

School of Computer Science

Course Title: Data Structures

Date: October 3, 2007

Course Number: COP 3530

Number of Credits: 3

Subject Area: Programming	Subject Area Coordinator: Jai Navlakha email: navlakha@cis.fiu.edu
Catalog Description: : SCS Web page	
Textbook: Data Structures & Problem Solving in Java By Mark Weiss	
References:	
Prerequisites Courses: COP 3337	
Corequisites Courses: None	

Type: Required

Prerequisites Topics:

- **Master the design and implementation of classes using I inheritance and polymorphism**
- **Master the use and implementation of interfaces**
- **Be exposed to writing recursive methods**
- **Be familiar with the implementation of linked list data structures**
- **Be familiar with the Stack & Queue data structures**
- **Be exposed to the Java Collection interface**

Course Outcomes:

- O1. Be familiar with basic techniques of algorithm analysis
- O2. Be familiar with writing recursive methods
- O3. Master the implementation of linked data structures such as linked lists and binary trees
- O4. Be familiar with advanced data structures such as balanced search trees, hash tables, priority queues and the disjoint set union/find data structure
- O5. Be familiar with several sub-quadratic sorting algorithms including quicksort, mergesort and heapsort
- O6. Be familiar with some graph algorithms such as shortest path and minimum spanning tree
- O7. Master the standard data structure library of a major programming language (e.g. java.util in Java 1.2)

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Outline

Topic	Number of Lecture Hours	Outcome
<ul style="list-style-type: none"> • Review of Java <ul style="list-style-type: none"> ○ Interfaces ○ Function Objects ○ Iterators ○ Nested & Inner Classes 	3	
<ul style="list-style-type: none"> • Algorithm Analysis <ul style="list-style-type: none"> ○ Basic Big-Oh ○ Sample $O(N^3)$, $O(N^2)$, $O(N)$ algs ○ Binary Search ○ Divide & Conquer $O(N \log N)$ algs 	6	O1
<ul style="list-style-type: none"> • Sorting <ul style="list-style-type: none"> ○ Mergesort ○ Quicksort ○ Lower Bounds ○ Other sorts as appropriate 	6	O1, O2 & O5
<ul style="list-style-type: none"> • Java Collection Data Structures <ul style="list-style-type: none"> ○ List, ArrayList & LinkedList ○ Set, HashSet & TreeSet ○ Map, HashMap & TreeMap 	3	O7
<ul style="list-style-type: none"> • Stacks, Queues, Linked Lists <ul style="list-style-type: none"> ○ Includes Java style implementation details, such as Iterator class 	4	O3
<ul style="list-style-type: none"> • Binary Search Trees <ul style="list-style-type: none"> ○ including AVL trees 	4	O4
<ul style="list-style-type: none"> • Hash Tables 	3	O4
<ul style="list-style-type: none"> • Priority Queues 	3	O4
<ul style="list-style-type: none"> • Shortest Path Algorithms 	3	O6
<ul style="list-style-type: none"> • Disjoint Sets 	3	O4

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Course Outcomes Emphasized in Laboratory Projects / Assignments

Outcome	Number of Weeks
O2	1 assignment 2 weeks
O7	1 assignment 2 weeks
O3	1 assignment 2 weeks
O4	1 assignment 2 weeks
O6	1 assignment 2 weeks

**Oral and Written Communication:
None**

**Social and Ethical Implications of Computing Topics:
None**

Approximate number of credit hours devoted to fundamental CS topics

Topic	Core Hours	Advanced Hours
Algorithms:	1.0	
Software Design:	0	
Computer Organization and Architecture:	0	
Data Structures:	2.0	
Concepts of Programming Languages:	0	

**Theoretical Contents:
None**

Problem Analysis Experiences

5 assignments

**Solution Design Experiences:
None**

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The Coverage of Knowledge Units within Computer Science Body of Knowledge¹

Knowledge Unit	Topic	Lecture Hours
AL1	Algorithm Analysis, Sorting, Shortest Path & Disjoint Sets	6
AL2	Algorithm Analysis, Sorting, Shortest Path & Disjoint Sets	6
AL3	Algorithm Analysis, Sorting, Shortest Path & Disjoint Sets	6
PF3	Stacks, Queues, linked lists, binary trees, hash tables & priority queues	14

¹See <http://www.computer.org/education/cc2001/final/chapter05.htm> for a description of Computer Science Knowledge units