Algorithms & Data Structures

CS - 2420 002

Course Description

CSIS 2420 focuses on dynamic data structures including stacks, queues, linked lists, heaps, hash tables, balanced trees, and graphs. It also covers the design and analysis of efficient algorithms, including algorithms for recursion, sorting, searching and traversal operations. CSIS-2420 develops problem-solving skills through the design and implementation of programs that solve substantial programming challenges. It is recommended students complete CSIS 2410 prior to taking this course.

Pre-Requisite(s): CS 1410 | CSIS 1410

Course Student Learning Outcomes

- Analyze and evaluate the efficiency and scalability of algorithms and determine the performance characteristics of a software program.
- Select the appropriate sorting or searching algorithm given specific quantitative limitations.
- Select the appropriate data structure(s) to solve a problem given a set of programming specifications and performance requirements.
- Utilize the interfaces and data structure classes of a given API to design and implement programs that solve substantial programming challenges.
- Implement classic algorithms and data structures using generic classes.

Text | Lecture Videos

CS 2420 is based on the book Algorithms by Robert Sedgewick and Kevin Wayne (ISBN 978-0321573513)

Students are asked to **purchase a subscription to Prof. Sedgewick's lecture videos**, which are referenced in the weekly prep assignments. Additionally, Prof. Sedgewick and his team provide a free book companion website that complements the videos and serves as a valuable resource throughout the semester.

For more details, please refer to the 'Textbook' tab on the 'Getting Started' page within the Orientation Module.

Brief Description of Assignments/Exams

Instructions, due dates, and submission procedures for all graded coursework are managed through Canvas.

- **Prep Quizzes** (7%):
  Weekly prep quizzes on Canvas help you assess how well you've understood the material from the video lectures. These quizzes can be taken only once, but the three lowest scores will be dropped from your final grade calculation.

- **Course Exercises** (20%):
  Course exercises (CEs) are crucial to your learning. They serve as a bridge between Professor Sedgewick's video lectures and the assignments. Collaboration and pair programming with classmates are encouraged when working through these exercises.

- **Assignments** (23%):
  Assignments are an essential part of the course, requiring you to apply new concepts independently. Academic integrity is essential; while you may discuss homework concepts with classmates, your implementations must be your own unless instructions explicitly permit a designated assignment partner.

- **Exams** (50%):
  There will be two module tests and one final exam. Upholding academic integrity during exams is paramount. If an exceptional situation prevents you from taking an exam at the scheduled time, please contact me at least 24 hours in advance.

Important: The first module test and the final must be taken in person in the SLCC Testing Center.

There are limited opportunities to use remote proctor services for students who are unable to attend in person. Remote proctor services are typically associated with an additional fee and need to be arranged well in advance.

Grading Scale

Grading Scale	A 94% - 100%	A- 90% - 93%
B+ 87% - 89%	B 84% - 86%	B- 80% - 83%
C+ 77% - 79%	C 74% - 76%	C- 70% - 73%
D+ 67% - 69%	D 64% - 66%	D- 60% - 63%
E 59% and below		

Additional Policies

Rules for Code Libraries:

Unless instructions state otherwise, use only classes from java.lang and algs4.jar for assignments and exams. This builds strong problem-solving skills and mirrors professional practice, where companies often limit libraries for security, maintainability, and consistency.

Academic Integrity and AI:

CS 2420 encouraged you to use AI as a learning tool when working on CEs or prep quizzes. AI can accelerate your progress by clarifying concepts, answering questions, or providing hints when you encounter difficulties in coding. However, AI should not be used to write your code. To ensure compliance, instruct AI tools not to generate code.

The use of AI is strictly prohibited during exams, including module tests and the final. Any use of AI in these assessments will be considered cheating.

Late Policy:

Submitting work on time is important, as it reflects competence, focus, and effective time management, which are strongly linked to success - not only in college but also also in the workplace.

However, unexpected challenges can arise. You may submit your work until the posted "until-date," after which submissions close. Canvas deducts 1% per day after the due date, so please avoid falling behind, and if you do, make it a priority to catch up quickly.

Canvas will post 0 points if a due date passes without a submission. This is intended to get your attention in case a submission was overlooked. When you see 0 points, don't be alarmed. Instead, take it as a call-to-action. You'll have the opportunity to submit late up until the posted 'until'-date,' with the 1% daily deduction applied.

Sometimes students face an unforeseeable situation that disrupts their ability to submit coursework for a longer period. If that is the case, please contact me as soon as possible. Early communication allows us to explore ways I can support you during difficult times.

Missed Exams:

If you miss an exam, you may have an opportunity to make it up within a reasonable timeframe. However, a 20% late deduction will apply to the exam grade.

Engagement Plan

As your instructor, I am committed to maintaining regular and substantive interaction to support your success in this course. You can expect the following:

- **Communication:**
    - I will respond to questions on Canvas mail within 24 hours during the workweek.
    - I will read posts on the 2420 Discord #□-help channel every workday and reply as appropriate.

    - If you request a meeting, I will find time to meet with you within two business days.
- **Course Guidance:**
    - While Canvas is your central hub for all coursework and grading, Discord is our space for help and community support. I will hold study sessions (announced in advance) and provide guidance in key Discord channels:
        - #-help: General course-related questions (no code sharing)
        - #tips: Helpful reminders and hints
        - #study-sessions: Practice opportunities and exam prep
        - #level-up-coding: Patterns and insights to improve coding
    - I will post weekly announcements with summaries of upcoming assignments and reminders to help you stay on track.
- **Feedback and Evaluation:**
    - I will grade assignments within one week of the due date if submitted on time.
    - Feedback is often posted directly in the rubric. Whenever points are deducted, comments will clearly identify the issue, and may also include suggestions for improvement.

My goal is to keep you connected, supported, and informed throughout the semester. I encourage you to use these channels actively and reach out early if you need help.

Keys for Success (how to succeed in the course)

Stay on pace.
Success comes from keeping up with the schedule, practicing consistently, and seeking help when needed. Submitting work on time keeps you engaged and helps concepts stick.

Take summary notes.
You may use notes during exams, so the effort you put in will pay off directly. Focus on capturing the essentials—class names, what each class represents, and its core functionality—rather than rewriting the book. If you need to look up extra information, add

only what's missing. Test your notes by trying to explain the concept to someone else—if it doesn't work, refine them.

Apply and update notes.

- **Videos + Quizzes**: Capture key ideas and examples to start building your notes.
- **CEs:** Complete them on time. Use your notes first; if you need extra information, add only the essentials so your notes grow into a reliable exam resource.
- **Assignments:** Again, rely on your notes first and amend them as needed.

Don't give up.
Everyone hits roadblocks when learning to code—that's normal. Struggle is part of the process. When you solve a problem, add what helped you to your notes so you can use it next time. Each challenge you work through strengthens your skills and confidence.

Prepare for exams.
During module tests and the final, you may only use Eclipse, algs4.jar (including the source code of its classes), and your notes. The stronger your notes, the more confident you'll be on exams.

CS and CSIS Tutoring

In addition to the Online Tutoring described below, you have access to free CS and CSIS Tutoring.
https://www.slcc.edu/csis/tutoring.aspx

The availability of tutors can change over time. Please use the provided link to look up the latest schedule.

Online Tutoring

Students at SLCC have access to online tutoring through Canvas. From your Canvas course click Online Tutoring in the course navigation and follow the steps to set up an

appointment. If this is your first time using the Online Tutoring we recommend you click "Take a Tour" to familiarize yourself with the service.

Note that students only receive 480 minutes of tutoring time each semester. After that we encourage you to use the resources found through this link: https://www.slcc.edu/tutoring/index.aspx

If you have any additional questions reach out to elearningsupport@slcc.edu.

Institutional Policies

As members of our academic community, we would like to invite you to review the Institutional Syllabus which covers important policies and procedures. This document contains important links for students on the code of student rights and responsibilities, academic integrity, and grading policies, Title IX and other important acknowledgements. By familiarizing yourself with this information, you can help us create a safe and respectful environment for everyone.

For more information, navigate to the Institutional Policies tab on the Institutional Syllabus page.

Learning Support and Tutoring Services

We are pleased to offer a range of tutoring and learning support services to help you achieve your academic goals. Whether you need assistance with a specific subject or want to improve your study skills, you have many options for tutoring or other support.

To learn more about the services we offer and how to access them, visit the Institutional Syllabus page under the Tutoring and Learning Support tab. We encourage you to take advantage of these resources to help you succeed in your studies. If you have any questions or would like to schedule a tutoring session, please don't hesitate to reach out to us. We are here to support you in any way we can.

Advising and Counseling Support Services

At our institution, we are committed to supporting your academic and personal growth. That's why we offer a range of advising and counseling services to help you navigate the

challenges of college life. To learn more about the resources available to you and how to access them, visit the Institutional Syllabus page under the Advising and Counseling Support Services tab. Our advising team and the support centers across campus are here to support you in achieving your goals and overcoming any obstacles you may face.

Student Academic Calendar

As students you should be aware of all important dates in the semester, such as the day that courses begin and end, as well as the drop date and the last day to withdraw. To learn more about those dates, navigate to the Student Academic Calendar below:

SLCC Student Academic Calendar

Assignment Schedule

Due Date	Assignment Name	Assignment Type	Points
	1410 Lab - Doc Comments | JAR	Assignment	0
	1410 Lab - jUnit	Assignment	0
	1410 Lab - KeyValuePair	Assignment	0
	Big O - Part 1	Quiz	0
	Big O - Part 1	Quiz	0
	Big O - Part 2	Quiz	0
	Big O - Part 2	Quiz	0
	Quiz Generic Methods and Types | Review	Quiz	0
	Quiz Generic Methods and Types | Review	Quiz	0

Due Date	Assignment Name	Assignment Type	Points
	REVIEW Analysis of Algorithms	Quiz	0
	REVIEW Analysis of Algorithms	Quiz	0
	REVIEW Balanced BSTs	Quiz	0
	REVIEW Balanced BSTs	Quiz	0
	REVIEW Heap	Quiz	0
	REVIEW Heap	Quiz	0
	REVIEW: Elementary Sorts	Quiz	0
	REVIEW: Elementary Sorts	Quiz	0
	REVIEW: Tree Traversals	Quiz	0
	REVIEW: Tree Traversals	Quiz	0
	Roll Call Attendance	Assignment	0
	Video & Quiz - Java Doc #1	Quiz	0
	Video & Quiz - Java Doc #1	Quiz	0
	Video & Quiz - Java Doc #2	Quiz	0
	Video & Quiz - Java Doc #2	Quiz	0

Due Date	Assignment Name	Assignment Type	Points
	Video & Quiz - jUnit #1	Quiz	0
	Video & Quiz - jUnit #1	Quiz	0
	Video & Quiz - jUnit #2	Quiz	0
	Video & Quiz - jUnit #2	Quiz	0
	Video & Quiz - Runnable JAR	Quiz	0
	Video & Quiz - Runnable JAR	Quiz	0
8/30/25	Academic Honesty	Quiz	5
8/30/25	CE Getting Started	Assignment	8
8/30/25	Discussion - This Is Me	Discussion	8
8/30/25	Programming Survey | Study Group	Quiz	3
8/30/25	Quiz Orientation	Quiz	8.5
9/3/25	CE - Debugging	Assignment	10
9/3/25	Quiz Array vs Linked List	Quiz	4
9/3/25	Quiz Intro to Linked List	Quiz	6
9/6/25	CE Intro to Data Structures CODE	Assignment	10
9/6/25	Quiz Union Find - Dynamic Connectivity	Quiz	3

Due Date	Assignment Name	Assignment Type	Points
9/6/25	Quiz Union Find - Improvements	Quiz	2
9/6/25	Quiz Union Find - Quick Union	Quiz	4
9/6/25	Quiz Union Find - QuickFind	Quiz	3
9/10/25	CE Intro to Algorithms CODE	Assignment	10
9/10/25	Quiz Analysis of Algorithms - Mathematical Models	Quiz	4
9/10/25	Quiz Analysis of Algorithms - Observations | Percolation	Quiz	2
9/10/25	Quiz Analysis of Algorithms - Order of Growth	Quiz	8
9/13/25	CE ArrayList | LinkedList	Assignment	10
9/13/25	CE Memory Usage	Assignment	10
9/13/25	Quiz Analysis of Algorithms - Memory	Quiz	6
9/17/25	CE Stack | Queue	Assignment	10
9/17/25	Quiz Recursion	Quiz	4
9/17/25	Quiz Stacks and Queues - Applications	Quiz	2

Due Date	Assignment Name	Assignment Type	Points
9/17/25	Quiz Stacks and Queues - Iterators | Bag	Quiz	5
9/17/25	Quiz Stacks and Queues - Queues	Quiz	4
9/17/25	Quiz Stacks and Queues - Resizing arrays	Quiz	6
9/17/25	Quiz Stacks and Queues - Stacks	Quiz	9
9/20/25	A01 Stack | Queue | Linked Structure	Assignment	40
9/20/25	CE Fluency: Analysis of Algorithms	Quiz	10
9/24/25	CE Iterator | Recursion	Assignment	10
9/24/25	Quiz Elementary Sorts - Insertion Sort	Quiz	4
9/24/25	Quiz Elementary Sorts - Rules | Comparable	Quiz	5
9/24/25	Quiz Elementary Sorts - Selection Sort	Quiz	4
9/27/25	A02 - Recursion	Assignment	30
9/27/25	CE Fluency: Elementary Sorts	Quiz	10
9/30/25	Module1 Exam CODE	Quiz	35
9/30/25	Module1 Test	Quiz	33

Due Date	Assignment Name	Assignment Type	Points
10/1/25	Quiz Mergesort - bottom up	Quiz	1
10/1/25	Quiz Mergesort - Comparator	Quiz	3
10/1/25	Quiz Mergesort - Introduction	Quiz	11
10/1/25	Quiz Mergesort - Sorting Complexity	Quiz	5
10/1/25	Quiz Mergesort - Stability	Quiz	4
10/4/25	CE Merge CODE_PLO-CS-6	Assignment	10
10/4/25	CE Stable CODE	Assignment	10
10/4/25	Quiz Quicksort - Introduction	Quiz	8
10/4/25	Quiz Quicksort - Selection	Quiz	4
10/8/25	CE Comparative Benchmarking	Assignment	10
10/8/25	Quiz Quicksort - System Sorts	Quiz	5
10/8/25	Quiz Priority Queue - API and Implementation	Quiz	3
10/8/25	Quiz Priority Queue - Binary Heap	Quiz	10
10/8/25	Quiz Quicksort - Duplicate Keys	Quiz	3

Due Date	Assignment Name	Assignment Type	Points
10/11/25	A03 Sorting - Part 1	Assignment	25
10/11/25	CE HeapSort CODE	Assignment	10
10/11/25	Quiz Priority Queue - Heap Sort	Quiz	4
10/15/25	CE Fluency: Heap	Quiz	10
10/15/25	Pair Up - A04 Symbol Table	Assignment	2
10/15/25	Quiz Elementary ST - API	Quiz	6
10/15/25	Quiz Elementary ST - Implementations	Quiz	3
10/15/25	Quiz Elementary ST - ordered operations	Quiz	2
10/22/25	CE Elementary ST CODE	Assignment	10
10/25/25	A03 Sorting - Part 2	Assignment	25
10/25/25	CE Fluency: Tree Traversals	Quiz	8
10/25/25	Quiz BST	Quiz	7
10/25/25	Quiz BST - Delete	Quiz	4
10/25/25	Quiz BST - Ordered Operations	Quiz	4
10/29/25	CE BST CODE	Assignment	10
10/29/25	Quiz Balanced Search Trees - BTrees	Quiz	3

Due Date	Assignment Name	Assignment Type	Points
10/29/25	Quiz Balanced Search Trees - red black BSTs	Quiz	13
10/29/25	Quiz Balanced Trees - 2-3 trees	Quiz	6
11/1/25	A04 Symbol Table	Assignment	40
11/1/25	Pair Up - Team Project	Assignment	2
11/1/25	Quiz Hash Table - Separate Chaining	Quiz	4
11/1/25	Quiz Hash Tables - Context	Quiz	4
11/1/25	Quiz Hash Tables - Hash Functions	Quiz	8
11/1/25	Quiz Hash Tables - Linear Probing	Quiz	4
11/1/25	CE Fluency: Balanced BSTs	Quiz	10
11/5/25	CE Hash CODE	Assignment	10
11/5/25	Quiz Symbol Table Applications - Dictionary Client	Quiz	2
11/5/25	Quiz Symbol Table Applications - Indexing Clients	Quiz	1
11/5/25	Quiz Symbol Table Applications - Sets	Quiz	6

Due Date	Assignment Name	Assignment Type	Points
11/5/25	Quiz Symbol Table Applications - Sparse Vectors	Quiz	2
11/8/25	CE DFS vs BFS CODE	Assignment	10
11/8/25	Quiz Undirected Graph - challenges	Quiz	1
11/8/25	Quiz Undirected Graphs - API	Quiz	7
11/8/25	Quiz Undirected Graphs - breadth first search	Quiz	3
11/8/25	Quiz Undirected Graphs - Connected Components	Quiz	5
11/8/25	Quiz Undirected Graphs - depth first	Quiz	5
11/8/25	Quiz Undirected Graphs - intro	Quiz	3
11/10/25	Module 2&3 Exam CODE	Quiz	46
11/10/25	Module2&3 Test	Quiz	49
11/12/25	Quiz Directed Graphs - intro	Quiz	2
11/12/25	Quiz Directed Graphs - Digraph API	Quiz	3
11/12/25	Quiz Directed Graphs - digraph search	Quiz	6

Due Date	Assignment Name	Assignment Type	Points
11/15/25	CE Symbol Graph CODE	Assignment	10
11/15/25	Team Project - Design_PLO-CS-4	Assignment	20
11/19/25	CE Directed Graphs	Assignment	10
11/19/25	Quiz Directed Graphs - topological sort | strong component	Quiz	6
11/22/25	CE Internet CODE	Assignment	10
11/22/25	Quiz Minimum Spanning Trees - edge-weighted graph API	Quiz	4
11/22/25	Quiz Minimum Spanning Trees - Greedy Algorithms	Quiz	5
11/22/25	Quiz Minimum Spanning Trees - Intro	Quiz	2
11/22/25	Quiz Minimum Spanning Trees - Kruskals Algorithm	Quiz	3
11/25/25	Team Project - Significant Progress	Assignment	25
11/29/25	CE City Connections CODE	Assignment	10
11/29/25	Quiz Minimum Spanning Tree - Prim's Algorithm	Quiz	8

Due Date	Assignment Name	Assignment Type	Points
11/29/25	Quiz Minimum Spanning Trees - Context	Quiz	3
12/3/25	CE Shortest Paths CODE	Assignment	10
12/3/25	Quiz Shortest Paths - API	Quiz	6
12/3/25	Quiz Shortest Paths - Dijkstra's algorithm	Quiz	7
12/3/25	Quiz Shortest Paths - properties	Quiz	4
12/6/25	Team Project - Finished Project_PLO-CS-1	Assignment	50
12/9/25	Vote and Reflection - Team Project	Quiz	16
12/10/25	Discussion: Detecting AI-Generated Images	Discussion	10
12/11/25	Jamboree 8 XC	Assignment	0
12/13/25	Bonus Points	Assignment	0
12/18/25	Final	Quiz	50
12/18/25	Final CODE	Quiz	50