

# Strand Analysis

# Computer Science IV

## Computer Science IV - 2004

| <b>Strands</b>                                    | <b>Courses</b>      | <b>The Learner will be able to...</b>   |
|---|---------------------|---|
| <b>Visual C++</b>                                 |                     |   |
| <b>Introduction to Computers</b>                  |                     |   |
| The History of Computers                          | Computer Science IV | understand the history of computers and how they evolved into today's powerful desktop computers.   |
| Computers Today                                   | Computer Science IV | understand the components that make up a typical desktop computer.  |
| Computer Architecture                             | Computer Science IV | understand the basics of microcomputer architecture.  |
| <b>How Computers are Programmed</b>               |                     |   |
| The Computer's Language                           | Computer Science IV | understand how data and instructions are represented inside the computer.   |
| Programming Languages                             | Computer Science IV | understand the basics of the binary numbering system, the differences between high and low-level computer languages and the advantages of each, the roles of assemblers, interpreters, and compilers. |
| The Programming Process                           | Computer Science IV | understand and be able to describe the steps in the programming process.  |
| <b>Entering, Compiling, and Running a Program</b> |                     |   |
| C++ Program Structure                             | Computer Science IV | understand the structure of a C++ program.  |
| From Source Code to a Finished Product            | Computer Science IV | access the text editor and enter C++ source code; compile, link, and run C++ programs.  |
| <b>Variables and Constants</b>                    |                     |   |
| Variable Types                                    | Computer Science IV | understand the different variable types used in C++ and how they differ from constants.   |
| Using Variables                                   | Computer Science IV | declare, name, and initialize variables.  |
| Constants   | Computer Science IV | use constants.  |
| <b>Math Operations</b>                            |                     |   |
| The Fundamental Operators                         | Computer Science IV | use the arithmetic operators.   |
| Counting by One and the Order of Operations       | Computer Science IV | increment and decrement variables and understand the order of operations.   |
| How Data Types Affect Calculations                | Computer Science IV | use mixed data types and avoid overflow, underflow, and floating-point errors.  |

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| <b>Strands</b>                         | <b>Courses</b>      | <b>The Learner will be able to...</b>   |
|--|---------------------|---|
| <b>Strings and Screen I/O</b>          |                     |   |
| Strings                                | Computer Science IV | understand C++ strings and use character arrays.  |
| Screen Input/Output                    | Computer Science IV | use console I/O for input and output.   |
| <b>Decision Making in Programs</b>     |                     |   |
| The Building Blocks of Decision Making | Computer Science IV | understand how decisions are made in programs and how true and false is represented in C++; use relational operators, logical operators, the if structure, the if/else structure, and nested if structures. |
| Selection Structures                   | Computer Science IV | use the switch structure.   |
| <b>Loops</b>                           |                     |   |
| The for Loop                           | Computer Science IV | explain the importance of loops in programs and use the for loop.   |
| While Loops                            | Computer Science IV | use while loops, do while loops, break and continue statements, and nested loops.   |
| <b>Functions</b>                       |                     |   |
| How to Build Programs with Functions   | Computer Science IV | build structured programs that are divided into functions; understand the phrase "scope of variables"   |
| Data and Functions                     | Computer Science IV | understand how data is passed to functions  |
| Library Functions                      | Computer Science IV | use the library functions that are included with the compiler.  |
| <b>Pointers and Enumerated Types</b>   |                     |   |
| Pointer Basics                         | Computer Science IV | understand the basics of pointers; declare pointers; use the address-of and dereferencing operators   |
| More about Character Arrays            | Computer Science IV | use pointers with character arrays; use subscript notation  |
| Using enumerated types                 | Computer Science IV | use enumerated user-defined types   |
| <b>Arrays</b>                          |                     |   |
| One-Dimensional Arrays                 | Computer Science IV | use one-dimensional arrays.   |
| Parallel and Multi-Dimensional Arrays  | Computer Science IV | use parallel arrays; use multi-dimensional arrays; use the <b>sizeof</b> operator.  |
| <b>Structures and String Functions</b> |                     |   |

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|---|---------------------|---|
| Structures                                      | Computer Science IV | understand structures and how to use them;  |
| String Functions                                | Computer Science IV | understand nested structures and how to use them  |
| Converting Strings to Numbers                   | Computer Science IV | understand various string functions and how to use them   |
| <b>Data File Basics</b>                         |                     | convert strings to numbers  |
| File Concepts                                   | Computer Science IV | understand the uses for data files; understand the difference between sequential-access and random-access files.  |
| Using Sequential-Access Files                   | Computer Science IV | open and close data files; write to data files; read from data files; add to the end of a data file; detect the end of a file                                     |
| Sequential File Techniques                      | Computer Science IV | use multiple data files at the same time; prompt the user for file names  |
| <b>Introduction to Linked Lists</b>             |                     |   |
| Linked List Basics                              | Computer Science IV | understand the difference between static and dynamic data structures  |
| Linked Lists in C++                             | Computer Science IV | declare and initialize linked list nodes; add nodes to the end of a linked list; traverse through the nodes of a linked list; dispose of a node in a linked list. |
| <b>Advanced Linked List Operations</b>          |                     |   |
| Inserting Linked List Nodes                     | Computer Science IV | insert nodes into a linked list   |
| Deleting Nodes and Saving a Linked List to Disk | Computer Science IV | delete nodes from a linked list; save a linked list to disk   |
| Doubly and Circularly Linked Lists              | Computer Science IV | understand doubly linked lists; understand circularly linked lists  |
| <b>Stacks, Queues, and Trees</b>                |                     |   |
| Stacks  | Computer Science IV | understand stacks   |
| Queues  | Computer Science IV | understand queues   |
| Binary Trees                                    | Computer Science IV | understand binary trees; understand preorder, postorder, and inorder traversals   |
| <b>Recursion and Searching</b>                  |                     |   |
| Recursion                                       | Computer Science IV | understand recursion  |

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| Sequential and Binary Searching       | Computer Science IV | understand sequential searching; understand binary searching   |
| Searching Binary Trees and Hashing    | Computer Science IV | search and traverse binary trees; understand hashing   |
| <b>Sorting</b>                        |                     |  |
| Introduction to Sorting Algorithms    | Computer Science IV | understand the basics of sorting; understand the selection sort; understand the insertion sort                                       |
| More Incremental Sorting Algorithms   | Computer Science IV | understand the bubble sort; understand the shell sort  |
| Divide and Conquer Sorting Algorithms | Computer Science IV | understand the quick sort; understand the merge sort   |
| <b>Introduction to Classes</b>        |                     |  |
| Object-Oriented Programming (OOP)     | Computer Science IV | understand the difference between the procedural paradigm and the object-oriented paradigm; understand encapsulation and inheritance |
| Classes                               | Computer Science IV | understand and design classes; understand members and methods of classes; understand constructors                                    |
| Using Classes                         | Computer Science IV | use classes and object-oriented programming to implement procedural methods  |