# 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’ve been in the Computer Science program for 4 years.]**

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

**[Secure Software Development – understand how to build software that protects data and minimizes vulnerabilities**

**Object-Oriented Programming (OOP) – writing clean, reusable, and maintainable code using principles like inheritance and encapsulation**

**Agile Methodology – learning to work collaboratively in iterative development cycles abd adapt quickly to feedback and change]**

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

**[Through my enhancements, I aim to demonstrate skills such as refactoring code to improve security, implementing RESTful APIs, and conducting software testing to ensure reliability. These skills show my ability to meet course outcomes like writing maintainable code, following secure coding practices, and applying software development life cycle principles effectively.]**

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

**[The skills I will demonstrate, such as secure coding, API development, and software testing, align closely with my career goal of becoming a professional software engineer. These are core skills that are highly valued in the industry and are essential for building scalable, secure, and efficient applications. By highlighting these skills in my portfolio, I can show future employers that I am prepared for real-world software development challenges.]**

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

**[My specialization is in software engineering, and the skills I plan to demonstrate directly support that focus. I will show how I write efficient and maintainable code, apply security best practices, and design applications that align with user and business needs.]**

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

AI-generated content may be incorrect.**

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.

**[**CS 405: Secure Coding**] Overview: The purpose of the project is to implemenet comprehensive unit testing on the container class using Google Testing framework. This testing ensures expected behaviors under normal normal (positive) and exceptional (negative) secnarios.**

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** | **Rationale** | **Benefits** |
| **Improve Test Coverage** | **To check how the vector behaves in more situations** | **Make sure the code works correctly in different scenarios** |
| **Add Testing Naming Consistency** | **Apply a consistent naming scheme** | **Easier to identify failures and test purposes** |
| **Add Logging for Debugging** | **Use SCOPED\_TRACE() to add info when test fails** | **Makes debugging test failures faster and clearer** |
| **Add documentation** | **Add a README and code comments to explain what the test does** | **Helps new developers understand and use the test suite** |
| **Create helper functions** | **Reuse code like adding valuesor checking values in multiple tests** | **Reduces code duplication and makes test easier to write** |
| **Sete up Automatic testing (CI/CD)** | **Run test automatically using GitHub Actions** | **Ensures code is always tested before it goes live** |

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.

* + 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.

**[I will demonstrate skills such as secure coding, detailed documentation, modular design, and the use of version control system like Git. Additionally, I’ll show how I apply design principles in user interfaces, make informed design trade-offs, and build applications that support collaborative environments and decision-making.]**

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

**[Outcome 1 - 5]**

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.

**[**CS 260: Data Structures and Algorithms**] Overivew: The project involved building a software program that could load, store, and retrieve course information using Binary Search Tree (BST). The main goal was to manage course data efficiently by allowing the user to load course data from a CSV file, print a list of courses in alphanumeric order, and search for a specific course’s details, including prerequisites. I chose this project because it demonstrates my understanding of tree structures, recursion, and sorting, all essential concepts in algorithms and data sructures.**

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

**[The project uses a basic BST, which works well for organizing and searching data. However, if the items are added in a certain order (like sorted data), the tree can become unbalanced. This makes it ac more like a linked list, which slows down performance from fast (O(log n)) to slow (O(n)). I plan to replace the basic BST with an AVL Tree, a type of self-balancing tree. ]**

**Pseudocode:**

**Function insert(node, course):**

**If the current node is empty:**

**Create and return a new node with the course**

**If course ID is less than current node’s course ID:**

**Insert into the left branch**

**Else:**

**Insert into the right branch**

**Update the node’s height**

**Calculate the balance factor (left height – right height)**

**If unbalance:**

**-Rotate right if left-heavy and left child is also left-heavy**

**-Rotate left if right-heavy and right child is also right-heavy**

**-Rotate left then right if left-heavy but left child is right-heavy**

**-Rotate right then left if right-heavy but right child is left-heavy**

**Return the update node**

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.

**[The enhancement will demonstrate my ability to implement and understand advanced data structure like AVL Trees, using recursion effectively, and optimize algorithms for better performance. Additionally, It will show my ability to write clean, maintainable,and well-documented code. I will also explain the trade-offs and logic behind choosing AVL Tree over a basic BST, showcasing critical thinking and problem-solving skills.]**

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

**[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.**]**

* 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.

**[ The artifact I selected is my Warehousing Tracking App from** CS 360: Mobile Architecture and Programming. **This app helps warehouse staff and managers monitor inventory by providing features like real-time stock tracking, quantity adjustments, and low-stock alerts. It connects to a secure, real-time database to keep inventory data synchronized and accessible across users. I bulit the app using modular approach with a focus on database interactions, secure user login, and smooth UI/UX design.** **]**

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

**[To enhance the database functionality, I plan to integrate advanced data analytics using Firebase Cloud Funtions. This enhancement will allow the app to generate insights such as the most frequently restocked items, peak usage times, or inventory trends over time. These analytics would be displayed on a dashboard for warehouse managers, helping them make smarter stock decisions. ]**

**Flowchart:**

**User Updates Inventory**

* **Inventory Change Triggers Firebase Function**
* **Function Analyzes Inentory Patterns**
* **Analytics Stored in Database**
* **Dashboard Displays Update Analytics**

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.

**[This enhancement will show my ability to build data-driven mobile applications that interact with cloud databases in real-time. It also showcases my proficiency with advanced backend programming concepts like serverless computing and data summarization.]**

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

**[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.

**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.**]**

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

**[In the code review, I plan to demonstrate my ability to write clean, secure, and maintainable code using modern practices. The reviewed code will highlight my use of object-oriented principles, secure coding techniques, and efficient data structures. I will also showcase the use of industry-standard tools like Git version control and Google Test for unit testing, illustrating how I apply collaborative and automated development strategies.]**

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

**[I will communicate the purpose and impact of my enhancements in a professional, coherent manner. These write-ups will cearly explain the technical decisions I made, the reasons behind those choices, and how they relate to course outcomes and real-world industry needs. Through this I will demonstrate my ability to communicate complex technical information to various audiences.]**

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

**[I will reflect on my growth throughout the Computer Science program, identify areas where I’ve demonstrated mastery, and connect those experiences to my career goals in software engineering. I will assess how my knowledge of secure development, data structure, and database integration has evolved. This reflection will help illustrate my readiness for industry work and my understanding of how each skill supports both outcomes and career specialization. ]**