

IT-2660: DATA STRUCTURES & ALGORITHMS

Cuyahoga Community College

Viewing: IT-2660 : Data Structures & Algorithms

Board of Trustees:

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Academic Term:

Fall 2018

Subject Code

IT - Information Technology

Course Number:

2660

Title:

Data Structures & Algorithms

Catalog Description:

Programming and problem-solving skills are further developed by using language features to implement various data structures such as stacks, queues, linked lists, trees and graphs. Additional topics include recursion, sorting, searching, and hashing algorithms.

Credit Hour(s):

4

Lecture Hour(s):

3

Lab Hour(s):

2

Requisites

Prerequisite and Corequisite

IT-2650 Java Programming.

Outcomes

Course Outcome(s):

Analyze problems, design and implement programming solutions using data structures and complex algorithms.

Objective(s):

1. A. Analyze simple data structure problems, defining necessary input, output, and processes.
2. J. Produce executable programs using data structures and algorithms.
3. B. Design programming solutions independent of programming languages.
4. C. Code data structure algorithms in programming language based on results of analysis and design.
5. D. Examine the advantages and disadvantages of using various data structures and algorithms.
6. E. Analyze various data structures and their operations at a logical level.
7. F. Examine the processing efficiency and memory space requirements of various data structures and algorithms to make design decisions.
8. G. Implement data structure logic and syntax.
9. H. Use accepted language style conventions and documentation.
10. I. Test, debug, and correct program code.

Methods of Evaluation:

1. Class participation and discussion
2. Oral and/or written reports
3. Homework assignments
4. Hands-on computer lab projects

5. Comprehensive projects
6. Quizzes
7. Examinations
8. Hands-on computer lab examinations

Course Content Outline:

1. Review language fundamentals
 - a. Classes and objects
 - b. Interfaces
 - c. Inheritance
 - d. Deep vs. shallow copies
 - e. Accepted style conventions
 - f. Accepted documentation
2. Data types
 - a. Abstract data types
 - b. Value vs. reference types
 - c. Arrays
 - d. Generics
 - e. Collections
3. Types of Data Structures
 - a. Lists
 - b. Stacks and queues
 - c. Linked structures
 - d. Hashed structures
 - e. Binary Search Trees
 - f. Heaps, priority queues, graphs
4. Data Structure & Algorithm Design
 - a. Processing efficiency (Big-O analysis)
 - b. Memory space requirements (Density)
 - c. Advantages/disadvantages of various data structures
 - i. Lists
 - ii. Stacks and queues
 - iii. Linked Structures
 - iv. Hashed structures
 - v. Binary Search Trees
 - vi. Heaps, priority queues, graphs
 - d. Logic
 - e. Syntax
5. Data structure problems
 - a. Input
 - b. Output
 - c. Processes
6. Recursion
 - a. Recursion vs. iteration
 - b. Formulating recursive algorithms
 - c. Backtracking
 - d. Problems with recursion
7. Sorting, Searching, and Hashing algorithms
 - a. Bubble sort
 - b. Heap sort
 - c. Merge sort
 - d. Quick sort
 - e. Linear search
 - f. Binary search
 - g. Linear hashing
 - h. Quadratic hashing
 - i. Linear quotient hashing
 - j. Chained hashing

Resources

Goodrich and Tamassia. *Data Structures and Algorithms using Java*. 5th ed. John Wiley Sons, 2010.

Malik and Nair. *Data Structures using C++*. 2nd ed. Cengage Learning, 2010.

Sedgewick, R., Wayne, K. *Algorithms*. 4. Addison-Wesley Professional, 2011.

Karumanchi, N. *Data Structures and Algorithms Made Easy in Java: Data Structure and Algorithmic Puzzles*. 2. CreateSpace Independent Publishing Platform, 2011.

McAllister, W. *Data Structures and Algorithms Using Java*. 9. Jones Bartlett Learning, 2009.

Resources Other

1. Oracle, Java Programming web site: <https://www.oracle.com/java/index.html>

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