

CS 499 Module One Assignment Template

I. Self-Introduction:

- A. How long have you been in the Computer Science program?

[I embarked on my journey into the Computer Science program back in 2020, which means I've been immersed in this field for nearly four years now. Coming from a background where I was primarily involved in teaching Math and Science to middle school students in Nepal, the shift to computer science was quite a leap. This transition represented my first deep dive into the world of technology, a field previously foreign to me beyond basic computing tasks.]

- B. What have you learned while in the program? List three of the most important concepts or skills you have learned.

[My introduction to computer science was a profound and transformative experience, as I progressed from being a complete beginner to being a skilled and knowledgeable participant in the field of technology. The initial step was crucial, as it provided me with the fundamental knowledge required to explore more intricate subjects.

Programming Languages and Object-Oriented Programming (OOP): One of the most valuable talents I developed is the ability to write in many languages and comprehend the concepts of Object-Oriented Programming (OOP). These skills are important for software development and comprehending the architecture and design of diverse applications, making them fundamental to my education and future profession.

Data Structures and Algorithms: Studying data structures and algorithms has provided me with the knowledge to effectively arrange and manipulate data. Acquiring this expertise is essential for resolving intricate problems and enhancing software performance, which is critical in every domain of computer science.

Network Security: Network security is crucial for me as I prioritize information security and need to develop abilities in this area. This requires comprehending the methods for safeguarding data while it is being transmitted across networks, which is a crucial element in upholding the security and privacy of information.]

- C. Discuss the specific skills you aim to demonstrate through your enhancements to reach each of the course outcomes.

[In the enhancements I have planned for my ePortfolio, my goal is to showcase a high level of proficiency in software engineering, the adept application of algorithms for performance enhancement, and comprehensive database management. These are indispensable skills for anyone aspiring to make a mark in the cybersecurity field.]

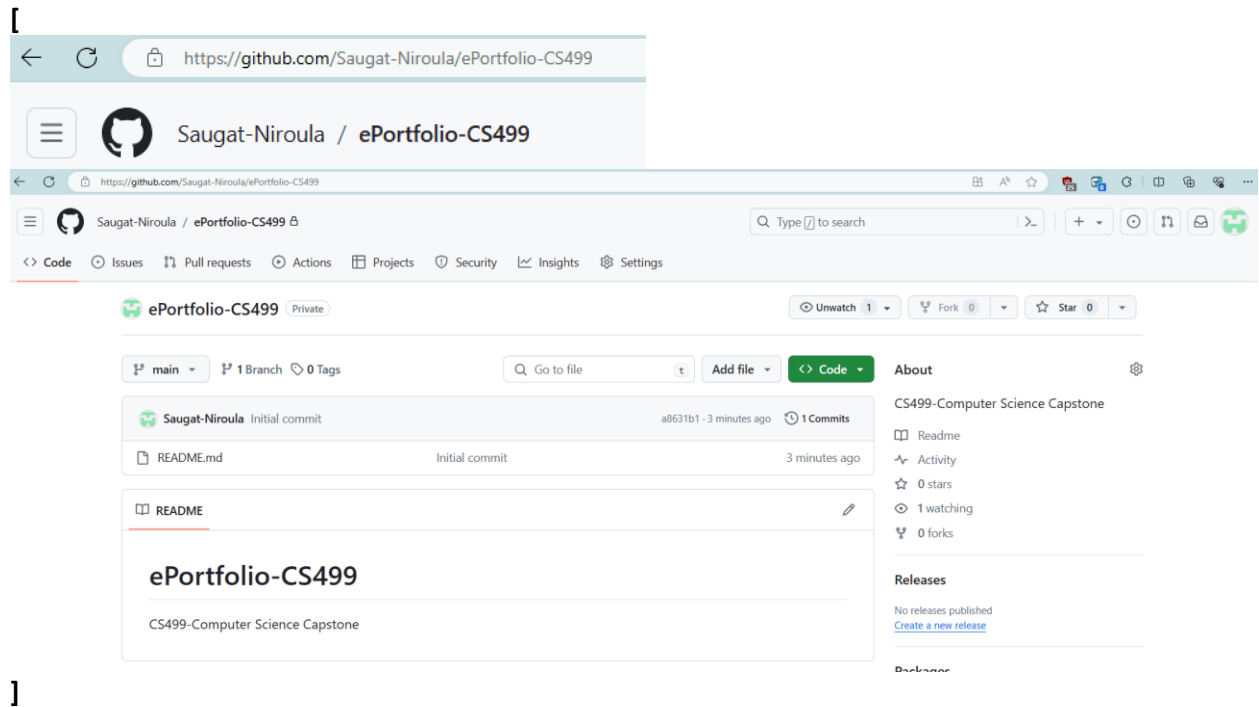
- D. How do the specific skills you will demonstrate align with your career plans related to your degree?

[The skills I plan to enhance align directly with my career aspirations in cybersecurity. Proficiency in software development, data manipulation, and data protection are all critical to analyzing and fortifying systems against cyber threats.]

- E. How does this contribute to the specialization you are targeting for your career?
[The targeted enhancements in my ePortfolio are carefully chosen to bolster my specialization in Information Security. They prepare me to confront sophisticated security challenges and to implement robust defensive strategies against cyber threats effectively.]

II. ePortfolio Set Up:

- A. Submit a **screen capture** of your ePortfolio home page that clearly shows your URL.
i. You already have a repository in GitHub where you uploaded projects in previous courses. Your ePortfolio will reside in GitHub but can link to work at other sites, such as Bitbucket.
- B. Use the GitHub Pages link in the Resource section for directions on:
i. How to create your GitHub website and publish code to GitHub Pages
ii. Issues, such as adding links to other sites
- C. Paste a screenshot of your GitHub Homepage with your URL clearly showing in the space below.



III. Enhancement Plan:

- A. **Category One:** Software Engineering and Design
i. **Select an artifact** that is **aligned with the** software engineering and design **category** and explain its origin. Submit a file containing the code for the artifact you choose with your enhancement plan.

[Artifact: Inventory Management Application

The artifact selected for the Software Engineering and Design category is the **Inventory Management Application** created for the CS360 course using Android Studio. This app aims to optimize inventory management in warehouse environments by offering functionalities such as user authentication, inventory display, item addition and removal, quantity adjustment, and low inventory notifications.

This project was developed as part of the Mobile Architecture and Programming course (CS360) undertaken in September 2023. The project was motivated by personal experience in a warehouse environment and the need for a more efficient inventory management system.]

- ii. **Describe** a practical, well-illustrated **plan** for enhancement in alignment with the category, including a pseudocode or flowchart that illustrates the planned enhancement.

[The Enhancement Plan for this category is as follows:

1. **Refactor Code to Use Design Patterns:**

- Implement the Singleton Pattern for the **DatabaseHelper** class to ensure a single instance throughout the app.
- Apply the MVC (Model-View-Controller) pattern to separate concerns and improve code maintainability.

2. **Improve User Interface:**

- Redesign the user interface following Material Design guidelines to enhance user experience.
- Add animations and transitions to make the app more intuitive and visually appealing.

3. **Enhance Functionality:**

- Add a feature for generating inventory reports in PDF format.
- Implement a barcode scanner for quick item lookup and addition.

Pseudocode:

```
// Singleton Pattern for DatabaseHelper
public class DatabaseHelper extends SQLiteOpenHelper {
    private static DatabaseHelper instance;

    public static synchronized DatabaseHelper getInstance(Context context) {
        if (instance == null) {
            instance = new DatabaseHelper(context.getApplicationContext());
        }
        return instance;
    }
    // Existing implementation...
}

// MVC Pattern - Example
// Model: Data class representing inventory item
public class InventoryItem {
```

```
private String itemName;
private int quantity;

// Getters and setters...
}

// View: XML layout files for UI components
// Controller: Activity class handling user interactions
public class InventoryController {
    private InventoryModel model;
    private InventoryView view;

    public InventoryController(InventoryModel model, InventoryView view) {
        this.model = model;
        this.view = view;
    }

    // Methods to handle user actions...
}

.]
```

iii. Explain how the planned enhancement will **demonstrate** specific **skills** and align with course outcomes.

- a. Identify and describe the specific skills you will demonstrate that align with the course outcome.

[This project will enable me to showcase my proficient abilities in:

- **Design Patterns:** Applying Singleton and MVC patterns demonstrates an understanding of advanced software design principles.
- **UI/UX Design:** Enhancing the user interface according to Material Design guidelines showcases skills in creating professional-quality, user-friendly applications.
- **Mobile Development:** Adding features such as PDF generation and barcode scanning highlights proficiency in mobile application development and integration of third-party libraries.

]

- b. Select one or more of the course outcomes below that your enhancement will align with.

[The improvements I plan to implement in the Inventory App will directly support the course outcome to:

- Design, develop, and deliver professional-quality oral, written, and visual communications that are coherent, technically sound, and appropriately adapted to specific audiences and contexts.
- Demonstrate an ability to use well-founded and innovative techniques, skills, and tools in computing practices for the purpose of implementing computer solutions that deliver value and accomplish industry-specific goals.]

B. **Category Two:** Algorithms and Data Structures

- i. **Select an artifact** that is **aligned with the** algorithms and data structures **category** and explain its origin. Submit a file containing the code for the artifact you choose with your enhancement plan. You may choose work from the courses listed under Category One.

[Artifact: Inventory Management Application

The artifact selected for the Algorithms and Data Structures category is the **Inventory Management Application** developed for the CS360 course using Android Studio.

This project involves managing inventory data using SQLite databases and implementing basic operations such as adding, updating, and deleting items. It was originally developed as part of the CS360 course to apply concepts of mobile app development and database management.]

- ii. **Describe** a practical, well-illustrated **plan** for enhancement in alignment with the category, including a pseudocode or flowchart that illustrates the planned enhancement.

[The Enhancement Plan for this category is as follows:

1. **Optimize Data Retrieval:**
 - Implement indexing on frequently queried columns to improve query performance.
 - Use in-memory caching for frequently accessed data to reduce database load.
2. **Advanced Data Structures:**
 - Implement a balanced binary search tree or hash map for in-memory caching of inventory data.
3. **Enhanced Sorting and Filtering:**
 - Add functionalities for sorting inventory items by different criteria (e.g., name, quantity).
 - Implement filtering options to display only items meeting certain conditions.

Pseudocode:

```
// Indexing for SQLite tables  
private static final String SQL_CREATE_ENTRIES =
```

```
"CREATE TABLE " + DatabaseContract.DataEntry.TABLE_NAME + " (" +  
DatabaseContract.DataEntry._ID + " INTEGER PRIMARY KEY," +  
DatabaseContract.DataEntry.COLUMN_ITEM_NUMBER + " INTEGER," +  
DatabaseContract.DataEntry.COLUMN_ITEM_NAME + " TEXT," +  
DatabaseContract.DataEntry.COLUMN_QUANTITY + " INTEGER, " +  
"CREATE INDEX idx_item_name ON " + DatabaseContract.DataEntry.TABLE_NAME + "  
(" + DatabaseContract.DataEntry.COLUMN_ITEM_NAME + "));"
```

```
// In-memory caching using HashMap  
public class InventoryCache {  
    private Map<String, InventoryItem> cache;  
  
    public InventoryCache() {  
        cache = new HashMap<>();  
    }  
  
    public InventoryItem getItem(String itemName) {  
        return cache.get(itemName);  
    }  
  
    public void addItem(InventoryItem item) {  
        cache.put(item.getItemName(), item);  
    }  
  
    // Other cache management methods...  
}  
]
```

iii. Explain how the planned enhancement will **demonstrate** specific **skills** and align with course outcomes.

- a. Identify and describe the specific skills you will demonstrate to align with the course outcome.

[This project will enable me to showcase my proficient abilities in

- **Data Structure Optimization:** Implementing advanced data structures and indexing demonstrates proficiency in optimizing data retrieval and storage.
- **Algorithm Efficiency:** Enhancing sorting and filtering functionalities showcases the ability to improve algorithm efficiency and manage trade-offs in design choices.

]

- b. Select one or more of the course outcomes listed under Category One that your enhancement will align with.

[The above enhancement will address the course outcome related to:

- Demonstrate an ability to use well-founded and innovative techniques, skills, and tools in computing practices for the purpose of implementing computer solutions that deliver value and accomplish industry-specific goals.
- Design and evaluate computing solutions that solve a given problem using algorithmic principles and computer science practices and standards appropriate to its solution while managing the trade-offs involved in design choices.]

C. Category Three: Databases

- i. **Select an artifact** that is **aligned with the** databases **category** and explain its origin. Submit a file containing the code for the artifact you choose with your enhancement plan. You may choose work from the courses listed under Category One.

[Artifact: Inventory Management Application

The artifact selected for the Databases category is the **Inventory Management Application** developed for the CS360 course using Android Studio.

The project involves using SQLite databases to manage inventory data, including user authentication and inventory item details. This was developed as part of the CS360 course to apply concepts of mobile app development and database management.
.]

- ii. **Describe** a practical, well-illustrated **plan** for enhancement in alignment with the category, including a pseudocode or flowchart that illustrates the planned enhancement.

[The Enhancement Plan for this category is as follows:

1. **Integrate Cloud-Based Database:**
 - Replace the local SQLite database with a Firebase Firestore database to enable real-time data synchronization and access from multiple devices.
2. **Advanced SQL Queries and Triggers:**
 - Implement complex SQL queries and triggers to automatically update inventory levels and notify users when quantities are low.
3. **Data Migration:**
 - Create data migration scripts to transition from SQLite to Firebase Firestore without data loss.

Pseudocode:

```
// Firebase Firestore integration
FirebaseFirestore db = FirebaseFirestore.getInstance();
```

```
// Add a new item to Firestore
Map<String, Object> item = new HashMap<>();
item.put("itemName", itemName);
```

```
item.put("quantity", quantity);

db.collection("inventory")
  .add(item)
  .addOnSuccessListener(new OnSuccessListener<DocumentReference>() {
    @Override
    public void onSuccess(DocumentReference documentReference) {
      Log.d(TAG, "DocumentSnapshot added with ID: " + documentReference.getId());
    }
  })
  .addOnFailureListener(new OnFailureListener() {
    @Override
    public void onFailure(@NonNull Exception e) {
      Log.w(TAG, "Error adding document", e);
    }
  });

// SQL Trigger example for low inventory notification
CREATE TRIGGER low_inventory_trigger
AFTER UPDATE ON data
FOR EACH ROW
WHEN NEW.quantity = 0
BEGIN
  INSERT INTO notifications (item_name, message) VALUES (NEW.item_name, 'Item out
of stock');
END;
.]
```

iii. Explain how the planned enhancement will **demonstrate** specific **skills** and align with course outcomes.

- a. Identify and describe the specific skills you will demonstrate that align with the course outcome.

[With this improvement, I intend to showcase my expertise in:

- **Cloud Integration:** Integrating a cloud-based database demonstrates skills in modern database management and real-time data synchronization.
 - **Advanced SQL:** Implementing complex SQL queries and triggers showcases proficiency in database management and automation.
-]

- b. Select one or more of the course outcomes listed under Category One that your enhancement will align with.

[The enhancements to the will exemplify the course outcome to:

- Demonstrate an ability to use well-founded and innovative techniques, skills, and tools in computing practices for the purpose of implementing computer solutions that deliver value and accomplish industry-specific goals.
- Develop a security mindset that anticipates adversarial exploits in software architecture and designs to expose potential vulnerabilities, mitigate design flaws, and ensure privacy and enhanced security of data and resources.]

IV. ePortfolio Overall Skill Set

A. Accurately describe the **skill set** to be illustrated by the **ePortfolio overall**.

i. Skills and outcomes planned to be illustrated in the code review

[In this section of my ePortfolio, I will showcase my methodical approach to improving and streamlining code. I'll demonstrate how I tackle bugs, make the code easier to read and maintain, and ensure it's secure. By detailing my process of making thoughtful corrections and enhancements, I'll highlight my commitment to developing high-quality software that adheres to industry standards.]

ii. Skills and outcomes planned to be illustrated in the narratives

[The narrative portions of my ePortfolio will delve into the challenges I faced during the enhancement projects and the strategic solutions I employed to address these issues. Each narrative will offer insights into my problem-solving process, showcasing how I applied theoretical knowledge to practical scenarios to overcome obstacles. These stories will reflect my adaptability and creativity in navigating complex project requirements, illustrating my capacity to apply innovative solutions in a real-world context.]

iii. Skills and outcomes planned to be illustrated in the professional self-assessment

[In the professional self-assessment area, I will critically evaluate my educational journey and the practical skills I have honed throughout my coursework. This assessment will discuss the alignment of my academic experiences with my career objectives, particularly focusing on how they prepare me for challenges in the cybersecurity landscape. I will assess my strengths and pinpoint areas where further development is needed, providing a candid overview of my readiness to transition from an academic setting to a professional environment.]