

**DATA STRUCTURES  
CSIT 1400**

Class Hours: 3.0  
Laboratory Hours: 3.0  
Credit Hours: 4.0  
Revised: May 2009

Instructor:  
Office:  
Phone:  
Email:

This course is designed for transfer credit.

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**Catalog Course Description:**

Advanced problem solving and algorithm development, structured programming, data structures and applications, I/O techniques, lists, queues, trees, algorithms and files. Program development using UNIX operating system. This course is intended for University Parallel students.

**Entry Level Standards:**

The student is expected to be proficient in C programming components taught in CSIT 1020. 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:** CSIT 1020 or department approval.

**Textbooks and Other Supplies:**

**Required:**

Loudon, Kyle, *Algorithms With C*, O'Reilly; 1999

**Recommended:**

Kochan, Stephan, *Programming In C*; 3<sup>rd</sup>.. Edition, Developer's Library, 2005.

Kernighan, Brian & Rob Pike; *The Practice of Programming*; Addison-Wesley, 1999.

**I. WEEK/CHAPTER/TOPIC BASIS:**

**Week Topic**

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|---|---|
| 1 | Introduction, Review of C: Arrays, Strings, Pointers, Functions, Arguments and Scope of Variables, Program Structure, I/O with printf and scanf |
| 2 | I/O with printf and scanf, Pointer Arithmetic, Indirection, Double Indirection, Prototypes, Program Structure.                                  |
| 3 | String functions.   |
| 4 | Elementary File I/O, Make Files, Command Line Arguments   |
| 5 | Structures, Typedef, Dynamic Memory Allocation  |
| 6 | Lists, Stacks, Queues, Static and Dynamic Lists   |

- 7 Doubly Linked Lists, In-memory Conversion with sprintf and sscanf
- 8 Overview of Algorithm Complexity, Binary trees, Tree Traversals, Insertions and Deletions
- 9 Mid-term Exam
- 10 AVL Trees
- 11 Splay Trees
- 12 Hashing, Binary Heaps, Sorting, Pointers to Functions
- 13 Enumerated Data Types, Unions, Bitwise Operators
- 14 B-Trees
- 15 Final Exam

## II. COURSE OBJECTIVES:

- A. Demonstrate proficiency in the C programming languages. III, VI, VII, IX, XI
- B. Demonstrate use of advanced C programming statements and be 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

## III. INSTRUCTIONAL PROCESSES:

Students will:

1. Create a complex software package which implements multiple data structures. *Communication, Technological Literacy, Transitional Strategy, Active Learning*
2. Examine and implement algorithms that are efficient and reliable. *Technological Literacy, Transitional Strategy, Active Learning*
3. Use professional tools to produce software components and documentation. *Technological Literacy, Transitional Strategy, Active Learning*
4. Participate in a software development team. *Communication, Transitional Strategy, Active Learning*
5. Participate in a peer review of term projects. *Communication, Transitional Strategy, Active Learning*
6. Use professionally accepted methods and materials in completion of applications. *Technological Literacy, Transitional Strategy, Active Learning*

#### IV. **EXPECTATIONS FOR STUDENT PERFORMANCE:**

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

1. Learn the syntax and semantics of C programming languages. 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 hashing techniques. D
10. Understand heaps and their applications. D
11. Write a large program using various data structures. E, F
12. Use recursion as an alternative to linear solutions. A, B, C, G
13. Use make files to manage projects. F

#### V. **EVALUATION:**

##### **A. Testing Procedures:**

A minimum of two tests is recommended. Tests will cover material presented in class. Tests are not to be missed without a valid excuse.

##### **B. Laboratory Expectations:**

Lab attendance is required. Assignments will be given and must be completed and handed in at the designated date and time.

##### **C. Field Work:**

None is required.

##### **D. Other Evaluation Methods:**

Class participation, quizzes and homework will also comprise the final grade for the course.

##### **E. Grading Scale:**

93 – 100	A
88 – 92	B+
83 – 87	B
78 – 82	C+
73 – 77	C
65 – 72	D
Below 65	F

## **VI. POLICIES:**

### **A. Attendance Policy:**

Pellissippi State Community College expects students to attend all scheduled instructional activities. As a minimum, students in all courses (excluding distance learning courses) must be present for at least 75 percent of their scheduled class and laboratory meetings in order to receive credit for the course. Individual departments/programs/disciplines, with the approval of the vice president of Academic and Student Affairs, may have requirements that are more stringent. In very specific circumstances, an appeal of the policy can be addressed to the head of the department in which the course was taken. If further action is warranted, the appeal can be addressed to the vice president of Academic and Student Affairs (Pellissippi State Catalog)

### **B. Academic Dishonesty:**

Academic misconduct committed either directly or indirectly by an individual or group is subject to disciplinary action. Prohibited activities include but are not limited to (Pellissippi State Catalog):

- Cheating, including but not limited to unauthorized assistance from material, people, or devices when taking a test, quiz, or examination; writing papers or reports; solving problems; or completing academic assignments
- Plagiarism, including but not limited to paraphrasing, summarizing, or directly quoting published or unpublished work of another person, including online or computerized services, without proper documentation of the original source
- Providing others with information and/or answers regarding exams, quizzes, homework or other classroom assignments unless explicitly authorized by the instructor
- Taking an exam for another student

### **C. Accommodations for Disabilities:**

Students who need accommodations because of a disability, have emergency medical information to share, or need special arrangements in case the building must be evacuated should inform the instructor immediately, privately after class or in her or his office. Students must present a current accommodation plan from a staff member in Services for Students with Disabilities (SSWD) in order to receive accommodations in this course. Services for Students with Disabilities may be contacted by going to Goins 134 or 126 or by phone: 694-6751(Voice/TTY) or 539-7153. More information is available at [www.pstcc.edu/departments/swd/](http://www.pstcc.edu/departments/swd/)

### **D. Computer Usage Guidelines:**

College-owned or –operated computing resources are provided for use by students of Pellissippi State. All students are responsible for the usage of Pellissippi State's computing resources in an effective, efficient, ethical and lawful manner. (Pellissippi State Catalog).

### **E. Other Policies:**

Students are expected to promptly attend all lecture and lab classes. If a class is missed, it is the student's responsibility to make up all work and get notes and/or handouts. In the event that a student has an emergency beyond his/her control, he/she must notify the instructor as soon as possible.