PELLISSIPPI STATE TECHNICAL COMMUNITY COLLEGE
MASTER SYLLABUS

DATA STRUCTURES W/ LAB
CST 1400

Class Hours: 3.0  Credit Hours: 4.0
Laboratory Hours: 3.0  Date Revised: Spring 02

Catalog Course Description:

Advanced problem solving and algorithm development, structured programming, data structures and applications, I/O techniques, lists, queues, trees, algorithms, files. This course is intended for university parallel students.

Entry Level Standards:

The student is expected to proficient in C programming components taught in CST 1030. These include functions, arrays, string handling, argument passing, indirect addressing and elementary file I/O. The student is also expected to have a working knowledge of the Unix operating system, a Unix based editor such as vi or emacs and C program development in the Unix environment. The student must have math, writing, verbal and English language skills at the college level.

Prerequisite:

CST 1020 or department approval

Textbook(s) and Other Reference Materials Basic to the Course:

Weiss, Mark Allen; Data Structures and Algorithm Analysis in C, 2nd Edition; Addison-Wesley; 1997

I. Week/Unit/Topic Basis:

<table>
<thead>
<tr>
<th>Week</th>
<th>Topic</th>
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<tbody>
<tr>
<td>1</td>
<td>Introduction, Overview of Algorithm Complexity, Review of C: Arrays, Strings, Pointers, Pointer Arithmetic, Indirection, Double Indirection, Functions, Arguments and Scope of Variables, Prototypes, Program Structure</td>
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<tr>
<td>2</td>
<td>Review of C</td>
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<tr>
<td>3</td>
<td>Structures, Typedef, Dynamic Memory Allocation</td>
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<td>4</td>
<td>Lists, Stacks, Queues, Static and Dynamic Lists</td>
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<td>5</td>
<td>Record I/O, Command Line Arguments, Exam I</td>
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<tr>
<td>6</td>
<td>Binary trees, Tree Traversals, Insertions and Deletions, AVL Trees</td>
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<td>7</td>
<td>Splay Trees, B Trees</td>
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</tbody>
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II. Course Objectives*:

A. Demonstrate proficiency in the C and C++ programming language. III VI VII IX XI

B. Demonstrate use of advanced C programming statements and able to use these statements in writing a large program. III VI VII IX XI

C. Demonstrate knowledge of data abstraction, specification, refinement and implementation, understanding of specific structures such as lists, stacks, queues, linked-lists, hash tables and binary trees. III IV XI XII

D. Demonstrate use of various searching and sorting methods and select most efficient algorithm. III V XI XII

E. Demonstrate use of various data structures in writing a large program with C. III V X XI XII

F. Write well structured programming code using divide-and-conquer method. II III V VI VII IX X XI XII

G. Use recursive techniques to solve problems. V, VI, IX

*Roman numerals after course objectives reference goals of the CST program.

III. Instructional Processes*:

Students will:

1. Create a complex software package which implements multiple data structures. Communication Outcome, Problem Solving and Decision Making Outcome, Technological Literacy Outcome, Transitional Strategy, Active Learning Strategy

2. Examine and implement algorithms that are efficient and reliable. Problem Solving and Decision Making Outcome, Technological Literacy Outcome

3. Use professional tools to produce software components and documentation. Technological Literacy Outcome, Transitional Strategy

4. Participate in a software development team. Communication Outcome, Problem Solving and Decision Making Outcome, Personal Development Outcome, Transitional Strategy, Active Learning Strategy
5. Participate in a peer review of term projects. *Problem Solving and Decision Making Outcome, Communication Outcome, Transitional Strategy, Active Learning Strategy*

6. Use professionally accepted methods and materials in completion of applications. *Technological Literacy Outcome, Personal Development Outcome*

7. Practice elements of the work ethic such as punctuality, professionalism, dependability, cooperation, and contribution. *Personal Development Outcome*

*Strategies and outcomes listed after instructional processes reference Pellissippi State’s goals for strengthening general education knowledge and skills, connecting coursework to experiences beyond the classroom, and encouraging students to take active and responsible roles in the educational process.

**IV. Expectations for Student Performance***:

Upon successful completion of this course, the student should be able to:

1. Learn the syntax and semantics of C and C++ programming language. A
2. Utilize advanced C programming statements in large programs. B
3. Understand simple data types, arrays, structures and unions. B
4. Understand implementation of abstract data structures via pointers. B, C
5. Understand links, stacks, queues, linked-list and binary tree searching. C
6. Understand trees and tree traversal. C
7. Understand recursive functions. C, D
8. Understand various sorting and searching techniques. D
9. Understand graphs and graph traversal. D
10. Understand hashing techniques. D
11. Understand heaps and their applications. D
12. Write a large program using various data structures. E, F
13. Use recursion as an alternative to linear solutions. A, B, C, G
14. Use/Make files to manage projects. F

*Letters after performance expectations reference the course objectives listed above.

**V. Evaluation**:

**A. Testing Procedures**:

There will be three exams counting 200 points each. Projects will be team programming assignments and will include most of the data structures covered during the term.

**B. Laboratory Expectations**:

Laboratory programming assignments will be given for each laboratory period. Lab
assignments will count 200 points. A late penalty will be assessed on overdue assignments.

C. Field Work:

N/A

D. Grade Breakdown:

<table>
<thead>
<tr>
<th>Component</th>
<th>Points</th>
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<tbody>
<tr>
<td>First Exam</td>
<td>200 (20%)</td>
</tr>
<tr>
<td>Second Exam</td>
<td>200 (20%)</td>
</tr>
<tr>
<td>Final Exam</td>
<td>200 (20%)</td>
</tr>
<tr>
<td>Lab Assignments</td>
<td>200 (20%)</td>
</tr>
<tr>
<td>Project</td>
<td>200 (20%)</td>
</tr>
</tbody>
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E. Grading Scale:

- 925 - 1000 A
- 875 - 924 B+
- 825 - 874 B
- 775 - 824 C+
- 725 - 774 C
- 600 - 724 D
- Below 600 F

VI. Policies:

A. Attendance Policy:

Pellissippi State Technical Community College expects students to attend all scheduled instructional activities. As a minimum, students in all courses must be present for at least 75 percent of their scheduled class and laboratory meetings in order to receive credit for the course.

B. Academic Dishonesty:

Students are expected to do their own work in this class. It is the student's responsibility to request help from the instructor prior to the assignment's due date.

C. Make Up Exams:

All exams are required, and make-ups will be allowed only in the rarest of cases. In the event of an emergency, notification of the instructor must be made in advance if at all possible.