[CS-499-19912-M01 Computer Science Capstone 2025](https://learn.snhu.edu/d2l/home/2019781)

4-2 Milestone 3: Enhancement Two: Algorithms and Data Structure

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For my second enhancement, I focused on the category of **Algorithms and Data Structures**. The artifact I selected was my CS300 Advising Assistance Program, which I had previously enhanced for software design and engineering in Milestone Two. This program loads course data from a CSV file, prints a course list, allows lookup of individual courses with prerequisites, and now, after this enhancement, computes a **recommended course order** using a topological sort algorithm.

I selected this artifact because it provides a clear opportunity to showcase my understanding of graph algorithms and prerequisite structures. Courses and their prerequisites naturally form a directed graph, and the correct way to determine an order of study is through **topological sorting**. Implementing this algorithm demonstrates my skills in graph construction, indegree tracking, queue-based processing, and cycle detection.

The enhancement added a **new menu option**: “Print Recommended Course Order.” When selected, the program performs a topological sort across all courses, starting from those with no prerequisites. It then outputs a valid sequence of courses to take in order. For example, it shows that CSCI100 (Introduction to Computer Science) comes before CSCI101, which must be completed before CSCI200 (Data Structures), and so on. This aligns with both real-world advising needs and the intended course structure.

Through this enhancement, I met the **Algorithms and Data Structures outcome** by applying a non-trivial algorithm to a real problem. I also maintained software engineering principles by ensuring modularity and validation. One challenge I faced was ensuring that missing prerequisites or cycles in the data would be detected. To address this, I added validation that warns if a prerequisite is undefined and reports an error if a cycle exists.

This enhancement demonstrates growth in my ability to apply algorithms effectively to practical computing problems. It also shows that I can extend existing software in a way that adds meaningful functionality while adhering to design standards. In my final ePortfolio, this artifact will showcase my ability to design and evaluate algorithmic solutions, manage trade-offs, and deliver value through computer science principles.