Faculty	**Faculty of Engineering and Technology**		
Assessment Name (Eg: End/Sup)	**END**	**Paper Code**	**CIPC/A24-E1**
Module Name	**INTRODUCTION TO PROGRAMMING USING C++**	**Module Code**	**C6-IPC-11**
Month	**October**	**Year**	**2024**
Total Marks	**100**	**Duration**	**4 WEEKS**
Assessment Type (Eg: Written/Practical/Submission)	**PROJECT**	**Exam/Submission Date**	**09th November 2024**

Instructions

1. The Project is to be done by each individual student
2. Usage of AI tools in this assessment is NOT allowed
3. Read and understand the requirements of the mini project and address its needs using C++ programming concepts. Use the Code Blocks and C++ language for coding in Project.
4. You strictly adhere with the deadline in submission of your documents (both Turnitin and blackboard). You have 4 weeks to complete the Project Development. The due date is 09th November 2024 at 2359hrs.
5. No late submissions are allowed.
6. You are to write a Document for the Project which includes Analysis, Design, and Implementation of the project using programming concepts in C++. Not exceeding 15 pages including coding part. It is required to provide referencing section.
7. The assessments will be based on the Documentation, Project Presentation and the Project Solution (Artifact).
8. You need to submit the Soft Copy of the Documentation in turnitin.com to check plagiarism. Plagiarism is considered as a very serious Academic Dishonesty. Read the Plagiarism Guidelines (PY-ASM-007, Rev.002) to know about Penalty Details (Section 4 and 7), before you Document your Project. If plagiarized, it is treated seriously, even your marks can be nullified and results in issuing of a warning

letter.

9. For your presentation you need to come up with PPT slides which are video recorded clearly showing your face, your presentation should be of 10 to 15 minutes, you must submit the video in blackboard using the separate submission link for presentation submission provided by your lecturer in blackboard on or before scheduled due date (Point-3)
10. Ensure that you had made all the required feedback given by the lecturer during the review (if any).
11. You will be expected to present your system for not more than 15 minutes.

Scenario Description

Bukana - Child Vaccination Record Management System (Bukana CVRM) is a system to keep track of children vaccination records from birth till they grown. Bukana CVRM System also keeps track of the child's weight and height, basically all development growth details. In the world of digital information records keeping and secure private data, there is a need for a system to manage and provide secure way to document and report on children's vaccination and growth journey. To provide a complete reporting for the child growth and health, the system is required to include also reporting for minor medical consultation and/or services given to the child. There are three main users of the Bukana CVRM System, the Client/Parent, Doctor, and Nurse.

Child/Parent

The parent of the child being vaccinated is the main client. However, the vaccination record is for the child. Both the information of the child and the parents must be captured into the system. The parents will have to complete the form on the system, register user accounts so that they can login to the system and generate the vaccination and medical reports

Nurse

The nurse is the regular user of the system, most importantly the initiator of the child record keeping. The nurse often is the one administering the vaccines, measuring weight and height, and documenting the event of the day a child visited the clinic for vaccination consultation. Furthermore, the nurse schedules the next appointment for the next vaccination.

Doctor

The Doctor may handle both medical and/or vaccination consultations. During clinic consultation, the doctor may administer vaccine and/or perform other minor medical checkups or procedures.

Required:

Solution:

- You are required to implement functionality of this system using C++. You can use any C++ standard such as C++11, C++14, C++17, C++20, or C++27.

Features Required:

- Login Form
- Registration Forms
- Vaccination Record Capturing Form – vaccine administered, child height and weight, child age
- Medical Record Capturing Form – Medical Condition Treated, Symptoms, Treatment given
- Data Privacy – Data masking to provide some level of privacy for sensitive clinical data.
- Save, Display, and Print: Report Generation – Vaccination and Medical Report

Registration Forms

The system must have 3 types of registration forms. The Child/Parent registration form, the nurse registration form, and the Doctor(s) registration form.

The child Registration will have the following basic information:

```
#########################################################################
#                                                                       #
#      Child or Parent Registration Form:                               #
#                                                                       #
#########################################################################
#      Firstname:                                                       #
#      Middlename:                                                      #
#      Surname:                                                         #
#      Date of birth:                                                   #
#      Mother/Guardian:                                                 #
#      Father:                                                          #
#      Village:                                                         #
#      Chief:                                                           #
#      District                                                         #
#########################################################################
```

Child Record ID will be automatically generated from the child firstname, surname, dob, and unique generated number: i.e. **Child Record ID = [First 3 letters of firstname]-[first 3 letters of surname]-[DOB]-[record number]** e.g. **LER-MOH-20032024-1**

The Doctor's Registration form must have the following basic information:

```
#########################################################################
#                                                                       #
#      Doctor's Registration Form:                                      #
#                                                                       #
#########################################################################
#      Firstname:                                                       #
#      Surname:                                                         #
#      Practice Number:                                                 #
#      Resident Hospital/Clinic:                                        #
#      Clinic/Hospital Address:                                         #
#      Cellphone number:                                                #
#########################################################################
```

The Nurse's form will capture the following information:

```
#########################################################################
#                                                                       #
#      Nurse's Registration Form:                                       #
#                                                                       #
#########################################################################
#      Title (Default: Sister):                                         #
#      Firstname:                                                       #
#      Surname:                                                         #
#      Practice Number:                                                 #
#      Clinic:                                                          #
#      Clinic Address:                                                  #
#      Cellphone number:                                                #
#########################################################################
```

Vaccination Record Capturing

The vaccination record form is used to capture the vaccine administered per consultation. The form for capturing clinic consultation will capture the following basic information:

```
#########################################################################
#                                                                       #
#      Vaccination Clinic Capture Form:                                 #
#                                                                       #
#########################################################################
#      Treatment (i.e. TB, Polio, etc.):                                #
#      Vaccine:                                                         #
#      Child Record ID:                                                 #
#      Weight:                                                          #
#      Height:                                                          #
#      Nurse:                                                           #
#      Clinic:                                                          #
#      Clinic Date:                                                     #
#      Next Clinic Date:                                                #
#########################################################################
```

Medication Record Capturing

The vaccination record form is used to capture the vaccine administered per consultation. The form for capturing clinic consultation will capture the following basic information:

```
#########################################################################
#                                                                       #
#      Medical Consultation Capture Form:                               #
#                                                                       #
#########################################################################
#      Treatment :                                                      #
#      Medication:                                                      #
#      Child Record ID:                                                 #
#      Weight:                                                          #
#      Height:                                                          #
#      Doctor:                                                          #
#      Clinic:                                                          #
#      Consultation Date:                                               #
#      Checkup Date:                                                    #
#########################################################################
```

Display and Print/Generate Report

You must provide the menu to either display or print the report. When print is selected, display record information using the format below, and ask the user to confirm print. If the user confirms print, write the report into a new or existing report file using the same format below. The report filename must be the child's record ID with the .txt extension.

```
#########################################################################################################################################
#                                                                                                                                       #
#      Child's Vaccination Report:                                                                                                      #
#                                                                                                                                       #
#########################################################################################################################################
#      Child Fullname: Montsha Mafielong                                                                                                #
#      Guardian/Parents' Name(s): Ms Mamonontsha Mafielong                                                                              #
#      Date of Birth: 01/01/2022                                                                                                        #
#      Place of Birth: Quen Mamohato Memorial Hospital                                                                                  #
#      Vaccinations Adminstered:                                                                                                        #
#       -> Vaccine 1: TB Vaccine - BCG | Weight: 6.2kg| Height: 56cm| Date: 15/02/2022 | By: Senior Sister M. Mabokoboko| Clinic: Makoanyane Clinic  #
#       -> vaccine 2: Polio Vaccine - OPV-O | Weight: 6.2kg| Height: 56cm| Date: 01/06/2022 | By: Senior Sister M. Mabokoboko| Clinic: Makoanyane Clinic #
#       -> Vaccine 3: Vitamin + Albendazole | Weight: | Height: | Date: | By: | Clinic:                                                      #
#      Date for Next Vaccine: 01/02/2023                                                                                                #
#########################################################################################################################################
```

If display is selected, you must just Display the report on the consoler with the format above.

The medical report display, and report format must be as shown below:

```
#########################################################################################################################################
#                                                                                                                                       #
#      Child's Medical Report:                                                                                                          #
#                                                                                                                                       #
#########################################################################################################################################
#      Child Fullname: Montsha Mafielong                                                                                                #
#      Guardian/Parents' Name(s): Ms Mamontsha Mafielong                                                                                #
#      Date of Birth: 01/01/2022                                                                                                        #
#      Place of Birth: QMMH                                                                                                             #
#      Medical Consultations:                                                                                                           #
#       -> Consultation 1: Runny Tummy | Medication: Tummy Ache Medicines | Date: 04/10/2024 | By: Dr. Silos Silas | Clinic/Hospital: Siles Private Clinic  #
#       -> Consultation 2: Tonsils | Medication: Minor Surgery | Date: 15/10/2024 | By: Dr Mentose Molala | Clinic/Hospital: Mentose and Associates Clinic  #
#      Date for Checkup: 27/10/2025                                                                                                     #
#########################################################################################################################################
```

Data Masking Algorithm - Cover up:

To provide this clinical data protection feature, we will use data masking technique to protect viewing of sensitive data. There are five data masking algorithms, including hashing, cover up, replacement, transformation, and encryption. Companies often customize different masking rules based on a business specific masking algorithm to define flexible masking policies. For instance, a company may define which data to mask for protection such as address information and/or cellphone numbers. For the Bukana CVRM system, we will use the data masking technique called Cover up.

The cover up masking algorithm will need to be implemented and/or used in the Bukana CVRM system. There are 3 types of cover up algorithms to consider.

- Full cover: masks the entire value of a field.
    - For example, if you want to fully mask the phone number 1381111****, set the Cover string parameter to **********. Then, the data masking result is **********.

- Fixed position cover: masks the specified part of a field.
    - For example, if you want to mask the second segment of the IP address 192.168.255.254, set the Cover string parameter to *** and the Mask position configuration parameter to (5,7). Then, the data masking result is 192.***.255.254.

- Fixed characters mask: masks the specified characters of a field.

- For example, if you want to mask example in the email address username@example.com, set the Cover string parameter to ******* and the String to be obscured parameter to example. Then, the data masking result is username@*******.com.

Required Data Masking using Cover up – Cover up the following data as described below

- Child's fullname: Fixed characters cover up - First name full covered except first Character
- Child's Surname: Fixed characters position Cover up – all characters except last 3 characters
- Date of Birth: Fixed position cover up – Day and Month masked, year last 2 digit masked
- Guardian Name: Fixed characters cover up – First/Sur-name full covered except first Character
- Vaccinations Administered – Full cover up
- Consultations – Full cover up

The data displayed with Cover up data masking algorithm applied will look like this:

Vaccination Report – Masked Data:

```
#########################################################################################################################################################
#                                                                                                                                                       #
#      Child's Vaccination Report:                                                                                                                      #
#                                                                                                                                                       #
#########################################################################################################################################################
#      Child Fullname: M***** ******ong                                                                                                                 #
#      Guardian/Parents' Name(s): Ms M********** M********                                                                                              #
#      Date of Birth: **/**/20**                                                                                                                        #
#      Place of Birth: Quen Mamohato Memorial Hospital                                                                                                  #
#      Vaccinations Administered:                                                                                                                       #
#       -> Vaccine 1: ********** * *** | Weight: 6.2kg| Height: 56cm| Date: 15/02/2022 | By: Senior Sister M. Mabokoboko| Clinic: Makoanyane Clinic          #
#       -> vaccine 2: ***** ******* * ***** | Weight: 6.2kg| Height: 56cm| Date: 01/06/2022 | By: Senior Sister M. Mabokoboko| Clinic: Makoanyane Clinic     #
#       -> Vaccine 3: ******* * *********** | Weight: | Height: | Date: | By: | Clinic:                                                          #
#      Date for Next Vaccine: 01/02/2023                                                                                                                #
#########################################################################################################################################################
```

Medical Report – Masked Data:

```
#########################################################################################################################################################
#                                                                                                                                                       #
#      Child's Medical Report:                                                                                                                          #
#                                                                                                                                                       #
#########################################################################################################################################################
#      Child Fullname: M***** ******ong                                                                                                                 #
#      Guardian/Parents' Name(s): Ms M********** M********                                                                                              #
#      Date of Birth: **/**/20**                                                                                                                        #
#      Place of Birth: QMMH                                                                                                                             #
#      Medical Consultations:                                                                                                                           #
#       -> Consultation 1: ***** ***** | Medication: Tummy Ache Medicines | Date: 04/10/2024 | By: Dr. Silos Silas | Clinic/Hospital: Siles Private Clinic  #
#       -> Consultation 2: ******* | Medication: Minor Surgery | Date: 15/10/2024 | By: Dr Mentose Molala | Clinic/Hospital: Mentose and Associates Clinic  #
#      Date for Checkup: 27/10/2025                                                                                                                     #
#########################################################################################################################################################
```

Artifact:

- C++ source files, and DB files as vaccination_table.csv, medical_tables.csv, and user tables
- **Submit this zipped artifact on Blackboard, make sure to have zipped all the files required to make your application run as it should.**

Report:

Prepare a well written report describing some of you design decisions, flow diagrams, algorithms and pseudocodes, and code samples of the main components such as the Reading of the files, classes, and masking algorithms. The report must also include the Implementation section where you must demonstrate implementation of C++ concepts such as selection/conditional statements, iterations, function overloading if necessary, usage of data structures implemented using classes, file Ios, and so on. Please also include a fully documented testing criterion. If any debugging and evaluation performed, please include in this section.

This report must be submitted on Turnitin.

Marking Key:

Login/logout	All users should be able to: ✓ register (Child/Parent, Doctor, Nurse) ✓ login to the system ✓ Logout after completion of their tasks.	**10 marks**
Child Report	✓ Capture Vaccination Report ✓ **Capture Medical Report** ✓ **Display Vaccination Report** ✓ **Display Medical Report** ✓ **Print Vaccination Report** ✓ **Print Medical Report**	**20 marks**
Search and Display	✓ Search Medical Records by Child Record ID ✓ Search Vaccination Records by Child Record ID ✓ Search by Child Name and Surname, and Date of Birth ✓ Data Masking – Full Cover up for Child's and Parent fullname, Fixed position cover up for	**20 marks**
Update and Delete	✓ Update and Delete Child Record ✓ Show records when child deleted and updated	**10 marks**
Creativity and Advanced Features (i.e.)	✓ Classes – Child/Parent Class, Nurse class, Vaccination Report Class, Inheritance, Function Overloading, Function overriding (use of virtual keyword) ✓ File Ios ✓ iomanip, vector, string manipulation, and utilization	**10 marks**

Report

Report	Elucidate the C++ constructs used, showing the implementation design decisions, classes used, flow diagrams, and algorithms and/or Pseudocodes		**10 marks**
	Screen shots of system activities and output		**10 marks**
	Reporting style and bibliography/references		**5 marks**

Presentation	Introduction	**2 mark**
	Voice clarity	**3 marks**
	Enthusiasm	**4 marks**
	Presentation logic	**4 marks**
	Conclusion	**2 marks**

********** **********END OF PAPER **********