**LAGUARDIA COMMUNITY COLLEGE**
**CITY UNIVERSITY OF NEW YORK**
**DEPARTMENT OF MATHEMATICS, ENGINEERING, and COMPUTER SCIENCE**

**MAC286 Data Structures**

**4 hours (3 lecture, 1 lab), 3 credits**
**Prerequisite: MAC190, MAT200 or MAT241**

**CATALOG DESCRIPTION:**
This advance computer science course focuses on data structures. It is assumed that the student is familiar with basic computer concepts of object-oriented programming. Topics will include linear data structures such as a linked lists, stacks, queues and trees, file processing concepts, sorting and searching, and recursion. Programming assignments will focus on implementing complex algorithms.

**Instructional Objectives:**

1. To introduce the student to the concept of aggregate, dynamic and linear data structures.
2. To enable the student to solve complex problems using data structures.
3. To enable the student to write programs that require the use of various advanced techniques and data structures.
4. To enable the student to choose the correct data structures for problem-solving.
5. To encourage proper programming methodologies.
6. To provide the students with advanced problem-solving and programming techniques.

**Performance Objectives:**

1. Identify aggregate, dynamic and linear structures.
2. Solve complex problems using data structures.
3. Write programs that require the use of advanced techniques and data structures.
4. Choose the correct data structures to implement for various problems.
5. Apply various techniques for advanced problem-solving and programming.
6. Demonstrate proper programming methodologies.

**TEXTBOOK:** Data Structures in Java - 2$^{nd}$ Edition, by Robert Lafore; SAMS. SBN# 0672324539

**GRADING STANDARDS:**

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|---|---|
| Exams | 40% |
| Programming Assignments | 50% |
| Class Participation | 10% |
| Total | 100% |

**ACADEMIC INTEGRITY:** This class will be conducted in compliance with LaGuardia Community College's academic integrity policy.

**Sanctions for Academic Integrity Violations:** Sanctions or penalties for violations of academic integrity are imposed by the faculty member teaching the course upon discovery of a violation. All cases of academic dishonesty are filed with the College Adjudicator, who maintains a record of academic integrity violations.

The occurrence of a second or third offense of academic dishonesty may involve the imposition of a disciplinary sanction in addition to the academic sanction imposed by the instructor. Sanctions for violations of academic integrity include, but are not limited to, the following:

– failure of an exam
– a grade of F on an essay or research paper
– failure of a course project
– failure of the course
– suspension from the College
– dismissal from the College

**ATTENDANCE:** The maximum number of unexcused absences allowed is 15% of the total class meetings (about 7 hours). Unexcused absences beyond this maximum will result in a grade of WU or F.

| Week | Topics | Chapter | Pages |
|------|--------|---------|-------|
| 1 | Overview, Terminology, Object Oriented Programming | 1 | 9-30 |
| 2 | Arrays, Algorithms with Arrays, Programs with multiple classes, Interfaces, Ordered Array, Logarithms, Big O Notation, Linear Search, Binary Search | 2 | 33-74 |
| 3 | Stacks, Queues, Priority Queues, Parsing Arithmetic Expressions, PostFix Notation, Evaluation PostFix Expressions | 4 | 115-174 |
| 4-5 | Linked Lists: References, Simple Linked Lists, Inserting and Deleting Nodes, Double-Ended Lists, Sorted Lists, Efficiency, Doubly Linked Lists, Iterators | 5 | 179-245 |
| 6 | Binary Trees: Terminology, Finding a Node, Inserting a Node, Traversing the Tree, Finding Max/Min Values, Deleting a Node, Representing Trees as Arrays | 8 | 365-423 |
| 7 | Hash Tables, Introduction to Hashing, Open Addressing, Separate Chaining, Hash Functions, Hashing Efficiency, External Storage. | 11 | 519-574 |
| 8-9 | Heaps, Introduction to Heaps, Insertion, Removal, Array Size, Expanding the Heap, HeapSort, HeapSort Efficiency | 12 | 579-611 |
| 10-11 | Graphs, Searches, Directed Graphs, Weighted Graphs, Shortest-Path Problem, The Knight's Tour | 13, 14 | 615-665, 669-713 |
| 12 | When to Use What: Evaluation of General-Purposes and Special Purpose Date Structures, Sorting Graphs, External Storage | 15 | 718-728 |
| 13 | Final Examination | | |