DSPS) office. Here is a link to their web page: <https://www.lbcc.edu/disabled-student-services>

Course Policies

Attendance

For section 01-32191 there are no required class meetings.

Student enrolled in section 06-33968 are required to attend class on Monday/Wednesday. Two excused absences are permitted if arranged in advance with the instructor. Students with 100% attendance (excused absences do not count against 100%) will receive a grade boost to the next higher grade if they are within 3% points of the higher grade. Keep in mind that attending class faithfully usually results in a high grade not requiring the “boost”!

Withdrawal

The instructor reserves the right to withdraw you from the course prior to the census date if no assignments have been submitted, or after the census date if no work completed in the prior 14 days.

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Academic Integrity

Academic integrity preserves fair and equal opportunity for all students, also known as equity. If you have any questions **always ask the instructor**.

Disciplinary Action

The instructor has the right to take disciplinary action if a student does not comply with the course policies or instructions. Appropriate penalties may include the following:

- Written warning
- Referral to the Dean of Student Affairs for disciplinary action as warranted

Disclaimer

This syllabus is subject to change at the instructor's discretion. It is a roadmap for the course and is subject to change throughout the semester.