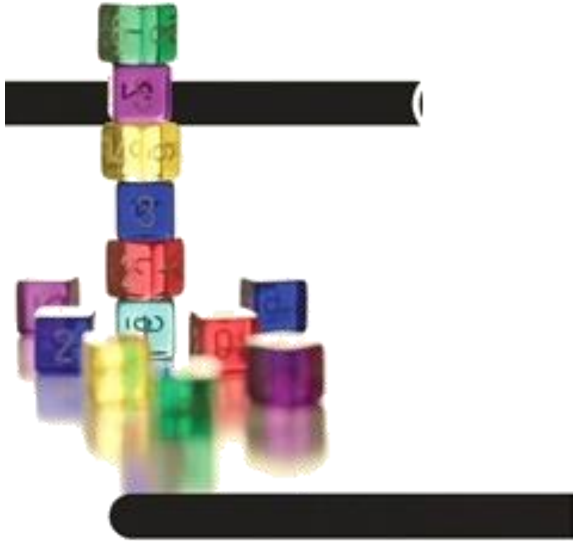


# Structures

# Objectives

To learn and appreciate the following concepts

- Basic operations and programs using structures
- Advantages of structures over array

# Session outcome

At the end of session one will be able to

1. Understand the overall ideology of structures
2. Write programs using structures
3. Understand the array of structures
4. Write programs using array of structures

# Introduction

- ***W**e’ve seen variables of simple data types, such as float, char, and int.*

➢ ***W**e saw **derived data** type, **arrays** to store group of related data.*

- Variables of such types represent one item of information: a height, an amount, a count, or group of item with same data type: list[10] and so on.

- But, these basic types does not support the storage of compound data.

  Eg. **Student** {name, address, age, sem, branch}

# Introduction

- C provides facility to define one's own type (user-defined) that may be a **composite** of basic types (**int, char, double**, etc) and other user-defined types.

  - ✓ **Structures**

# Introduction

- Definition:
  - collection of *one or more* variables, *possibly of different types*, grouped together under a *single name* for convenient handling

- A structure type in C is defined by the keyword **struct**.

# Structures

- Structures hold data that belong together.
- Examples:
    - ❑Student record: student id, name, branch, gender, start year, …
    - ❑Bank account: account number, name, address, balance, …
    - ❑Address book: name, address, telephone number, …
- In database applications, structures are called records.

# Structure versus Array

- A struct is heterogeneous, that means it can be composed of data of different types.
- In contrast, array is homogeneous since it can contain only data of the same type.

# Structure Definition - Syntax

The general format of a structure **definition**

```
struct  structure_name
{
  data_type member1;
  data_type member2;
  …
};
```

# Structure Definition - Examples

- Example:

```
struct Date
 {
     int day;
     int month;
     int year;
 } ;
```

Members of the **structure Date**

# struct examples

- Examples:

```
i)struct StudentInfo{
        int Id;
        int age;
        char Gender;
        double CGA;
  };
```

The “StudentInfo” structure has 4 members of different types.

```
ii)     struct Employee{
        char Name[15];
        char Address[30];
        int Age;
        float Basic;
        float DA;
        float NetSalary;
  };
```

The “Employee” structure has 6 members

# Important Points Regarding Structures

- **Definition** of Structure reserves **no space**.
- It is nothing but the " **Template / Map / Shape** " of the  structure .
- Memory is created, very first time when a **variable of structure type is created** / **Instance** is created.

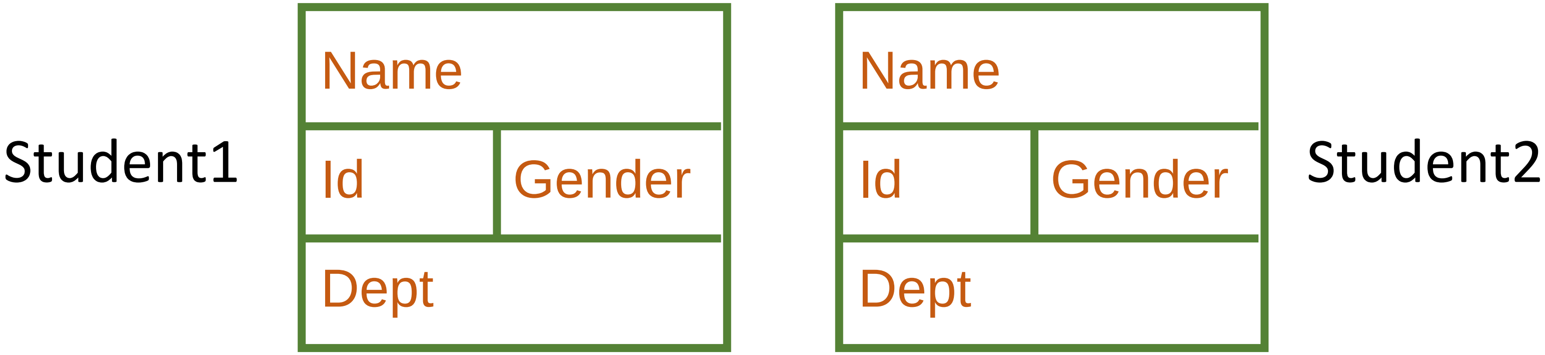
# Declaring Structure Variables

- Declaration of a variable of **struct** type using **struct** tag name, after structure definition:

  **<struct-type> <identifier_list>;**

- Example:

  **StudentInfo Student1, Student2;**



Student1 and Student2 are variables of **StudentInfo** type.

# Declaring Structure Variables

Declare them at the time of structure definition:

```
struct student
{
     int rollno;
     int age;
     char name[10];
     float height;
 }s1, s2, s3;  /* Defines 3 variables  of type student */
```

Members of a structure themselves are not variables. i.e. **rollno** alone does not have any value or meaning.

# Member or dot operator

- The link between member and a structure variable is established using the **member operator ‘.’** which is also known as ‘**dot operator**’

<struct-variable>**.**<member_name>

e.g.: student s1; // s1 is a variable of type //student structure.

s1. rollno;

s1. age;

s1. name;

# Assigning values to members

Different ways to assign values to the members of a structure:

**Assigning string:**

**strcpy(s1.name, “Rama”);**

**Assignment  statement:**

**s1.rollno = 1335;**

**s1.age = 18;**

**s1.height = 5.8;**

```
struct student
   {
   int rollno;
   int age;
   char name[20];
   float height;
   }s1;
```

Reading the values into members:

**scanf(“%s %d %f %f”, s1.name, &s1.age, &s1.rollno, &s1.height);**

# Structure Initialization Methods

There is one-to-one correspondence between the members and their initializing values.

1. Without tag name.

```
main()
{
    struct
    {
        int rollno;
        int age;
    }s1 ={20, 21};
        …
}
```

# Structure Initialization Methods

2. Using tag name.

```
main ( )
{
    struct Student
    {
        int rollno;
        int age;
    };
    Student s1={20, 21};
    Student s2={21, 21};
}
```

# Structure Initialization Methods

3. Using a tag name and defined outside the function.

```
struct Student
 {
     int rollno;
     int age;
 } s1={20, 21};

 main ( )
 {
         Student s2={21, 21};
         …
         …
  }
```

# Structure: Example

```
struct Book { // definition
        char title[20];
        char author[15];
        int pages;
        float price;
};
```

```
int main( ){
    struct Book b1;
//Input
    printf(“Input values”);
    scanf(“%s %s %d %f”, b1.title, b1.author, &b1.pages, &b1.price);
   //gets(b1.title); gets(b1.author);

//output
   printf(“%s %s %d %f”, b1.title, b1.author, b1.pages, b1.price);
    return 0;
}
```

# Summary

- Structure Basics
- Member accessing using dot operator
- Simple problems using structures