

C/C++ Programming

1. Introduction

- ▶ Welcome to C
- ▶ Course Objectives
- ▶ Practical Exercises
- ▶ Features of C
- ▶ The History of C
- ▶ Standard C vs. K&R C
- ▶ A C Program
- ▶ The Format of C
- ▶ Another Example
- ▶ Variables
- ▶ printf and scanf
- ▶ Integer Types in C
- ▶ Integer Example
- ▶ Character Example
- ▶ Integers with different bases
- ▶ Real types in C
- ▶ Real Example
- ▶ Constants
- ▶ Warning!
- ▶ Named Constants
- ▶ Preprocessor Constants
- ▶ Take Care With printf and scanf

2. Operators in C

- ▶ Operators in C
- ▶ Arithmetic Operators
- ▶ Using Arithmetic Operators
- ▶ The Cast Operator
- ▶ Increment and Decrement
- ▶ Prefix and Postfix
- ▶ Truth in C
- ▶ Comparison Operators
- ▶ Logical Operators
- ▶ Logical Operators
- ▶ Bitwise Operators
- ▶ Bitwise Example
- ▶ Assignment
- ▶ Other Assignment Operators
- ▶ sizeof Operator
- ▶ Conditional Expression Operator

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- ▶ Precedence of Operators
- ▶ Associativity
- ▶ Precedence/Associativity Table

3. Control Flow

- ▶ Control Flow
- ▶ Decisions if then
- ▶ if then else
- ▶ Nesting ifs
- ▶ switch
- ▶ More about switch
- ▶ while loop
- ▶ Semicolon Warning!
- ▶ while, not until!
- ▶ do while
- ▶ for loop
- ▶ for is not until either!
- ▶ Stepping with for
- ▶ Extending the for loop
- ▶ break
- ▶ continue

4. Functions

- ▶ The Rules Writing a Function
- ▶ Calling a Function
- ▶ Prototypes
- ▶ Prototyping is Not Really Optional
- ▶ Writing Prototypes
- ▶ Take Care With Semicolons
- ▶ Example Prototypes
- ▶ Example Calls
- ▶ Rules of Visibility
- ▶ Call by Value
- ▶ Call by Value
- ▶ C and the Stack
- ▶ Stack Example
- ▶ Storage
- ▶ auto
- ▶ static
- ▶ register
- ▶ Global Variables

5. Pointers

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- ▶ Pointers
- ▶ Declaring Pointers
- ▶ Example Pointer Declarations
- ▶ The "&" Operator
- ▶ Rules
- ▶ The "*" Operator
- ▶ Writing Down Pointers
- ▶ Initialisation Warning!
- ▶ Initialise Pointers!
- ▶ NULL
- ▶ Fill in the Gaps
- ▶ Type Mismatch
- ▶ Call by Value
- ▶ Reminder
- ▶ Call by Reference
- ▶ Pointers to Pointers

6. Arrays in C

- ▶ Declaring Arrays
- ▶ Accessing Elements
- ▶ Array Names
- ▶ Passing Arrays to Functions
- ▶ Using Pointers
- ▶ Pointers Go Backwards Too
- ▶ Pointers May be Subtracted
- ▶ Using Pointers
- ▶ * and ++
- ▶ Which Notation?
- ▶ Strings
- ▶ Printing Strings
- ▶ Null Really Does Mark the End!
- ▶ Assigning to Strings
- ▶ Pointing to Strings
- ▶ Multidimensional Arrays

7. Structures in C

- ▶ Concepts
- ▶ Setting up the Template
- ▶ Creating Instances
- ▶ Initialising Instances
- ▶ Structures Within Structures
- ▶ Accessing Members
- ▶ Unusual Properties
- ▶ Instances May Be Assigned

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- ▶ Passing Instances to Functions
- ▶ Pointers to Structures
- ▶ Why (*p).name?
- ▶ Using p->name
- ▶ Pass by Reference
- ▶ Returning Structure Instances
- ▶ Linked Lists
- ▶ Example
- ▶ Printing the List

8. Reading C Declarations

- ▶ Introduction
- ▶ SOAC
- ▶ typedef

9. Handling Files in C

- ▶ Introduction
- ▶ Streams
- ▶ What is a Stream?
- ▶ Why stdout and stderr?
- ▶ stdin is Line Buffered
- ▶ Opening Files
- ▶ Dealing with Errors
- ▶ File Access Problem
- ▶ Copying Files
- ▶ Convenience Problem
- ▶ Accessing the Command Line
- ▶ Useful Routines
- ▶ Binary Files

10. Miscellaneous Things

- ▶ Unions
- ▶ Remembering
- ▶ Enumerated Types
- ▶ Using Different Constants
- ▶ The Preprocessor
- ▶ Including Files
- ▶ Pathnames
- ▶ Preprocessor Constants
- ▶ Avoid Temptation!
- ▶ Preprocessor Macros
- ▶ A Debugging Aid
- ▶ Working With Large Projects

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- ▶ Data Sharing Example
- ▶ Data Hiding Example
- ▶ Use Header Files
- ▶ Getting it Right

10. C and the Heap

- ▶ What is the Heap?
 - ▶ How Much Memory?
 - ▶ Dynamic Arrays
 - ▶ Using Dynamic Arrays
 - ▶ calloc/malloc Example
 - ▶ realloc Example
 - ▶ realloc can do it all
 - ▶ Allocating Arrays of Arrays
 - ▶ Dynamic Data Structures
 - ▶ Linking the List
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C++ Programming

Introduction

- ▶ Instructions for use
- ▶ Basics of C
- ▶ Structure of a program
- ▶ Variables. Data Types
- ▶ Constants
- ▶ Operators
- ▶ Basic Input/Output

Control Structures

- ▶ Control Structures
- ▶ Functions (I)
- ▶ Functions (II)

Compound data types

- ▶ Arrays
- ▶ Character Sequences
- ▶ Pointers
- ▶ Dynamic Memory
- ▶ Data structures
- ▶ Other Data Types

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Object Oriented Programming

- ▶ Classes (I)
- ▶ Classes (II)
- ▶ Friendship and inheritance
- ▶ Polymorphism

Advanced concepts

- ▶ Templates
- ▶ Namespaces
- ▶ Exceptions
- ▶ Type Casting
- ▶ Preprocessor directives
- ▶ C++ Standard Library
- ▶ Input/Output with files .