C Programming Notes

#### **1. Introduction to C**

* **Developer**: Dennis Ritchie (Bell Labs, 1972)
* **Type**: Middle-level language — combines low-level memory access with high-level readability

#### **2. Features**

* Portability across systems
* Rich standard library
* Fast execution — close to hardware
* Structured programming support
* Powerful constructs: pointers, manual memory management

#### **3. Basic Structure of a C Program**

#include <stdio.h>

int main() {

printf("Hello, World!\n");

return 0;

}

**Elements:**

* Preprocessor directives (#include)
* main() — program entry point
* Statements terminated with ;

#### **4. Data Types**

|  |  |  |
| --- | --- | --- |
| **Type** | **Size (approx)** | **Description** |
| int | 2 or 4 bytes | Whole numbers |
| char | 1 byte | Single characters |
| float | 4 bytes | Decimal numbers |
| double | 8 bytes | Double-precision floats |

Derived types: arrays, pointers, structures, unions, enums

#### **5. Operators**

* **Arithmetic**: +, -, \*, /, %
* **Relational**: ==, !=, >, <, >=, <=
* **Logical**: &&, ||, !
* **Bitwise**: &, |, ^, ~, <<, >>
* **Assignment**: =, +=, -=
* **Other**: sizeof, ternary ?:, comma operator ,

#### **6. Control Flow**

* **Conditionals**: if, if-else, nested if, switch
* **Loops**: for, while, do-while
* **Jumps**: break, continue, return, goto (use sparingly)

#### **7. Functions**

* **Library functions**: e.g., printf(), scanf()
* **User-defined functions**:  
  + With/without arguments
  + With/without return values

Syntax:  
  
 return\_type func\_name(parameters) {

// body

}

#### **8. Arrays & Strings**

**Array**: fixed-size collection of elements  
  
 int arr[5] = {1, 2, 3, 4, 5};

**String**: character array ending with \0  
  
 char str[10] = "Hello";

#### **9. Pointers**

A variable holding memory address of another variable:  
  
 int x = 10;

int \*p = &x;

* Use \* to dereference, & to get address

#### **10. Structures & Unions**

**Structure**: groups different data types  
  
 struct Student {

int id;

char name[50];

float marks;

};

* **Union**: all members share same memory location (saves space)

#### **11. File I/O**

* Key functions:  
  + fopen(), fclose()
  + fprintf(), fscanf()
  + fgetc(), fputc()
  + fread(), fwrite()

#### **12. Advantages of C**

* Speed and efficiency
* Wide portability
* Core for system-level programming (OS, embedded systems)
* Foundation for many modern languages (C++, Java, Python, etc.)