# CIS7 Project Documentation Guide

# 1. Team Name **Team Name**: CODEVELOPERS **Members:** Valerie Avalos, Jeanine Rodriguez, Gianni Rahman

2. Team Project Information and Details (30 Points)  
  
· **What problems are you solving in this project?**  
The problem our team CODEVELOPERS is working on to solve in our project is utilizing a Vigenere Cipher to encrypt and/or decrypt a plaintext string message provided by the user using the keyword they provide to use as the alphabet shift on the plaintext string message that will then return a cipher text message.   
  
· **What solutions are you implementing in the project?**  
The focus of our program is the mathematical solution used in Vigenere Ciphering to encrypt and decrypt the user’s message. Another solution we are implementing into the project is to capitalize all letters of the message inputted by the user. We are doing this to avoid any issues with shifting characters using ASCII chart that might reach its limit if it needs to go over 127 on the ASCII table.   
  
·  **Provide explanation of calculations and algorithm implementation.**  
Our first function ‘toupper’ is used to capitalize all the letters in the message to upper case. We do this simply by putting the message through a for loop to access each letter up until it reaches the length of the word and implements the function ‘toupper’ to capitalize and store it. The main function is the mathematical calculation for encryption and decryption. Encryption basis is given by Ek(Mi) = (Mi + Ki) mod 26 while the solution for decryption is Dk(Ci) = (Ci - Ki) mod 26. In our case we also are working with ASCII table so our functions have a little more to them. The encrypted function is calculated by the index of the letter plus the shift index given by the keyword. We mod 26 by the letters of the alphabet and add ‘A’ to start at this location in the ASCII table. The decryption function is similar to this however we are working backwards. The plaintext is calculated by the index of the message minus the index shift of the keyword +26 and mod 26 for alphabet. Again we add ‘A’ to start give the starting point of the ASCII.   
  
· **What is the program objectives? Explain how your program is interacting with the user and its purpose.**  
The objective of the program is to allow users to both encrypt or decrypt a message of their choice. The program interacts with the user by first asking for their choice of either encrypting or decrypting a message. The program validates their selection. After they have made this selection, they are then asked to input a message for either encryption or decryption. Finally, the user is asked for a keyword to work with in the process of encrypting/decrypting their inputted message. The user essentially has their own say in the program and can control how a message is encrypted or decrypted based on their input. The purpose of the program then is to use vigenere cipher to encrypt or decrypt the input provided by the user.   
  
· **How is discrete structures implemented in the C++ program?**  
Discrete structures are implemented into the C++ program as we are working with a finite set of elements in our program, a string of characters provided by the user and in return a new encrypted message is provided to the user. If the user provides a key to encrypt or decrypt a message that is also a definite set of data to work with in the process of encryption/decryption. We put together a mathematical equation, the Vigenere Cipher solution, to capture the results we are looking for. This uses discrete steps to reach a solution.   
  
· **What are the limitations of the program?**  
The limitations of this program are that it only registers 26 letters of the alphabet, meaning that any special characters like “!” or numbers “2” won’t register well. You can encrypt a message that involves special characters, but the decryption of the same message won’t be 100% accurate to the original message. The program turns the special characters into a letter. Another limitation of our program is that it does not register spaces either. When the user does enter a space into the program when asked to enter a message, any input entered after will be held in the queue and used as the next input. This does not give the desired output to the program.

·  **Provide recommendation on improving the limitations of the program.**  
For improving the confines of the program, it would be recommended to address the limitations of the program, allowing a user to input spaces, special characters and numbers into their messages and keywords. Doing so would make the program more powerful and efficient for the user.

3. Flowchart AND PSEUDOCODE (30 Points)

1. Gathering input from user  
   {System out – ask for user input: cout << “Do you want to encrypt or decrypt?”

Check for user input – BRANCH - if user selects encryption (option 1), if user selects decryption (option 2)

If the user does not enter 1 or 2 and enters a different value -

BRANCH - {while selection != either option, output message and ask for input again.   
cout << “Please enter valid input” , cin >> input  
}

1. If Option 1 (Encryption) :  
   {System out – ask user for input message: cout << “Enter message”;  
     
   Grab user input, place in STRING variable (message): cin >> message;

Grab MESSAGE string and change all characters to upper case in function --> for loop (I = 0; I < length; I++) {toupper (message[I])

System out – ask for user input on keyword that will be circled through on Vigenere Table: cout << “Enter keyword”

Grab user input, place in STRING variable (keyword): cin >> keyword;   
Change to uppercase   
{for loop (I=0; I < keyword.length(); I++) {toupper(keyword(I)};   
  
Encryption Function  
For loop(start; I < messagelength; increase I)  
 message[i] + keyword [i] mod 26 + ‘A’

1. If Option 2 (Decryption):   
   {Grab user input, place in STRING variable (message)

Grab MESSAGE string and change all characters to upper case  
Capitalize all letters: for loop(I = 0; I < length(); I++) toupper.

System out – ask for user input on keyword that will be circled through on table

Grab user input, place in STRING variable (keyword)  
}

Decryption function   
 For loop (I = 0; I < messagelength; increase I)   
 (message[i] – keyword[i] + 26) mod 26 + ‘A’

1. Output

Based on the user input(whether they chose encryption or decryption), the encryption or decryption will be outputted in cipher text or plain text.

(System out- encryption/decryption:  
for(i = 0; i < message.length(); ++i)  
 going through to print each letter  
}

For Encryption: cout << encrypted[i]   
OUTPUTS CIPHER TEXT

For Decryption: cout << decrypted[I];  
OUTPUTS PLAIN TEXT

**FLOWCHART FOLLOWING PAGE**

Diagram

Description automatically generated