

## Programming Assignments (due date: 11/23)

---

**Project 1 [Duvar and Willie]:** Write a program that allows conversions of numbers from one base (such as hexadecimal, decimal, or binary) to another base (such as binary or decimal or octal). This program should be open enough to allow several different types of conversions to be conducted. A graphical user interface (GUI) is recommended but is not a must.

**Project 2 [Duvar and Willie]:** Write a program that allows coloring countries of a geographical map such that neighbor countries will not have the same color. This code should use only 4 colors. Countries can be designated by letters in a graph and adjacent vertices are neighboring countries. A GUI is recommended.

**Project 3 [Jean Francois]:** Write a program that computes 5000 Fibonacci numbers generated by the following recurrence formula  $F_0=0$ ,  $F_1=1$ ,  $F_n=F_{n-1} + F_{n-2}$  ( $n > 1$ ) and displays only those numbers that are prime. A GUI is recommended.

**Project 4 [Yinchao]:** Write a program that encrypts and decrypts an input sentence written in natural language using three different types of hash functions, one of them is congruential (Caesar).

Compare the level of security of these three types.

**Project 5 [Ebony]:** Write a program that receives a mapping between two sets and output a message telling whether this mapping is a function, injective, surjective or bijective.

**Project 6 [Elias]:** Write a program that generates 5000 random numbers and sorts them using:

(i) **Selection Sort**, (ii) **Bubble Sort**, and (iii) **Heap Sort**. The program should:

1. Compute the time in milliseconds of the three sorting algorithms,
2. Find which sorting algorithm is the fastest among the three,
3. Search for: the first element, the last element of the 5000 numbers and their average using a binary search algorithm.