Introduction to Programming in C

The Complete Program (the classic “Hello, World!”)

```c
#include <stdio.h>

int main(void)
{
    printf("Hello, World!\n");
    return 0;
}
```

Detailed Explanation – Line by Line

```c
#include <stdio.h>
```

- This is a preprocessor directive (it is executed before compilation begins).
- It tells the compiler: “Insert the entire contents of the standard input-output header file here.”
- The file stdio.h contains the declaration of the printf function (and many others).
- Without this line, the compiler would not know what printf is and would produce an error.

```c
int main(void)
```

- Every C program must have exactly one function named main.
- Execution of the program always begins at the first statement inside main.
- int means that the function main will return an integer value to the operating system when it finishes.
- void inside the parentheses means that main receives no arguments (parameters) from the operating system. (Writing int main() is also accepted in modern C, but int main(void) is the explicitly correct form.)

```c
{
```

- The opening brace marks the beginning of the body (block) of the function main.
- All statements that belong to main must appear between this { and the matching closing brace.

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

- printf is a library function that writes formatted output to the standard output (the screen).
- The text inside the double quotes is called a string literal – it is printed exactly as written.
- \n is an escape sequence that represents a newline character (move to the next line).
- Every statement in C must end with a semicolon ; – this is how the compiler knows the statement is complete.

```
    return 0;
```

- The return statement terminates the function and sends a value back to the caller.
- Because main is declared as int main, it must return an integer.
- By universal convention, returning 0 means "the program terminated successfully".
- Any non-zero value indicates that an error occurred.

```
}
```

- The closing brace marks the end of the function main.
- When execution reaches this point, the program finishes and control returns to the operating system.

How to Compile and Run

1. Save the code exactly as shown in a file named hello.c
2. Open a terminal/command prompt
3. Compile with gcc (the standard C compiler):

```
gcc hello.c -o hello          # creates executable named "hello"
```

4. Run the program:

```
./hello                       # Linux / macOS
hello                         # Windows (if using MinGW or similar)
```