

GMU Spring 2020

INFS 519 - Program Design and Data Structures

Instructor: Hal Greenwald (hgreenwa@gmu.edu)

Office Hours: By appointment

Lecture: 7:20 pm - 10:00 pm Tuesday Art and Design Building 2026

Course Description

Study of the fundamentals of data structures and algorithms applied in programming solutions to application problems. The course stresses programming in a modern high-level language.

Prerequisites

The prerequisite for this course is SWE-510 or its equivalent. You should have a semester's worth of basic programming in Java, including program design, coding, and debugging techniques.

Textbooks

Mark Allen Weiss, Data Structures & Problem Solving Using Java, Addison-Wesley (4th ed. is latest).

Topics to be covered and schedule

The following topics will be covered in approximately the order listed below. Lecture notes will be posted under Blackboard Announcements prior to each class.

Topic	Textbook Chapter(s)
Java – review of selected topics	1 - 4
Algorithm Analysis	5
Recursion, Sorting Algorithms	7, 8
Array, ArrayList, Stacks, Queues	15,16
Linked Lists	17
Trees	18
Binary Search Trees, B-Trees	19
Hash Tables	20
Graphs	14
Huffman Encoding	12.1
Special Topics	TBD

Syllabus: may be subject to modification.

Date:	Topics include:
1/21	Introduction, binary and hexadecimal integers, ASCII and Unicode, Java data types, Strings, Arrays, Multidimensional Arrays, ArrayList, Iterator and ListIterator
1/28	Overriding and Overloading methods, Inheritance, Static vs Dynamic polymorphism, Truth tables, Java bitwise and bit shift operators, Introduction to Algorithmic Complexity
2/4	Abstract Data Types, Sorting and Searching, Singly Linked List, Doubly Linked List, code examples and analysis
2/11	Circular Linked List, Code examples and analysis continued, Generics, Homework # 1 assigned.
2/18	Collections framework and Collection interfaces, Legacy classes and synchronization, Stack implementations: Array-based vs Linked list
2/25	The Stack continued, Recursion, Recursion vs Iteration, The Queue interface
3/3	Priority Queues, Algorithm efficiency, Time/Space Complexity, Homework # 1 due , Homework # 2 assigned.
3/17	Big O Notation, Priority Queues continued, Binary Trees: Size, Depth, and Balance, Midterm Exam
3/24	Binary Trees continued, Binary Search Trees, BST applications
3/31	Homework # 2 due , Time Complexity continued, Logarithms, Binary tree traversals continued, Recursive $O(\log(n))$ search, Homework # 3 assigned.
4/7	AVL Trees, Balance factor, Rotations
4/14	Graphs: Directed vs Undirected, Weighted vs Unweighted, Adjacency Matrix, Depth/Breadth-first search, Hash Tables, Homework # 3 due , Homework # 4 assigned
4/21	Priority Queues revisited, Heap (Min/Max), Heap Sort
4/28	Huffman Encoding, special topics, Homework # 4 due.
5/12	Final Exam (Cumulative)



GRADING POLICY

Your course grade will be an aggregate of the following items:

- Homework (40 points): 4 Java programming assignments
- Midterm Exam: (30 points)
- Final Exam – cumulative: (30 points)

Grading:

- A+ is at least 98 points
 - A: is at least 90 points
 - B+: is at least 88 points
 - B: is at least 80 points
 - C: is at least 70 points
 - D: is at least 60 points
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Honor Code

The class enforces the **GMU Honor Code**. Violations of academic honesty will NOT be tolerated.

Both the University and the Computer Science Department have honor codes you are expected to adhere to: <https://oai.gmu.edu/mason-honor-code/> and <http://cs.gmu.edu/resources/honor-code/>. You are bound by these honor codes.

Disability Statement

If a disability or other condition affects your academic performance, please document it with the Office of Disability Services.

Campus Resources

Computer Labs – there are several freely available computer labs on campus, for hours and locations please see: <http://doit.gmu.edu/students/computer-labs/computer-lab-locations/>

Office of Disability Services - <http://ds.gmu.edu>

Counseling and Support Services - <http://caps.gmu.edu>

English as a Second Language (ESL) Writing Support - <http://writingcenter.gmu.edu/tutoring/esl-writing-support>

Working together vs. individually

For this class homework and exams require individual work. Study groups are *encouraged*, but homework solutions and write-ups **MUST** be the result of individual effort. Similarly, study groups for examinations are encouraged. However, exams are individual effort and closed book.

Class Policies

Blackboard is used for class announcements, assignments, and other related information.

Please show up on time – late arrivals can be disruptive.

Mute cell phones. If you must take a phone call during class please take it outside the room.

No web surfing or texting during class – it can be disruptive to those around you.

No make-up exams and, in general, no late assignments will be accepted unless otherwise announced.