

# ECE 220 Computer Systems & Programming

## Data Structures



# The type journey

Objects

struct \*

struct []

struct, typedef, enum

int \*, char \*, float \*

int[], char[], float[]

int, char, float

# Data Types

Fundamental Data Types: int, float/double, char

Arrays & Pointers

**Enumerated** data type:

- user-defined
- a list of related items (enumeration constants)
- count starts at 0 by default

Example:

```
enum Months {JAN, FEB, MAR, APR, MAY, JUN, JUL, AUG, SEP, OCT, NOV, DEC};
```

```
enum Months cur_month;
```

```
cur_month = MAR; //what is the value of cur_month?
```

//what if we define it this way?

```
enum Months {JAN=7, FEB, MAR, APR, MAY, JUN, JUL, AUG, SEP, OCT, NOV, DEC};
```

# Structures

- allow user to define a new type consists of a combination of fundamental data types (**aggregate data type**)

Example: student record

```
struct StudentStruct
{
    char Name[100];
    int UIN;
    float GPA;
};
struct StudentStruct student;
strncpy(student.Name, "John Doe", sizeof(student.Name));
student.UIN = 123456789;
student.GPA = 3.89;
```

//or we can just use one line

```
struct StudentStruct student = {"John Doe", 123456789, 3.89};
```

# Using typedef

```
struct StudentStruct
{
    char Name[100];
    int UIN;
    float GPA;
};
typedef struct StudentStruct student;
student s1, s2;

/*****/

typedef struct StudentStruct
{
    char Name[100];
    int UIN;
    float GPA;
}student;
student s1, s2;
```

# Unions

- similar to struct, but members of the union share the same memory location

```
typedef union StudentUnion
{
    char Name[100];
    int UIN;
    float GPA;
}studentU;
//What's the size of studentU?
```

```
//What would happen if we do this:
studentU s1;
s1.UIN = 123456789;
s1.GPA = 3.89;
```

# Arrays of Structs

```
//create an array of student struct
student ece220[200];

//access each element of the array
ece220[0]
ece220[1]

//access individual fields in each element
ece220[0].Name[0] = "J";
ece220[0].Name[1] = "o";
ece220[0].Name[2] = "h";
ece220[0].Name[3] = "n";
ece220[0].UIN = 123456789;
ece220[0].GPA = 3.89;
```