University of Technology
الجامعة التكنولوجية

Computer Science Department
قسم علوم الحاسوب

البرمجة المهيكلة

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Structured Programming
First class // Second course

Lecture 1

Do / While statement

Write C++ program to find the summation of even numbers

```
#include<iostream.h>
 void main( )
{
int max,sum,digit; digit=2;
cout << "enter a number: "; cin >>
max;
sum=0;
do
{
Sum=sum+digit; Digit+=2;
}
while ( digit<=max );
cout <<
"2+4+…="<<max<<"sum="<<sum
<<end
```

Write C++ program to find the factorial of n:
n! = n * n-1 * n-2 * n-3 * … * 2 * 1

```
#include<iostream.h>
void main( )
{
int n, f = 1;
cout << "enter positive number: ";
cin >> n;
do
{
f = f * n; n --;
}
while ( n > 1 );
cout << "factorial is: " << f;
}
```

Lecture 2

For statement

C++ to add the numbers from 1 to 100

```
#include<iostream.h>
void main( )
{
        int sum = 0;
        for ( int i = 1; i <= 100; i ++ )
              sum = sum + i;
        cout << "sum is: " << sum;
}
```

C++ program to find the result of the series

$$\sum_{i=1}^{20} i^2$$

This program is to find the summation of the squares of the numbers from 1 to 20

To read 10 numbers and find the summation of the positive numbers

```
#include<iostream.h>
void main( )
{
        int num, sum = 0;
        for ( int i = 1; i <= 10; i ++ )
        {
           cout << "enter your number: ";
           cin >> num;
           if ( num > 0 )   sum = sum + num;
        }
        cout << "The sum is: " << sum;
}
```

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Lecture 3

For statements (continue)

C++ program to find the series

$$\sum_{i=1}^{20} a_i^2$$

This program is to read 20 numbers and find the summation of the squares of them

C++ program to print the following

```
1   10
2   9
3   8
4   7
5   6
6   5
```

```
#include<iostream.h>
void main( )
{
        int x;
        for ( x = 1; x < 7; ++ x )
            cout << x <<"\t" << 11 – x << endl;
}
```

Lecture 4

Functions

Example 1:

```
void printmessage ( )
{
    cout << "University of Technology";
}

void main ( )
{
    printmessage( );
}
```

Example 2:

```
int max (int a, int b)
{
    int c;
    if (a > b)  c = a;
      else   c = b;
    return (c);
}

void main ( )
{
    cout << max (5, 6);
}
```

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Lecture 5

Function with return statement

Example 1

Write C++ program using function to calculate the average of two numbers entered by the user in the main program:

```
#include<iostream.h>
float aver (int x1, int x2)
{
        float z;
        z = ( x1 + x2) / 2.0;
        return ( z);
}

void main( )
{
        float x;
        int num1,num2;
        cout << "Enter 2 positive number \n";
        cin >> num1 >> num2;
        x = aver (num1, num2);
        cout << x;
}
```

Example2:

Write C++ program, using function, to find the summation of the following series: $\sum_{i=1}^{n} i^2 = 1^2 + 2^2 + 3^2 - \cdots + n^2$

Lecture 6

Using two functions in a program

(the first function to find the factorial , the second function to find the power)

write C++ program, using function to find the sumation of the given series: Sum=x-(x^3)/3!+(x^5)/5!- ...(x^n)/n!

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<table>
<tr>
<td>Lecture 7</td>
<td>
<u>One dimension array</u>
<u>Example1</u>
Write C++ program to display 2nd and 5th elements of array distance:
<pre>
#include<iostream.h>
void main( )
{
    double distance[ ] = { 23.14, 70.52, 104.08, 468.78, 6.28};
    cout << "2nd element is: " << distance[1] << endl;
    cout << "5th element is: " << distance[4];
}
</pre>
<u>Example2</u>
Write C++ program, to find the summation of array elements:
<pre>
#include<iostream.h>
void main ( )
{
    int const L = 10;
    int a [L];
    int sum = 0;
    cout << "enter 10 numbers \n";
    for (int i =0; i <L; i++)
      {
        cout << "enter value " << i << ": ";
        cin >> a [i];
        sum += a [i];
      }
    cout << "sum is: " << sum << endl;
}
</pre>
</td>
</tr>
<tr>
<td>Lecture 8</td>
<td>Example1:Write C++ program o find the minimum and maximum number in one dimension array</td>
</tr>
</table>

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Lecture 9

Two dimensions array

Example 1:

Write C++ program, to read 4*4 2D-array, then find the summation of the array elements, finally print these elements:

```
#include<iostream.h>
void main ( )
{
        int a [ 4 ] [ 4 ];
        int i , j, sum = 0;
        for ( i = 0 ; i < 4; i++ )
           for ( j = 0 ; j < 4; j++ )
              cin >> a [ i ] [ j ];

        for ( i = 0 ; i < 4; i++ )
           for ( j = 0 ; j < 4; j++ )
              sum += a [ i ] [ j ];
        cout << "summation is: " << sum << endl;

        for ( i = 0 ; i < 4; i++ )
           {
              for ( j = 0 ; j < 4; j++ )
                 cout << a [ i ] [ j ];
              cout << endl;
           }
}
```

Example2

Write C++ program, to read 3*4 2D-array, then find the summation of each row:

```
#include<iostream.h>
void main ( )
{
        int a [ 3 ] [ 4 ];
        int i , j, sum = 0;
        for ( i = 0 ; i < 3; i++ )
           for ( j = 0 ; j < 4; j++ )
              cin >> a [ i ] [ j ];

        for ( i = 0 ; i < 3; i++ )
           {
              sum = 0;
              for ( j = 0 ; j < 4; j++ )
                 sum += a [ i ] [ j ];

              cout << "summation of row " << i  << " is: " << sum << endl;
           }
}
```

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<table>
<tr><td>Lecture 10</td><td>

Two dimensions array

Example 1 : Write C++ program to add Two 2-D arrays of size 3*4

Example 2:Write C++ program to replace each element in the main diameter (diagonal) in 2-D array with zero

</td></tr>
<tr><td>Lecture 11</td><td>

String

Example1

Write C++ program to print string, then print it character by character:

```
#include<iostream.h>
void main( )
{
    char s [ ] = "ABCD";
    cout << "Your String is: " << s << endl;
    for ( int i =0; i < 5; i++ )
      cout << "S[" << i << "] is: " << s [ i ] << endl;
```

Example2:

Write C++ program to convert each lower case letter to uppercase letter:

```
#include<iostream.h>
#include<ctype.h>
void main( )
{
        char s [ ] =
        "abcd";cout << s
        << endl;
        for ( int i =0; i < 4; i++ )
            s [i] = char(toupper (s[i] ));
        cout << s;
}
```

string length is 4 characters

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Lecture 12

String

toupper() function to convert the String to upper case.

tolower() function to convert the String to lower case.

The header file of ***toupper , tolower functions is*** <ctype.h>

Example 1

```
#include<iostream.h>
#include<ctype.h>
void main( )
{
        char s [ ] =
        "abcd"; cout << s
        << endl;
        for ( int i =0; i < 4; i++ )
             s [i] = char(toupper (s[i] ));
        cout << s;
}
```

Example2

Write C++ program to read a string then count the number of the digits

```
#include<iostream.h>
void main( )
{
        char s [100 ] ;
        cin>>s;
        int i  , count=0;
        for (  i =0; s[i]!='\0'  ; i++ )
             if (s[i] >='0'  &  s[i]<='9')
                count++;
        cout << "numbr of digits are : <<count <<endl;
}
```

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Lecture 13	<u>Structure</u> **<u>Example 1 :</u>**This example uses parts inventory to demonstrates tructures. **#include<iostream.h>** **Structpart // specify astructure** **{** **Intmodel_no;In** **tpart_no;Floatc** **ost;** **}** **Voidmain()** **{** **Partp1;** **//defineastructurevariable.P** **1.model_no=6244;** **P1.part_no=373;P1.cost=217.55;** **Cout<<"/nmodel"<<p1.model_no;Co** **ut<<",** **part"<<p1.part_no;Cout<<",cost"<** **<p1.cost;** **}**