

Department of Mechanical, Industrial, and Mechatronics Engineering


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Course Number	MTE301
Course Title	Programming for Mechatronics Engineering
Semester/Year	Winter 2025
Section Number	4

Assignment No.1

Submission Date	Sep 19, 2025
Due Date	Sep 19, 2025

Student Name	Student ID (xxxx1234)	Signature*
Moosa Mughal	xxxx93125	

(Note: Remove the first 4 digits from your student ID)

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Assignment 1 Problem 1

Bubble sort a vector of integers.

1. Ask for an integer.
2. Ask if the user wants to input more (y/n)
3. Break loop when answer is n
4. Print unsorted vector using for loop
5. Use bubble sort algorithm to sort vector
 - a. Check if `vector[p]>vector[p+1]`
 - b. Switch positions if true
 - c. And repeat till vector end
6. Print the sorted vector

```
Enter more? [y/n]: n
Unsorted numbers: 5 -32 2 34
Sorted numbers: -32 2 5 34
```

Assignment 1 Problem 2

Read two files and make a histogram for the number of each alphabet. Then compare the files by calculating the euclidean distance for the histograms and also the euclidean distance for the normalized histograms (for better results).

1. Read the files using ifstream and put in a string variable.
2. Print the files to the console.
3. Make a vector with size 26 (num of alphabet), and initial value of 0.
4. Use for loop check each character in the file
5. if it is an alphabet (`isalpha(c)`) then increase the value of the character
6. Print letters using for loop
7. Then print histograms using a for loop
8. Compare histograms using a for loop, that finds the sum of the differences² and gets the `sqrt(sum)` which == euclidean distance.
9. Normalize histograms by:
 - a. Using a for loop to find the total
 - b. If total is = 0 then return the empty vector
 - c. If not cast the histogram as a double and a for loop to divide each value by the total
 - d. Then repeat step 8 with the normalized histogram.
10. Print euclidean distance & normalized euclidean distance.

```
File 1: A histogram is a data structure composed of N bins ,
File 2: each containing a number of occurrences of an event associated with its bin.
```

```
Num of: a b c d e f g h i j k l m n o p q r s t u v w x y z
File 1: 5 1 2 2 2 1 1 1 3 0 0 0 2 2 4 1 0 3 5 4 2 0 0 0 0 0
File 2: 6 2 6 1 7 2 1 2 6 0 0 0 1 8 5 0 0 3 4 5 2 1 1 0 0 0
```

```
Euclidean distance (not normalized): 9.89949
Euclidean distance (normalized): 0.147926
```

Assignment 1 Problem 3

Compute a sum of two positive integer values of format "a+b" which ignores the spaces.

1. Collect the expression using `getline(cin, input)`.
2. Remove spaces from string using a for loop that checks for spaces and adds the character to a new array.
3. Get position (`plusPos`) of '+' for next step.
 - a. If no plus sign give an error
4. Extract numbers (one on the left of `plusPos` and one on the right).
5. Check if both numbers are positive integers by using `isdigit(ch)` to check if each character is a number.
 - a. Print an error if its not.
6. Convert the number to int (`stoi`).
7. Print the sum of the numbers.

```
Enter an addition expression (Ex: 1 + 2, 1+ 2): 213 +21
213 + 21 = 234
```