# CS 499 Module One Assignment Template

Complete this template by replacing the bracketed text with the relevant information.

1. **Self-Introduction:** Address all of the following questions to introduce yourself.
   1. How long have you been in the Computer Science program?

**I have been in the Computer Science program since February of 2020.**

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

**Software Development Lifecycle (SDLC): Understanding the entire process of planning, developing, testing, and maintaining software.**

**Database Management: Proficiency in designing, implementing, and managing databases using SQL.**

**Programming Languages: Advanced skills in Java and Python, including object-oriented programming and software engineering principles.**

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

**I intend to demonstrate my skills in full-stack development, UI design, and software testing by enhancing my capstone project to align with best-industry standards, incorporating user feedback, and ensuring the application is robust and scalable.**

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

**These skills align with my career plans as I aim to become a software engineer focusing on building user-friendly applications. Mastering full-stack development and UI is crucial for creating end-to-end solutions that meet user needs, while software testing ensures the reliability and quality of the software.**

* 1. How does this contribute to the specialization you are targeting for your career?

**This contributes to my specialization in software engineering, particularly in application development. By refining my project to demonstrate these skills, I will be better prepared to handle real-world challenges in developing, testing, and deploying software solutions, making me a valuable asset to potential employers.**

1. **ePortfolio Set Up:**
   1. Submit a **screen capture** of your ePortfolio GitHub Pages home page that clearly shows your URL.
      1. 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.
   2. Use the GitHub Pages link in the Resource section for directions on:
      1. How to create your GitHub website and publish code to GitHub Pages
      2. Issues, such as adding links to other sites
   3. Paste a screenshot of your GitHub Pages home page with your URL clearly showing in the space below.

A screenshot of a computer

Description automatically generated

1. **Enhancement Plan:** 
   1. **Category One:** Software Engineering and Design
      1. **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.

**For this category, I have selected a To-Do List application developed during CS 250: Software Development Lifecycle. This project demonstrates the principles of the software development lifecycle, including planning, design, implementation, testing, and maintenance. The origin of this artifact is a course assignment that required students to develop an application using Agile methodologies. The project was completed over multiple sprints, with iterative improvements and testing at each stage.**

**Pseudocode:  
  
// Main class to run the To-Do List application**

**public class ToDoListApp {**

**public static void main(String[] args) {**

**ToDoList toDoList = new ToDoList();**

**// Sample tasks**

**toDoList.addTask("Buy groceries");**

**toDoList.addTask("Finish homework");**

**toDoList.addTask("Call the dentist");**

**// Display tasks**

**toDoList.displayTasks();**

**// Remove a task and display again**

**toDoList.removeTask(1);**

**toDoList.displayTasks();**

**}**

**}**

Note: Your artifact may be work from the following courses:

* IT 145: Foundation in Application Development
* CS 250: Software Development Lifecycle
* CS 260: Data Structures and Algorithms
* IT 315: Object Oriented Analysis and Design
* CS 320: Software Testing, Automation, and Quality Assurance
* CS 330: Computational Graphics and Visualization
* CS 340: Advanced Programming Concepts
* CS 350: Emerging Systems Architectures and Technologies
* CS 360: Mobile Architecture and Programming
* IT 365: Operating Environments
* IT 380: Cybersecurity and Information Assurance
* CS 405: Secure Coding
* CS 410: Reverse Software engineering
* IT 340: Network and Telecommunication Management
* IT 380: Cybersecurity and Information Assurance
  + 1. **Describe** a practical, well-illustrated **plan** for enhancement in alignment with the category, including a pseudocode or flowchart that illustrates the planned enhancement.

**Enhancement Description: Refactor the existing codebase to improve code readability and maintainability. Add a graphical user interface (GUI) to enhance user experience and integrate a database to persist tasks between sessions.**

**Plan Outline:**

1. **Refactoring: Improve variable names, remove redundant code, and ensure proper documentation.**
2. **GUI Development: Create an interface for task management.**
3. **Database Integration: Use SQLite to store and retrieve tasks, replacing the in-memory list.**

For this category of enhancement, consider improving a piece of software, transferring a project into a different language, reverse engineering a piece of software for a different operating system, or expanding a project’s complexity. These are just recommendations. Consider being creative and proposing an alternative enhancement to your instructor.

Think about what additions to include to complete the enhancement criteria in this category. Since one example option is to port to a new language, that is the kind of scale that is expected. This does not mean you need to port to a new language but instead have an equivalent scale of enhancement. Underlying expectations of any enhancement include fixing errors, debugging, and cleaning up comments, but these are not enhancements themselves.

**Pseudocode:**

**function main():**

**initializeDatabase()**

**createGUI()**

**eventLoop()**

**function createGUI():**

**loadTasksFromDatabase()**

**displayTasksInGUI()**

**function loadTasksFromDatabase():**

**connectToDatabase()**

**retrieveTasks()**

**populateTaskList()**

* + 1. Explain how the planned enhancement will **demonstrate** specific **skills** and align with course outcomes.
       1. Identify and describe the specific skills you will demonstrate that align with the course outcome.

**Refactoring Skills: Improve code readability and maintainability by restructuring the existing code.**

**GUI Development: Develop a user-friendly interface.**

**Database Management: Integrate SQLite to manage persistent data storage.**

* + - 1. Select one or more of the course outcomes below that your enhancement will align with.

**Software Development Lifecycle: The enhancement aligns with understanding and applying the software development lifecycle phases, from planning to maintenance.**

**Software Design and Implementation: Demonstrates the ability to design and implement a user-friendly interface and persistent storage solution.**

**Problem-Solving Skills: Applies problem-solving skills to refactor and enhance the existing application.**

Course Outcomes:

1. Employ strategies for building collaborative environments that enable diverse audiences to support organizational decision-making in the field of computer science.
2. Design, develop, and deliver professional-quality oral, written, and visual communications that are coherent, technically sound, and appropriately adapted to specific audiences and contexts.
3. 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.
4. 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.
5. 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.
   1. **Category Two:** Algorithms and Data Structures
6. **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.

**For the Algorithms and Data Structures category, I have selected a Sorting Algorithms Comparison project developed during CS 260: Data Structures and Algorithms. This project compares the efficiency of various sorting algorithms (e.g., Bubble Sort, Quick Sort, Merge Sort) using different data sets. The origin of this artifact is a course assignment focused on understanding and analyzing the time complexity of various sorting algorithms.**

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

**Enhancement Plan:**

* **Enhancement Description: Enhance the project by implementing more advanced sorting algorithms like Radix Sort and Heap Sort. Additionally, incorporate visualization of sorting processes to provide an intuitive understanding of how each algorithm operates.**

**Plan Outline:**

1. **Implement Advanced Sorting Algorithms: Add Radix Sort and Heap Sort to the existing codebase.**
2. **Visualization: Use a graphical library to visualize the sorting process for each algorithm.**

**Pseudocode for Visualization:**

**php**

**Copy code**

**function visualizeSortingAlgorithm(algorithm, data):**

**initializeGraph()**

**for each step in algorithmSteps:**

**updateGraph(step)**

**pause()**

**displayFinalGraph()**

For this category of enhancement, consider improving the efficiency of a project or expanding the complexity of the use of data structures and algorithms for your artifact. These are just recommendations. Consider being creative and proposing an alternative enhancement to your instructor. Note: You only need to choose one type of enhancement per category.

Think about what additions to include to complete the enhancement criteria in this category. Since one example option is to port to a new language, that is the kind of scale that is expected. Perhaps you might increase the efficiency and time complexity of an algorithm in an application and detail the logic of the increased time complexity. Remember, you do not need to port to a new language but instead have an equivalent scale of enhancement. Underlying expectations of any enhancement include fixing errors, debugging, and cleaning up comments, but these are not enhancements themselves.

1. Explain how the planned enhancement will **demonstrate** specific **skills** and align with course outcomes.
   1. Identify and describe the specific skills you will demonstrate to align with the course outcome.

* **Algorithm Design: Develop and optimize advanced sorting algorithms.**
* **Visualization: Create intuitive graphical representations of algorithm processes.**
* **Performance Analysis: Analyze and compare the performance of various algorithms.**
  1. Select one or more of the course outcomes listed under Category One that your enhancement will align with.
* **Design and Evaluate Computing Solutions: This enhancement aligns with designing and evaluating computing solutions using algorithmic principles.**
* **Use Well-founded Techniques: Demonstrates the use of innovative techniques for visualizing and implementing algorithms.**
  1. **Category Three: Databases**
     1. **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.

**For the Databases category, I have selected a Library Management System project from IT 340: Network and Telecommunication Management. This project involves managing book inventories, user records, and transaction logs using MySQL. The origin of this artifact is a course assignment aimed at developing a robust database system to handle complex queries and data relationships.**

* + 1. **Describe** a practical, well-illustrated **plan** for enhancement in alignment with the category, including a pseudocode or flowchart that illustrates the planned enhancement.

**Enhancement Plan:**

* **Enhancement Description: Migrate the database to a NoSQL database like MongoDB to handle unstructured data and improve scalability. Implement a web interface for interacting with the database.**

**Plan Outline:**

1. **Database Migration: Transfer data from MySQL to MongoDB.**
2. **Web Interface: Develop an HTML/JavaScript-based interface to interact with the MongoDB database.**

**Pseudocode for Data Migration:**

**php**

**Copy code**

**function migrateData():**

**connectToMySQL()**

**retrieveData()**

**connectToMongoDB()**

**insertData()**

For this category of enhancement, consider adding more advanced concepts of MySQL, incorporating data mining, creating a MongoDB interface with HTML/JavaScript, or building a full stack with a different programming language for your artifact. These are just recommendations; consider being creative and proposing an alternative enhancement to your instructor. Note: You only need to choose one type of enhancement per category.

Think about what additions to include to complete the enhancement criteria in this category. Since one example option is to port to a new language, that is the kind of scale that is expected. Perhaps you might increase the efficiency and time complexity of an algorithm in an application and detail the logic of the increased time complexity. Remember, you do not need to port to a new language but instead have an equivalent scale of enhancement. Underlying expectations of any enhancement include fixing errors, debugging, and cleaning up comments, but these are not enhancements themselves.

* + 1. Explain how the planned enhancement will **demonstrate** specific **skills** and align with course outcomes.
       1. Identify and describe the specific skills you will demonstrate that align with the course outcome.

**Database Design: Transition from relational to NoSQL database design.**

**Web Development: Create a user-friendly web interface for database interaction.**

**Data Migration: Manage and execute the migration of large datasets between different database systems.**

* + - 1. Select one or more of the course outcomes listed under Category One that your enhancement will align with.

**Use Well-founded Techniques: This enhancement demonstrates the use of well-founded and innovative techniques for database management and web development.**

**Design and Evaluate Computing Solutions: Aligns with designing and evaluating solutions for database systems.**

1. **ePortfolio Overall Skill Set**
   1. Accurately describe the **skill set** to be illustrated by the **ePortfolio** **overall**.
      1. Skills and outcomes planned to be illustrated in the code review

**Code Efficiency: Demonstrate skills in optimizing code for performance.**

**Algorithmic Thinking: Showcase the ability to implement and analyze complex algorithms.**

* + 1. Skills and outcomes planned to be illustrated in the narratives

**Software Design Principles: Discuss the application of design patterns and principles.**

**Problem-Solving: Illustrate problem-solving strategies in software development.**

* + 1. Skills and outcomes planned to be illustrated in the professional self-assessment

**Continuous Improvement: Reflect on the evolution of skills and knowledge.**

**Adaptability: Highlight adaptability to new technologies and methodologies.**