**Mansoura University**
**Faculty of Computers and Information Sciences**
**Department of Computer Science**
**First Semester- 2020-2021**

# [CS212P] Computer Organization and Architecture

## Grade: second grade

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# WHAT IS ASSEMBLY LANGUAGE?

- An Assembly language is a low-level programming language and it is a machine friendly language that is depend mainly on the structure of the computer(machine dependent).
- In contrast to the high-level language which is programmer friendly(easy to understand and interpret or compile ,maintain and debug the high-level code) and it can run on any platform.
- It needs An assembler for Translation.

# HOW TO WRITE AN ASSEMBLY LANGUAGE PROGRAM USING THE EMU8086 PROGRAM?

## 1. Write a Program For Reading and Displaying a Character

If we write this program in a high-level language such as c# it will be look like:

Console.Writeline("enter a character :"); //print 'enter a character' on the standard output

String ch=Consol.readline(); //read the char in ch variable

Consol.write("you entered"+Ch); // print 'you entered ch' with out introducing newline

# HOW TO WRITE AN ASSEMBLY LANGUAGE PROGRAM USING THE EMU8086 PROGRAM?

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## 1. Write a Program For Reading and Displaying a Character

But in assembly language it will look like:

```
MOV ah, 1h      ; keyboard input subprogram
INT 21h         ; read character into al
MOV dl, al      ; copy character to dl
MOV ah, 2h      ; character output subprogram
INT 21h         ; display character in dl
```

# HOW TO WRITE AN ASSEMBLY LANGUAGE PROGRAM USING THE EMU8086 PROGRAM?

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## 2. Write a Program For Displaying The String Using Library Functions

The c# console application already use the methods defined in the console class library like console.writeline( ) and console.wrilte( ) defined in the system name space for displaying any string which is pretty easy .But in assembly language the program will looks like:

```
include emu8086.inc          ; Macro declaration
ORG 100h                     ; com file
PRINT 'Hello World!'
GOTOXY 10, 5
PUTC 65                      ; 65 – is an ASCII code for 'A'
PUTC 'B'
RET                          ; return to the operating system.
```

# HOW TO WRITE AN ASSEMBLY LANGUAGE PROGRAM USING THE EMU8086 PROGRAM?

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Which uses the library of common functions emu8086 that define the macros a built- in procedures for various tasks:

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# HOW TO WRITE AN ASSEMBLY LANGUAGE PROGRAM USING THE EMU8086 PROGRAM?

**3. Write a Program that sum numbers from 1 to 10**

If we write this program in a high-level language such as c# it will be look like:

```
public static void Main() { int j, sum = 0;
Console.Write("\n\n"); Console.Write("Find the sum of
first 10 natural numbers:\n"); Console.Write("----------
----------------------------------");
Console.Write("\n\n"); Console.Write("The first 10
natural number are :\n"); for (j = 1; j <= 10; j++) {
sum = sum + j; Console.Write("{0} ",j); }
Console.Write("\nThe Sum is : {0}\n", sum); } }
```

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# HOW TO WRITE AN ASSEMBLY LANGUAGE PROGRAM USING THE EMU8086 PROGRAM?

**3. Write a Program that sum numbers from 1 to 10**

The equivalent assembly program will be as follows:

```
org 100h
include emu8086.inc ; Macro declaration
mov dx, 1           ; initial value
mov cx, 10          ; count of numbers
xor ax, ax          ; This puts zero in AX
Label1:
add ax, dx          ;This adds in turn 1, 2, 3, ... ,10 to AX
inc dx              ; next number
loop Label1         ; cycle on the rest of numbers
CALL PRINT_NUM      ; Print number in AX (sum)
RET                 ; return to operating system.
DEFINE_PRINT_NUM
DEFINE_PRINT_NUM_UNS ; required for print_num.
END                 ; end directive to end the assembler
```

# HOW TO WRITE AN ASSEMBLY LANGUAGE PROGRAM USING THE EMU8086 PROGRAM?

## 4. Write a Program to print ASCII code

The c# program to print the ascii code :

```
using System;
using System.Collections.Generic;
using System.Text;

namespace PrintASCII
{
    class PrintASCII
    {

        static void Main(string[] args)
        {
            for (int i = 0; i <= 255; i++)
            {
                System.Console.WriteLine("{0} = {1}", i, (char)i);
            }
        }
    }

}
```

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}
```

# HOW TO WRITE AN ASSEMBLY LANGUAGE PROGRAM USING THE EMU8086 PROGRAM?

**4. Write a Program to print ASCII code**

If we convert the previous c# to assembly, it will look like :

```
MOV AH , 2
MOV CX , 256
MOV DL , 0
Print_Loop:
        INT 21h
        INC DL
        DEC CX
        JNZ Print_Loop
END
```

# ASSEMBLY LANGUAGE PROGRAMMING

Thanks