GMU Spring 2021
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 ONLINE

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:
Week 1	Introduction, binary and hexadecimal integers, ASCII and Unicode, Java data types, Strings, Arrays, Multidimensional Arrays, ArrayList, Iterator and ListIterator
Week 2	Overriding and Overloading methods, Inheritance, Static vs Dynamic polymorphism, Truth tables, Java bitwise and bit shift operators, Introduction to Algorithmic Complexity, Linked Lists **Homework # 1 assigned**
Week 3	Abstract Data Types, Sorting and Searching, Singly Linked List, Doubly Linked List, code examples and analysis
Week 4	Circular Linked List, Generics, the Stack, Recursion
Week 5	Collections framework and Collection interfaces, Legacy classes and synchronization, Stack implementations: Array-based vs Linked list
Week 6	Recursion continued, Recursion vs Iteration, The Queue interface, **Homework # 2 assigned.**
Week 7	Priority Queues, Algorithm efficiency, Time/Space Complexity, Binary Trees
Week 8	Big O Notation, Binary Trees: Size, Depth, and Balance, **Midterm Exam** (currently schedule for March 16)
Week 9	Binary Search Trees, Logarithms, BST applications, Case study, **Homework # 3 assigned.**
Week 10	Time Complexity continued, Binary tree traversals (recursive vs. iterative) continued, Recursive O(log(n)) search, AVL Trees
Week 11	AVL Trees continued, Balance factor, Rotations
Week 12	Graphs: Directed vs Undirected, Weighted vs Unweighted, Adjacency Matrix, Depth/Breadth-first search, Hash Tables, **Homework # 4 assigned**
Week 13	Priority Queues revisited, Heap (Min/Max), Heap Sort
Week 14	Huffman Encoding, special topics
May 4	**Final Exam** (Cumulative) ONLINE 7:30PM-10:15PM

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 90 points
- B: is at least 80 points
- C: is at least 70 points

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. Piazza is used for questions and discussion outside of lecture.