

Effective: Fall 2025

COURSE INFORMATION

Course Title: Data Structures and Algorithms

Course Number: CSCI 225

Credits: 3

Total Weeks: 14 (Fall, Spring)
12 (Summer)

Total Hours: 39

Course Level: ☐ First Year ☒ Second Year
☐ New ☐ Revised Course
☐ Replacement Course

Department: Computer Science **Department Head:** M. O'Connor **Former Course Code(s) and Number(s) (if applicable):** N/A

Pre-requisites (If there are no prerequisites, type NONE): CSCI 125 or equivalent

Co-requisite Statement (List if applicable or type NONE): None

Precluded Courses: N/A

COURSE DESCRIPTION

This course will examine data structures and how they assist us in solving complex problems. Topics include: abstract data types (abstraction, encapsulation, information hiding), data structures (arrays, lists, stacks, queues, trees, heaps, sets, and hash tables), searching and sorting algorithms, correctness and efficiency, and object-oriented programming. All implementations will use the Java programming language.

LEARNING OUTCOMES

Upon successful completion of the course, students will be able to:

- Explain the fundamentals of data structures.
- Understand and apply the concept of abstract data types (ADTs).
- Use elementary data structures from the Java API such as arrays and lists, to solve problems.
- Demonstrate skills in tracing, analyzing, and designing recursive algorithms and recursive methods.
- Understand the purpose of algorithm analysis and be able to apply this to determine the running-time of simple non-recursive algorithms and recursive methods. Define and use big-O notation.
- Understand and implement various sorting algorithms and analyse the running-time required to determine their efficiencies.
- Describe, analyse and implement linear search and binary search algorithms.
- Describe how to use generic classes and methods in Java.
- Demonstrate how and when to use a linked list to store elements. Write code for basic operations such as add, insert, remove, and traverse
- Understand the doubly linked list data structure.
- Describe what a stack and what a queue is. Understand how to write array-based and linked list-based stack and queue classes to solve small but realistic problems.
- Describe in-depth applications of other data types such as trees (binary, binary search and AVL) and heap.
- Understand the characteristics and optimal behaviour of hash tables for access and retrieval.
- Explain the basics of graphs and their applications.

INSTRUCTION AND GRADING

Instructional (Contact) Hours:

Type	Duration
Lecture	39
Seminars/Tutorials	
Laboratory	
Field Experience	
Other (<i>specify</i>):	
Total	39

Grading System: Letter Grades ☒ Percentage ☐ Pass/Fail ☐ Satisfactory/Unsatisfactory ☐ Other ☐

Specify passing grade: 50%

Evaluation Activities and Weighting (total must equal 100%)

Assignments: 20% <i>Specify number of, variety, and nature of assignments:</i>	Lab Work: %	Participation: 15% <i>Specify nature of participation:</i>	Project: % <i>Specify nature of project:</i>
Quizzes/Test: %	Midterm Exam: 25%	Final Exam: 40%	Other: %

TEXT(S) AND RESOURCE MATERIALS

Provide a full reference for each text and/or resource material and include whether required/not required.

Tony Gaddis, Godfrey Muganda: Starting Out with Java: From Control Structures through Data Structures, 4th Edition. Pearson. 2019. ISBN 013478796X • 9780134787961.

COURSE TOPICS

List topics and sequence covered.

Week 1	Introduction Data Structures, Abstract Data Types, Array and ArrayList class
Week 2	Introduction to Stacks, their Applications and Implementation; Generics
Week 3	Introduction to Queues, their Applications and Implementation
Week 4	Introduction to Algorithms, Algorithm Analysis and O Notation; Searching Algorithms
Week 5	Sorting Algorithms
Week 6	Midterm Exam Advanced Sorting Algorithms
Week 7	Linked Lists and their Implementations

Week 8	Binary Trees
Week 9	AVL Trees
Week 10	Hashing
Week 11	Priority Queues, their Applications and Implementation
Week 12	Heapsort
Week 13	Introduction to Graphs
Week 14	Final Exam

NOTES

1. Students are required to follow all College policies. Policies are available on the website at: [Coquitlam College Policies](#)
2. To find out how this course transfers, visit the BC Transfer Guide at: bctransferguide.ca

Last Revised: May 2025

Last Reviewed: May 2025