

## FSU CURRICULUM FILE SYLLABUS

DATE APPROVED \_\_\_\_\_ (COMPLETED AT UNIV LEVEL)

COURSE PREFIX/NUMBER: COP 4530

COURSE TITLE: Data Structures, Algorithms and Generic Programming

PRE OR COREQUISITES: Pre:COP3330,MAD2104. Co/Pre:CDA3100 REPEAT CODE: 00

### LIST COURSE OBJECTIVES:

At the end of this course, you should be able to accomplish the objectives given below. Furthermore, since the tasks mentioned below are those that every computer scientist is expected to be familiar with, it will help you if you learn it well enough that you have a permanent working knowledge of the material discussed.

#### Data Structures

- Define and use the following *abstract data types* (ADTs) as generic containers:  
Positional ADTs: vector, list, deque, stack, queue, graph, digraph  
Associative ADTs: table, map (associative array), priority queue, set
- Implement these ADTs, including performance constraints (in terms of runtime complexity) on the operations.

Note that this implies the detailed study of trees of several types as implementation structures and the use of template classes as well as the elementary study of algorithms and their complexity.

#### Algorithms

You should be able to accomplish the following:

- Show the steps performed by algorithms that use the data structures given above, and of their simple variants.
- Prove the correctness of algorithms that use the data structures given above, and of their simple variants.
- Perform time and space *complexity analysis* of algorithms that use the data structures given above, and of their simple variants.

#### Generic Programming

You should be able to accomplish the following:

- Implement a given data structure as a *generic container*, using class templates with typename template parameters.
- Implement a given algorithm generically, using function templates with iterator template parameters.

Attaining these objectives will enable you to:

- Write code that performs many of the fundamental operations of Computer Science efficiently.

- Modify the techniques we discuss, when an application on which you are working is unable to use the techniques directly.
- Write code that is re-usable.

OBJECTIVES SHOULD BE BROADLY STATED TO ALLOW FACULTY DIFFERENCES AND ALLOW CHANGES IN MODE OF DELIVERY. ENOUGH DETAIL SHOULD BE GIVEN TO DISTINGUISH FROM OTHER COURSES IN ASSIGNMENT OF A SUS COURSE NUMBER. COMMITTEE APPROVALS ARE REQUIRED FOR A CHANGE IN OBJECTIVES.

GIVE BRIEF OUTLINE OF TOPICS TO BE COVERED (NO DATES):

Week	Chapter
1	Syllabus, <a href="#">initial quiz</a>
	1. Introduction
	2. C++ review: Templates and deep copy; Up to sec 1.6 (excluding 1.3 and 1.5)
2	Discuss assignment 1, compilation, and makefiles.
	3. STL, containers and iterators; Sec 1.7.
	4. Vectors; Sec 1.8
3	Using a debugger, performance analysis
	5. Complexity analysis; Sec 2.1, 2.2, 2.6, and 2.7
	6. Complexity analysis; Sec 2.3 - 2.5
4	Discuss assignment 2
	7. Linked lists -- Up to sec 3.2
	8. Self-organizing lists, STL lists; sec 3.5, 3.7
5	Discuss assignment 2
	9. Complexity analysis; Sec 2.8 - 2.9
	10. 8. Complexity analysis using integration -- class notes
6	Discuss assignment 3
	11. Deques; sec 3.8
	12. Stacks and queues; Up to sec 4.3.
7	Discuss assignment 4
	13. Stacks and queues in STL; sec 4.4 - 4.6
	14. Midterm review
8	Midterm review
	15. <b>Midterm</b>
	16. Recursion; up to sec 5.8
9	Discuss assignment 4 and midterm
	17. Iterators
	18. Binary trees, searching, and traversal: up to sec 6.4, except sec 6.4.3.

<b>10</b>	Discuss assignment 5
<b>11</b>	Discuss assignment 5
	21. AVL trees -- deletion; sec 6.7.2, and Self-adjusting trees; sec 6.8 22. Heaps; sec 6.9, except sec 6.9.2
<b>12</b>	Discuss assignment 6
	23. Heap initialization; sec 6.9.2 and class notes. 24. Proving properties of trees, and algorithms on them; class notes.
<b>13</b>	Discuss assignment 6.
	25. Hashing; up to sec 10.2.1 Thanksgiving -- no class
	Lecture review.
	26. Hashing; sec 10.2.2, sec 10.3 27. Graphs; up to sec 8.2
	Finals review
	Other topics 28. Finals review

**EVALUATION CRITERIA CHECK ONE (CHANGE IN EVALUATION CRITERIA REQUIRES THE DEPARTMENT TO SUBMIT A NEW SYLLABUS FOR THE FILE)**

EXAMS ONLY (THE NUMBER AND WEIGHT OF EACH TO BE REFLECTED ON THE STUDENT SYLLABUS)

EXAMS AND OTHER (SUCH AS LAB REPORTS OR ASSIGNMENTS, TERM PAPER OR WRITTEN PROJECT, ORAL PRESENTATION; THE WEIGHT OF EACH TO BE REFLECTED ON THE STUDENT SYLLABUS.

NO EXAMS - ONLY ASSIGNMENTS (TO BE DESCRIBED CLEARLY ON THE STUDENT SYLLABUS)