جامعة القاهرة الجديدة التكنولوجية

NEW CAIRO TECHNOLOGICAL UNIVERSITY

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جامعة القاهرة الجديدة التكنولوجية
NEW CAIRO TECHNOLOGICAL UNIVERSITY

TUE – The Technological Universities in Egypt

NCTU – New Cairo Technological University

Faculty of Industry and Energy Technology

Information Technology Department

Second-Year

Course: Programming Essentials in C++

Lecture 10

Presented by

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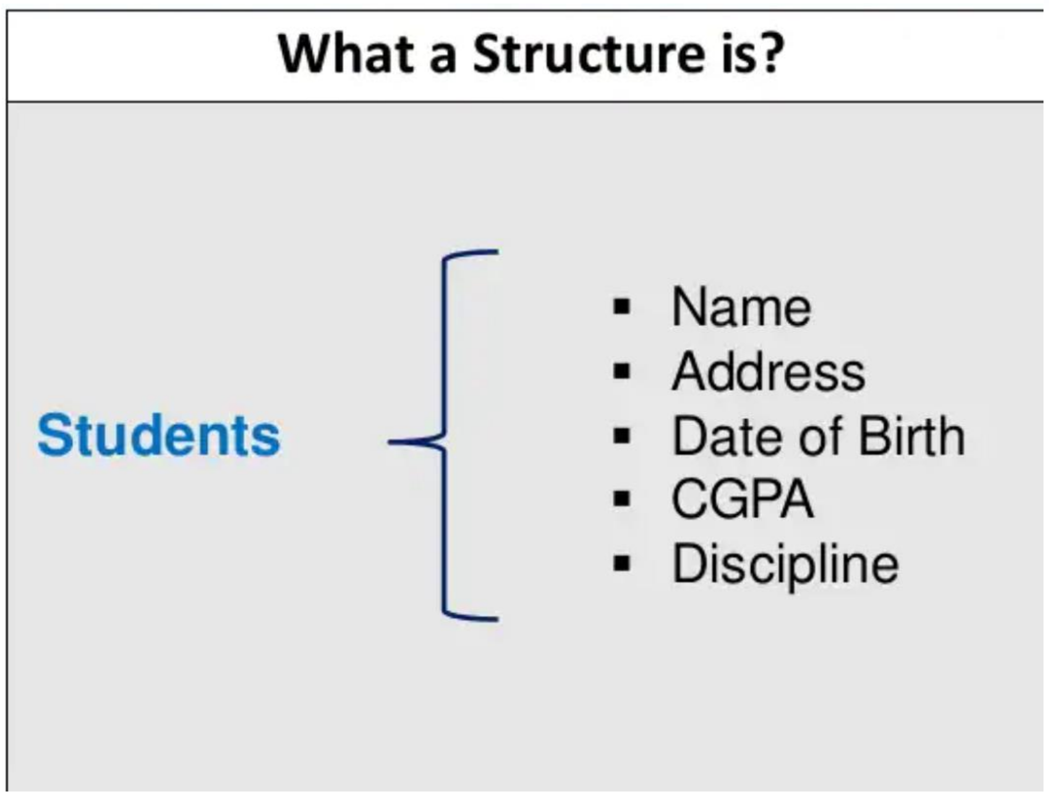
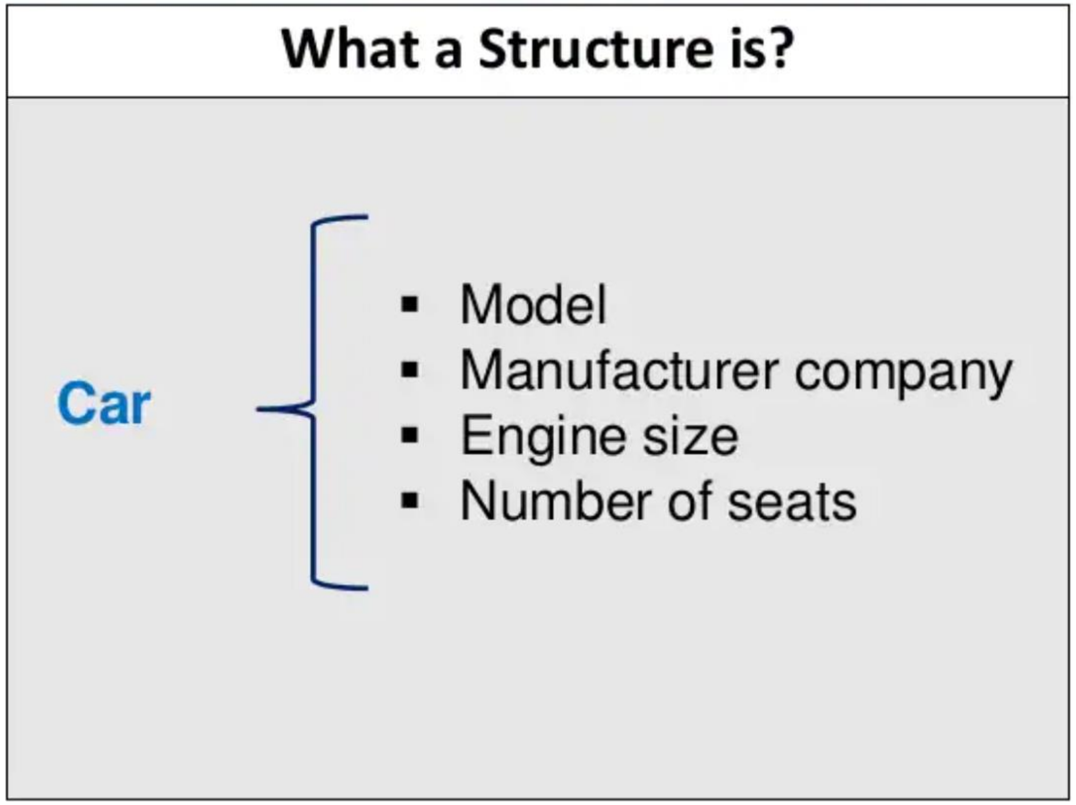
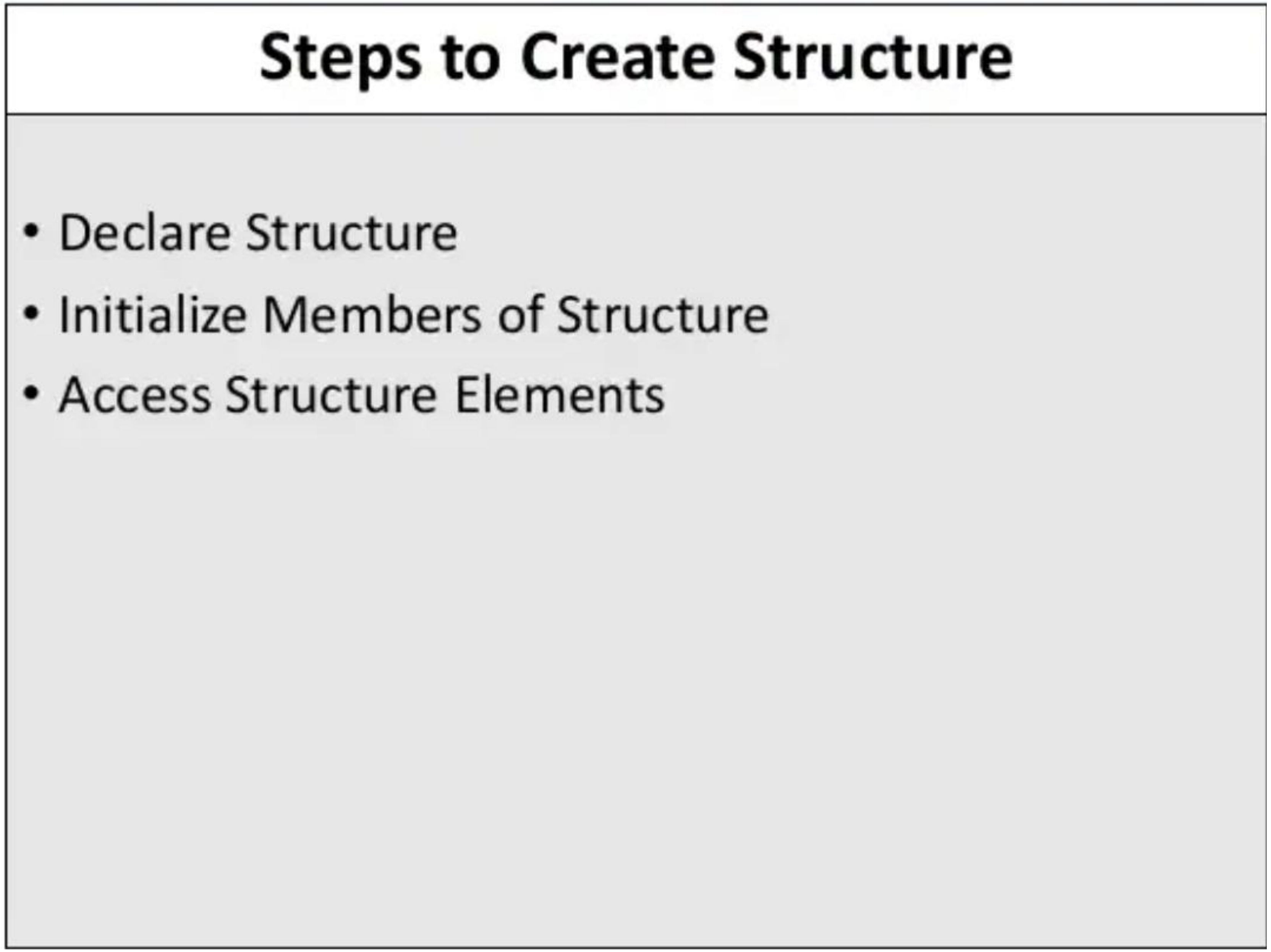
Contents:

C++ Data Structures







Steps to Create Structure

- Declare Structure
- Initialize Members of Structure
- Access Structure Elements

C++ Data Structures

- C/C++ arrays allow you to define variables that combine several data items of the same kind, but **structure** is another user defined data type which allows you to combine data items of different kinds.
- Structures are used to represent a record, suppose you want to keep track of your books in a library. You might want to track the following attributes about each book −
- Title
- Author
- Subject
- Book ID

Defining a Structure

To define a structure, you must use the struct statement. The struct statement defines a new data type, with more than one member, for your program. The format of the struct statement is this:

```
struct [structure tag] {
   member definition;
   member definition;
   ...
   member definition;
} [one or more structure variables];
```

For example:

```
struct product {
  int weight;
  double price;
} ;

product apple;
product banana, melon;
```

```
struct Books {
   char  title[50];
   char  author[50];
   char  subject[100];
   int   book_id;
};
```

```cpp
// example about structures
#include <iostream>
#include <string>
#include <sstream>
using namespace std;

struct movies_t {
  string title;
  int year;
} mine, yours;

void printmovie (movies_t movie);

int main ()
{
  string mystr;

  mine.title = "2001 A Space Odyssey";
  mine.year = 1968;

  cout << "Enter title: ";
  getline (cin,yours.title);
  cout << "Enter year: ";
  getline (cin,mystr);
  stringstream(mystr) >> yours.year;

  cout << "My favorite movie is:\n ";
  printmovie (mine);
  cout << "And yours is:\n ";
  printmovie (yours);
  return 0;
}

void printmovie (movies_t movie)
{
  cout << movie.title;
  cout << " (" << movie.year << ")\n";
}
```

```
Enter title: Alien
Enter year: 1979

My favorite movie is:
 2001 A Space Odyssey (1968)
And yours is:
 Alien (1979)
```

```cpp
// array of structures
#include <iostream>
#include <string>
#include <sstream>
using namespace std;

struct movies_t {
  string title;
  int year;
} films [3];

void printmovie (movies_t movie);

int main ()
{
  string mystr;
  int n;

  for (n=0; n<3; n++)
  {
    cout << "Enter title: ";
    getline (cin,films[n].title);
    cout << "Enter year: ";
    getline (cin,mystr);
    stringstream(mystr) >> films[n].year;
  }

  cout << "\nYou have entered these movies:\n";
  for (n=0; n<3; n++)
    printmovie (films[n]);
  return 0;
}

void printmovie (movies_t movie)
{
  cout << movie.title;
  cout << " (" << movie.year << ")\n";
}
```

```
Enter title: Blade Runner
Enter year: 1982
Enter title: The Matrix
Enter year: 1999
Enter title: Taxi Driver
Enter year: 1976

You have entered these movies:
Blade Runner (1982)
The Matrix (1999)
Taxi Driver (1976)
```

Structures as Function Arguments

```
#include <iostream>
#include <cstring>

using namespace std;
void printBook( struct Books book );

struct Books {
   char  title[50];
   char  author[50];
   char  subject[100];
   int   book_id;
};
```

Structures as Function Arguments

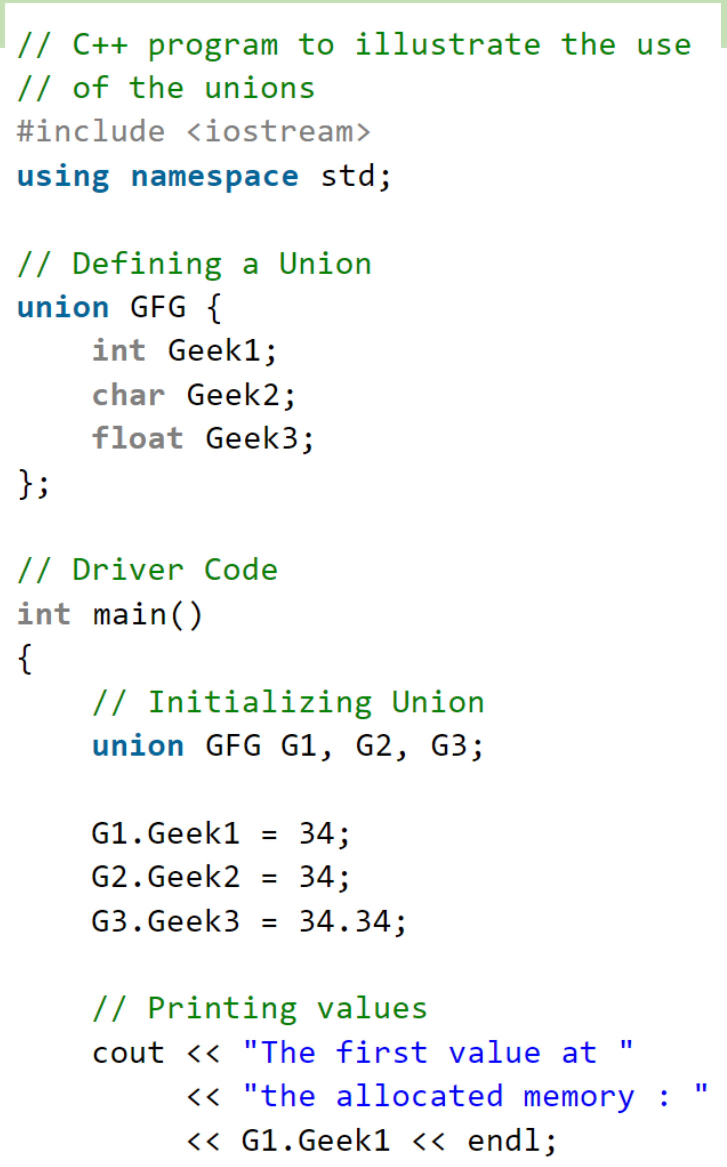
```
#include <iostream>
#include <cstring>

using namespace std;
void printBook( struct Books book );

struct Books {
   char  title[50];
   char  author[50];
   char  subject[100];
   int   book_id;
};

int main() {
   struct Books Book1;        // Declare Book1 of type Book
   struct Books Book2;        // Declare Book2 of type Book

   // book 1 specification
   strcpy( Book1.title, "Learn C++ Programming");
   strcpy( Book1.author, "Chand Miyan");
   strcpy( Book1.subject, "C++ Programming");
   Book1.book_id = 6495407;

   // book 2 specification
   strcpy( Book2.title, "Telecom Billing");
   strcpy( Book2.author, "Yakit Singha");
   strcpy( Book2.subject, "Telecom");
   Book2.book_id = 6495700;
```

```
   // Print Book1 info
   printBook( Book1 );

   // Print Book2 info
   printBook( Book2 );

   return 0;
}
void printBook( struct Books book ) {
   cout << "Book title : " << book.title <<endl;
   cout << "Book author : " << book.author <<endl;
   cout << "Book subject : " << book.subject <<endl;
   cout << "Book id : " << book.book_id <<endl;
}
```

When the above code is compiled and executed, it produces the following result −

```
Book title : Learn C++ Programming
Book author : Chand Miyan
Book subject : C++ Programming
Book id : 6495407
Book title : Telecom Billing
Book author : Yakit Singha
Book subject : Telecom
Book id : 6495700
```

Union in c++



```cpp
// C++ program to illustrate the use
// of the unions
#include <iostream>
using namespace std;

// Defining a Union
union GFG {
    int Geek1;
    char Geek2;
    float Geek3;
};

// Driver Code
int main()
{
    // Initializing Union
    union GFG G1, G2, G3;

    G1.Geek1 = 34;
    G2.Geek2 = 34;
    G3.Geek3 = 34.34;

    // Printing values
    cout << "The first value at "
         << "the allocated memory : "
         << G1.Geek1 << endl;
```

```cpp
    // Printing values
    cout << "The first value at "
         << "the allocated memory : "
         << G1.Geek1 << endl;

    cout << "The next value stored "
         << "after removing the "
         << "previous value : "
         << G2.Geek2 << endl;

    cout << "The Final value value "
         << "at the same allocated "
         << "memory space : "
         << G3.Geek3 << endl;
    return 0;
}
```