

MISSOURI WESTERN STATE UNIVERSITY

SCHOOL OF LIBERAL ARTS AND SCIENCES

DEPARTMENT OF COMPUTER SCIENCE, MATHEMATICS, AND PHYSICS
Undergraduate Program

COURSE NUMBER: CSC285
COURSE NAME: DATA STRUCTURES

COURSE DESCRIPTION:

Topics include algorithm analysis and the implementation of stacks, queues, linked lists, trees, and other data structures. Principles of data abstraction are emphasized throughout the course.

Prerequisites:

A grade of C or higher in both CSC 254 and MAT 112, MAT 116, or higher.

Objectives:

Upon completing this course students will have acquired a working knowledge of three software programs specific to graphic design. They will be able to:

- choose appropriate and efficient data structures and algorithms to solve a problem.
- compare data structures and algorithms for efficiency using algorithm analysis and experiments.
- apply algorithm analysis and knowledge of discrete mathematics to evaluate algorithms and data structures.
- implement and use linear data structures, including stacks, queues, lists
- implement and use search structures and algorithms including binary search, search trees, and hash tables.
- use and implement search data structures, including search trees and hash tables.
- use and implement priority queues.
- know and implement sorting algorithms and compare their performance analytically and empirically
- understand of graphs and their representations; implement graph search using BFS, DFS, and Dijkstra's Algorithm.
- solve problems using pointers and dynamically managed memory.
- write recursive functions and understand when recursion is appropriate to a problem.
- design, document, and implement classes and object hierarchies.
- apply tools and techniques for program correctness, such as unit testing, use of a symbolic debugger, and assert statements.
- write readable and maintainable code.
- explain computational solutions in person and in writing.

Required Texts:

Introduction to Java Programming Comprehensive Version 10th edition, Y. Daniel Liang.
Pearson (2015). ISBN: 978013376313

<http://www.mypersonstore.com/bookstore/intro-to-java-programming-comprehensive-version-0133761312>

COURSE OUTLINE:

- Introduction -- Course overview, administrative matters.
- Review Basic goals and concepts.
- Object oriented programming. Encapsulation. Inheritance. Polymorphism.
- Programming Skills. Xtreme Programming, debugging, testing, application of OO concepts.
- Basic data structures. Stacks, queues, linked lists, heaps.
- Algorithm analysis.
- Recursion.
- Sorting. Mergesort, quicksort, bin sort, heap sort. (Chapter 8)
- Trees. Traversal. Binary search trees. (Chapter 18-19)
- Hash Tables.
- Balanced Trees. Splay trees. AVL trees. Red-Black trees. B Trees. Union-Find trees.
- Priority Queues. Binary heaps.
- Graphs. Graph algorithms.