Chapter Two

Introduction to the Programming Language C

1

The *only* way to learn
a programming language
is by
writing programs in that language

2

The Programming Language C

- **C** is a *general-purpose* programming language
- **C** is developed by Dennis Ritchie at Bell Laboratories
- **C** has become one of the most widely used languages in the world

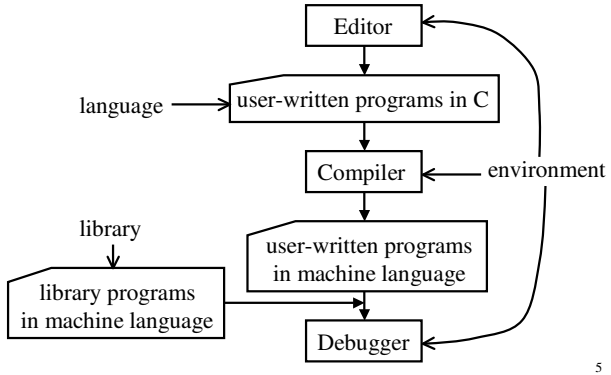
3

The C Programming System

- **C** programming language
  - A set of notations for representing programs
- **C** standard library
  - A set of well-developed programs
- **C** programming environment
  - A set of tools to aid program development

4

The C Programming System



5

The First C Program

Print the following words

hello, world

6

The First C Program

```
#include  <stdio.h>

main( )
{
        printf("hello, world\n");
}
```

7

Programs

- A **C** program consists of *functions* and *variables*
- A function contains *instructions* that specify the *operations* to be done during the computation
- Variables denote *memory locations* that store *data* used during the computation

8

Functions

- Functions can be either *user-defined* functions or *library* functions
- A **C** program begins the execution at the *beginning* of the function named *main*
- A function may *call* other functions to help it perform one of its subtasks

9

The First C Program

```
#include  <stdio.h>
          /* include library information */
main( )   /* name of starting function */
{         /* beginning of instructions */

     printf("hello, world\n");
          /* call library function */
}         /* end of instructions */
```

10

Arguments

- One method of *communicating data* between functions is for the *calling* function to provide a list of values, called *arguments*, to the *called* function
- The *parentheses* after the function name surround the argument list

11

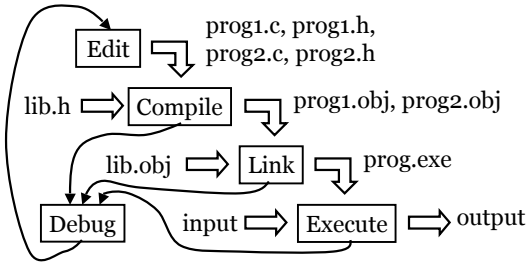
Strings

- A *character string* or *string constant* is a sequence of characters enclosed in *double quotes*
- The *backslash* \ in a string is used as an *escape character*. It is used for representing invisible characters
- Some common *escape sequences*

\\	backslash	\b	backspace
\n	newline	\t	tab
\"	double quote	\'	single quote

12

C Programming Environment



13

C Programming Environment

- ***Edit***: create the high-level language program files using the *editor*
- ***Compile***: translate the high-level language program into the machine language program using the *compiler*
- ***Link***: combine user's machine language program and the *library* using the *linker*

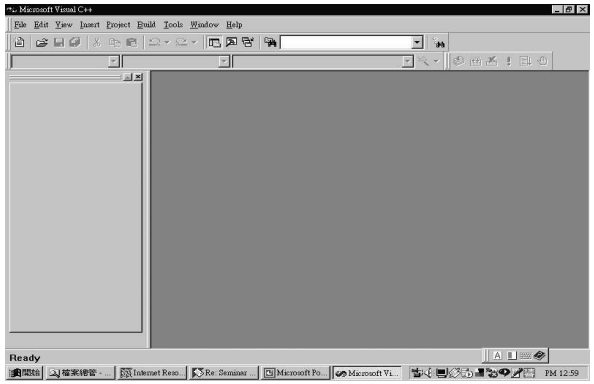
14

C Programming Environment

- ***Execute***: run the combined machine language program
- ***Debug***: correct the errors in the program
  - syntax errors
  - linking errors
  - runtime errors
  - logical errors

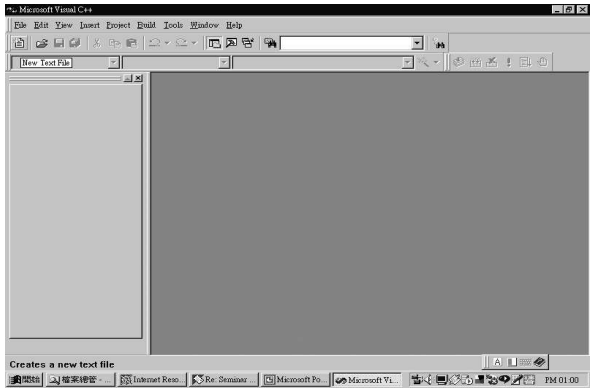
15

Microsoft Visual C++



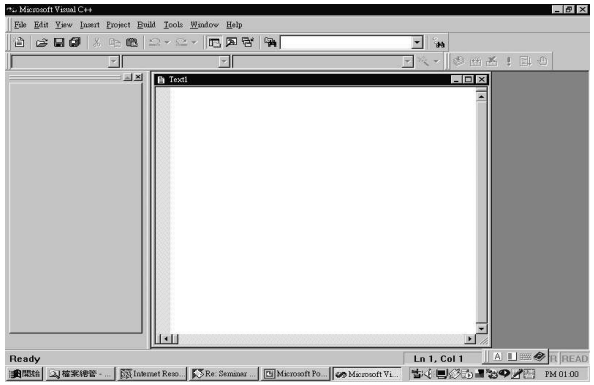
16

Creating the Source File



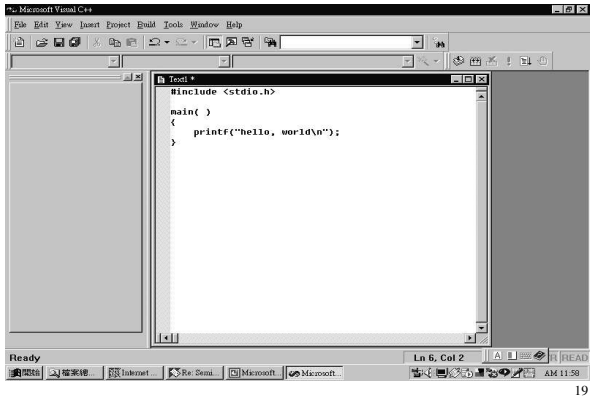
17

Creating the Source File



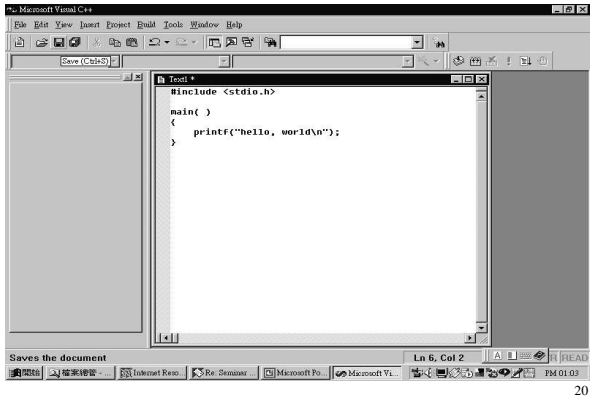
18

Editing the Source File



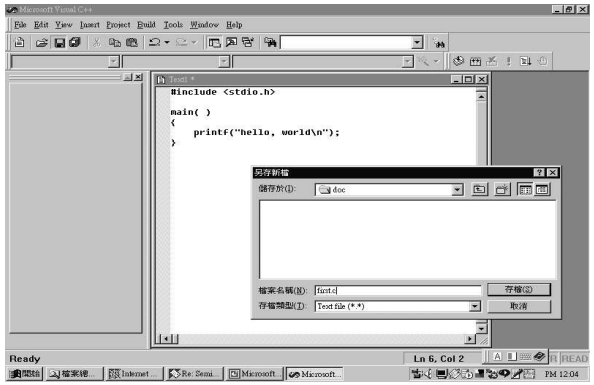
19

Saving the Source File



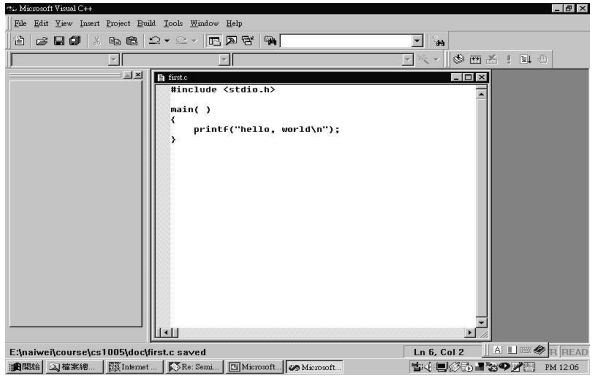
20

Saving the Source File



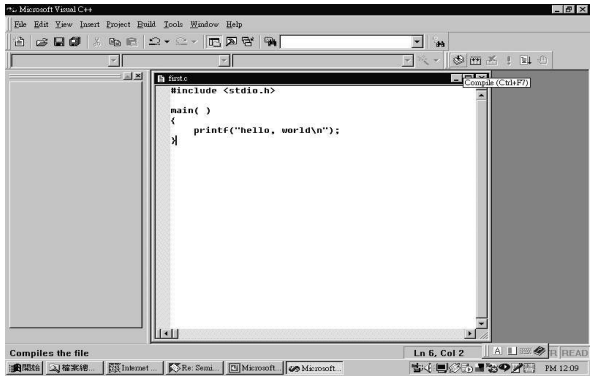
21

Saving the Source File



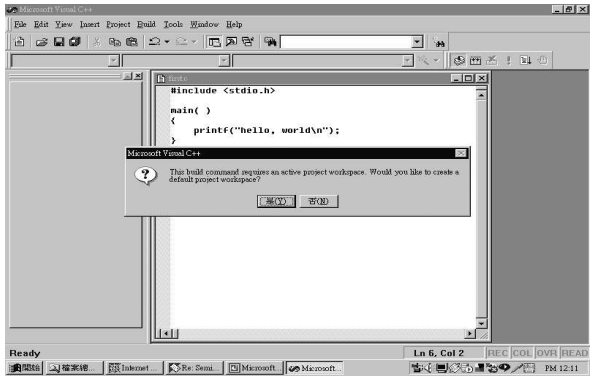
22

Compiling the Source File



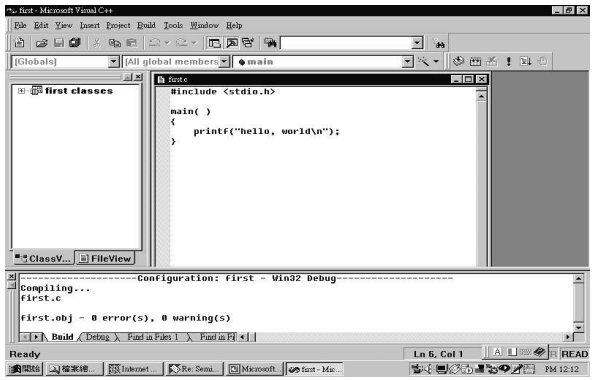
23

Compiling the Source File



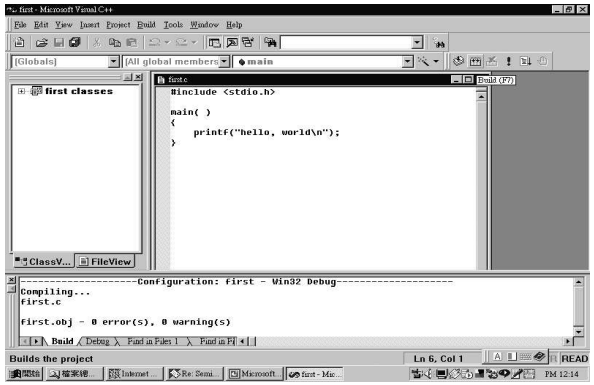
24

Compiling the Source File



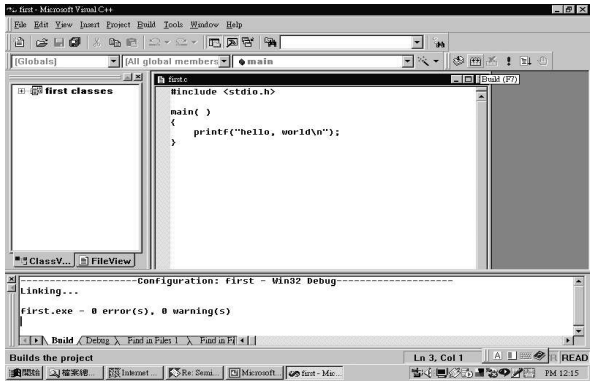
25

Linking the Object Files



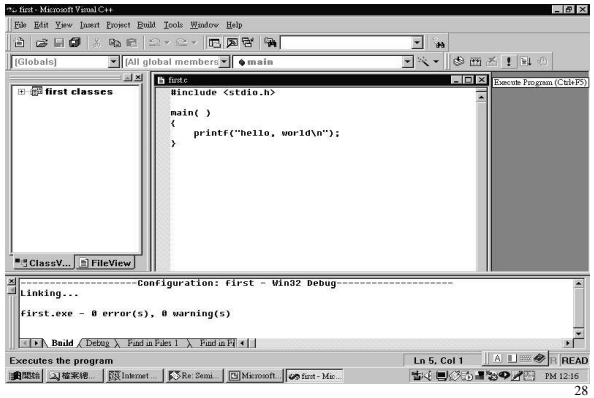
26

Linking the Object Files



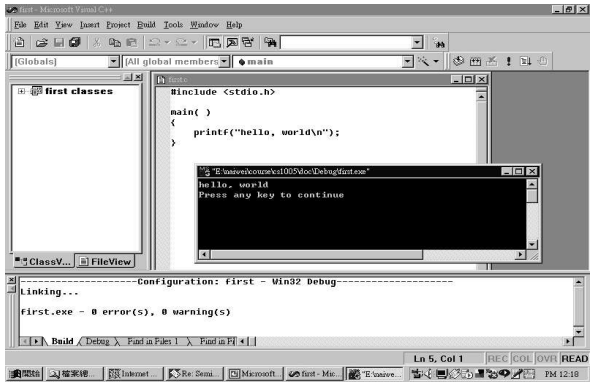
27

Executing the Executable File



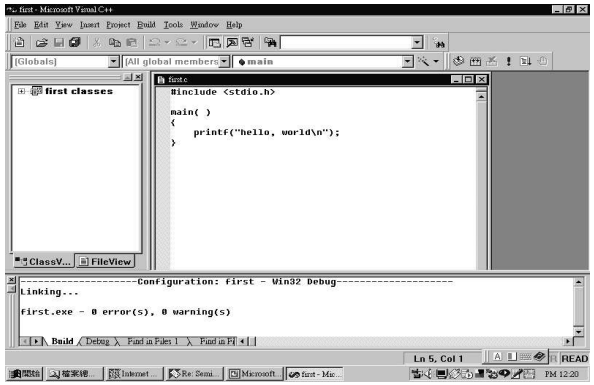
28

Executing the Executable File



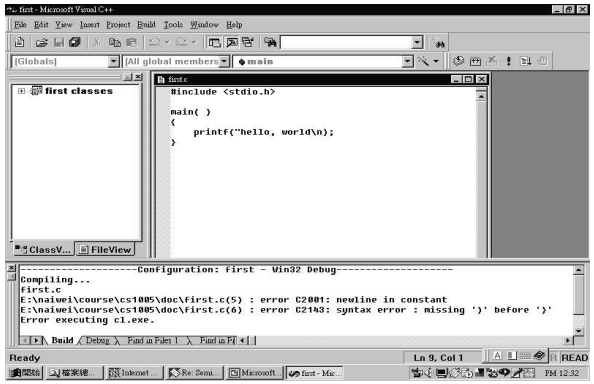
29

Executing the Executable File



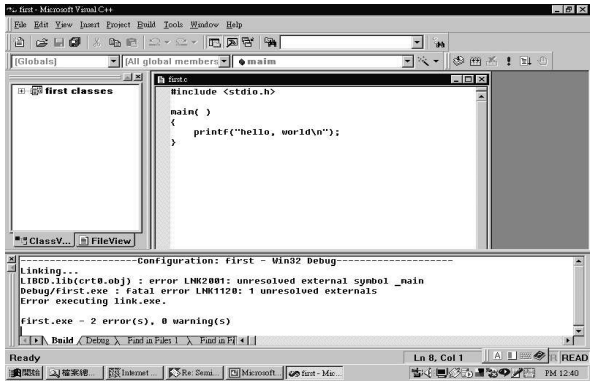
30

Debugging Syntax Errors



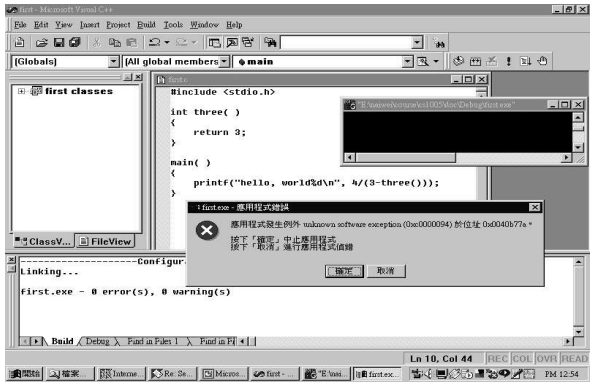
31

Debugging Linking Errors



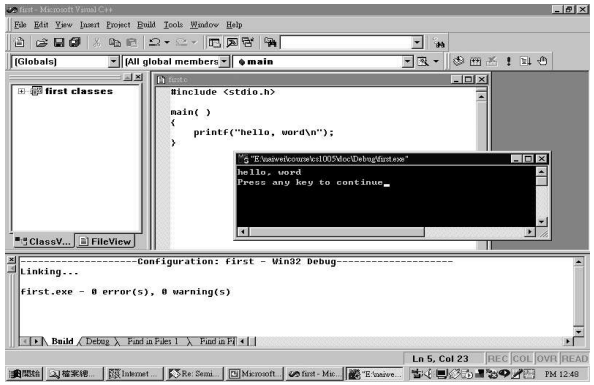
32

Debugging Runtime Errors



33

Debugging Logical Errors



34

Debugging Logical Errors

- *All* programmers make logic errors (bugs). In particular, *you* will make logic errors
- *Good* programmers is ones who *take pains* to minimize the number of bugs that persist in the finished code
- Always be skeptical of your own programs and *test them as thoroughly as you can*

35

Software Maintenance

- *Software requires maintenance*
  - Bug repair
  - Feature enhancement
- The cost of software maintenance constitutes between *80 and 90 percent* of the total cost
- *Software engineering* is the discipline of writing programs so that they can be understood and maintained by *others*
- *Good programming style* requires developing an *aesthetic* sense

36