# CS 499 Module One Assignment Template

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CS499

1-2 Module One Assignment

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 SNHU Computer Science program for about 15 months.**

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

**While in the program, I’ve learned a lot of specific skills as well as developed an understanding and appreciation of some larger, overarching concepts. Broadly, these include:**

* **Proficiency with popular programming languages including Java and C++.**
* **Understanding of important computer science concepts and design patterns, like Oject Oriented Programming (OOP), Model-View-Controller (MVC) frameworks, SQL and NoSQL databases, and time-critical run-time analysis using Big O notation.**
* **Appreciation of the importance of security-oriented software development, including designing security features like authentication, authorization, and cryptography into applications from the beginning of the design phase.**
  1. Discuss the specific skills you aim to demonstrate through your enhancements to reach each of the course outcomes.

**I intend to demonstrate through my enhancements the ability to implement authentication and authorization techniques as well as cryptography to protect user credentials. This will align with the following course goals:**

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

**I will also demonstrate that I can display, interact with, and modify datasets in a database as well as implement an interface that allows non-technical users to do the same.**

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

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

**I will implement data structures that allow records to be efficiently retrieved, modified, and loaded into a database.**

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

**I plan to use my degree to advance in my current career as a data analyst. These skills will demonstrate my ability to derive value from large, complex datasets, make those datasets accessible to non-technical users, secure them using security principles like the principle of least privilege and role-based access control (RBAC), and implement efficient data structures that use resources effectively.**

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

**The skills I plan to demonstrate contribute to my career specialization by reinforcing my expertise in data management and cybersecurity, which are crucial in the data analyst role I'm pursuing. My focus on secure data access, efficient data structures, and user-friendly database interfaces aligns directly with my career goals in data analytics. Mastering these skills will enable me to handle sensitive data securely, analyze data more effectively, and communicate insights to a broad audience, which is essential in my field. This specialization will set me apart in data analysis by showcasing my ability to bridge technical complexity with business needs and security requirements.**

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

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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 will use an artifact from CS 360: Mobile Architecture and Programming. This artifact is a mobile application that allows users to track inventory items in a database.**

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.

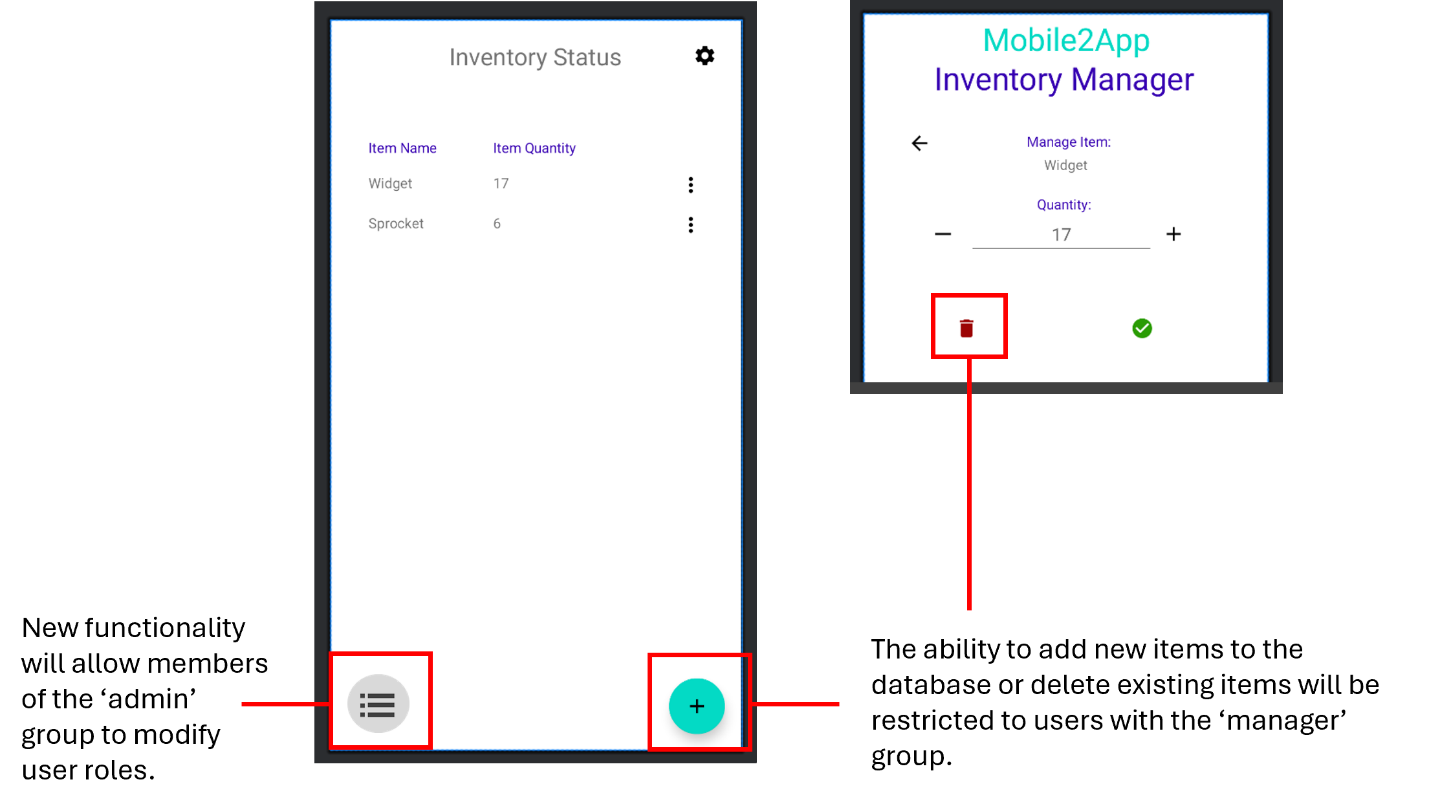
**While this application does an acceptable job of allowing users to interact with and modify database items, the security features of the application leave something to be desired.**

A screenshot of a login screen

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**Currently, users are required to log in to interact with the database, which is a good first step. However, user credentials are stored in the database in plaintext, which does not align with security best practices. To remedy this problem, I will implement password hashing, removing the ability of malicious actors to steal user credentials should they gain access to the database.**

**Additionally, all users are currently able to access all features of the application, as no access controls have been implemented beyond a simple log in feature. To futher enhance security, I will implement role-based access controls, which will restrict the ability to add or delete items from the database to a ‘manager’ group, and the ability to modify user accesses to an ‘admin’ group. An additional screen will be implemented to allow the ‘admin’ group to modify user accesses. Users with only the ‘user’ group will retain the ability to view and modify item quantities as well as modify local application settings. These enhancements will align the application with security best practices, as well as provide users with the necessary interface controls to manage the changes.**

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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.

**These enhancements will demonstrate my ability to implement authentication, authorization, and cryptography, as well as employ security best practices like the principle of least privilege and RBAC.**

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

**These enhancements will align with course outcome 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.**

**These enhancements align directly with this outcome, demonstrating my security-focused mindset, ability to mitigate potential vulnerabilities, and concern for privacy and the security of data resources.**

**These enhancements also align with course outcome 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.**

**Data security is a critical goal not just for good software design, but for the business and legal requirements of many industries. Ensuring security for proprietary data, as well as privacy for sensitive user information, is key to complying with many industry regulations, sustaining client trust, and maintaining competitive business practices.**

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 this category I will use an artifact from CS-300: Data Structures and Algorithms. This artifact reads information about a course catalog from a CSV file, loads it into a binary search tree (BST), and allows the user to examine the list of courses or an individual course. [Note: As far as I could tell CS300 and CS260 are functionally the same course, so this seemed like an admissible artifact. If this is incorrect please let me know.]**

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 current implementation of this artifact allows the user to import data from a CSV and display all of the data or elements of the data. However, if the user wishes to modify the dataset, they would need to directly alter the source CSV file. This is not ideal.**

A screenshot of a computer program

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**To better align with user needs, this enhancement will implement the ability to add a course to the dataset, including specifying which existing courses should be pre-requisites to that course, modify an existing course, or delete an existing course. Courses will not be deletable if they are pre-requisites to any other courses, as this would create confusing and inconsistent data. This enhancement will also implement the ability to export these changes to the same or a new CSV file.**

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.

**This enhancement will demonstrate my ability to expand a data structure to accommodate more complex use cases that expand functionality to meet user needs as well as my ability to translate a dataset from a data structure that is efficient for the application (the BST) to one that is convenient and portable for the end user (the CSV).**

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

**This enhancement will align with course outcome three:**

**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**

**These enhancements align with this outcome by designing expanded functionality, specifically to the implementation of the BST data structure, that addresses limitations in the original artifact.**

**These enhancements also align with course outcome 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.**

**These enhancements align with this outcome by providing end users an interface to meaningfully interact and modify the dataset while retaining validation for each modification and without having to directly access and modify the file. This enhancement will add value for the end user by transforming the application from a limited mechanism for viewing an existing dataset to a full scope application for viewing, expanding, or modifying a dataset.**

* 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 this category, I will use an artifact from CS-340: Advanced Programming Concepts. This artifact implements an MVC framework using a MongoDB model, a Jupyter notebook controller, and a Dash dashboard to provide users an interface to interact with and visualize a large dataset.**

* + 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 current implementation of this artifact allows users to filter data from the dataset based on pre-selected criteria derived from user requirements.**

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**Currently, filter criteria are hard-coded based on specifications provided by the client.**

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**While this approach meets requirements, it does not provide flexibility to meet future changes to the client’s needs. To address this shortcoming, this ehnahcement will add an interface to allow users to create custom database queries.**

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.

**These enhancements will demonstrate my ability to interface with MongoDB and facilitate the ability of non-technical users to interface with MongoDB. This will also highlight my ability to make complex datasets accessible and useful to non-technical users.**

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

**These enhancements will align with course outcome 1:**

**Employ strategies for building collaborative environments that enable diverse audiences to support organizational decision making in the field of computer science.**

**These enhancements align with this outcome by providing a mechanism for non-technical users to customize this application to their unique use-cases. This will provide all users with enhanced adaptability when using this software to meet organizational needs.**

**These enhancements also align with course outcome 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.**

**This application primarily serves as a mechanism to filter useful information from a large, complex dataset and display that information in visualizations that add value for the application’s business use case. Expanding that functionality will improve the application’s utility as a tool for communicating complex information in a way that is helpful to the end user.**

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 reviews will demonstrate my ability to evaluate the effectiveness of existing code, identify weaknesses in its design, and recommend enhancements to address those weaknesses. It will also demonstrate my ability to communicate effectively about technical content. This will support the following course outcomes:**

**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.**

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

**Artifact narratives will demonstrate the value each artifact represents as part of my ePortfolio as well as its intended value to its end user. It will also highlight the additional value created by the enhancements. Narratives will also demonstrate my problem solving process and ability to assess and create solutions to meet user needs. This will support the following course outcomes:**

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

**The professional self-assessment will provide an opportunity to highlight my strengths as a computer scientist. The specific strengths I intend to emphasize through this assessment and through the ePortfolio as a whole are my focus on secure coding practices and data security, empowering non-technical end users to derive value from complex datasets, and effective communication about technical topics to both other computer science professionals and non-technical end users. This will support the following course outcomes:**

**1. Employ strategies for building collaborative environments that enable diverse audiences to support organizational decision making in the field of computer science**

**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**