COMPUTER SCIENCE I

Computer Science I challenges students to explore the limits of what computers can accomplish. In this course, students analyze and design solutions to problems using programming skills. The fundamental concepts of programming are explored through the hands-on use of computing devices. Additional topics include algorithms, debugging and verification, documentation, security and privacy, communication and collaboration, and careers. All topics are an intrinsic part of the software development lifecycle.

- DOE Code: 4801
- Recommended Grade Level: Grade 10-12
- Recommended Prerequisite: Introduction to Computer Science
- Credits: 2 semester course, 2 semesters required, 1-3 credit per semester, maximum of 6 credits
- Counts as an elective or Directed Elective for all diplomas
- Qualifies as a quantitative reasoning course
- If PLTW curriculum is used, PLTW training is required of the teacher.

Implementation Guidance
Computer Science I builds on skills developed in Introduction to Computer Science. If that course it not offered, it is imperative that fundamental programming concepts are taught in a middle school program or incorporated in another way. This course is designed to be taught in any programming language, meaning it is language neutral. Additionally, all domains are an intrinsic part of the software development lifecycle. All domains are expected to be covered by the end of the second semester.

Dual Credit
This course provides the opportunity for dual credit for students who meet postsecondary requirements for earning dual credit and successfully complete the dual credit requirements of this course. The Dual Credit crosswalk can be accessed here.

Career and Technical Student Organizations (CTSOs)
Career and Technical Student Organizations are considered a powerful instructional tool when integrated into Career and Technical Education programs. They enhance the knowledge and skills students learn in a course by allowing a student to participate in a unique program of career and leadership development. Students should be encouraged to participate in Business Professional of America, DECA, or Future Business Leaders of America, the CTSOs for this area.

Content Standards

Domain – Problem Analysis

Core Standard 1 Students analyze a problem using current industry techniques to design a solution to a problem.

Standards

CSI-1.1   Document problem analysis through industry standards such as: flowcharts, functional specifications, user stories, etc.

CSI-1.2   Outline the problem assigned and describe the solution.

CSI-1.3   Use puzzles and games to enhance problem solving skills.

CSI-1.4   Recognize language appropriate planning and designing tools (for example: flowcharts, UML diagrams, pseudocode, use cases).

Domain – Collaboration and Communication

Core Standard 2 Students collaborate to complete various tasks.

Standards

CSI-2.1   Design a solution to a problem by working in a team.

CSI-2.2   Explore technologies that can be used to collaborate with others of various cultures and career fields.

CSI-2.3   Utilize a problem solving approach to develop a solution using technology.

CSI-2.4   Analyze the work of peers and provide feedback.

CSI-2.5   Program a solution to a problem using pair programming or other methods.

Domain – Algorithms, Data, and Analysis

Core Standard 3 Students design a solution to a problem using algorithms.

Standards

CSI-3.1   Develop algorithms to determine a solution.

CSI-3.2   Assess the use of algorithms to provide a solution.

CSI-3.3   Use pseudocode to describe a solution.

CSI-3.4   Create a program flowchart using ANSI standard flowcharting symbols to define a solution.

CSI-3.5   Explain how the algorithm can be used to solve a problem.

CSI-3.6   Apply Boolean logic and relational operations.

CSI-3.7   Describe the different methods for encoding data such as binary, decimal, hexadecimal, ASCII, and Unicode.

Domain – Program Development
Core Standard 4 Students create executable programs that utilize control structures, modularity, scoping, variables, and at least one data structure such as a list/array.

CSI-4.1	Define the process of programming.
CSI-4.2	Create a computer program that corresponds to an algorithm or proposed solution.
CSI-4.3	Define fundamental control structures (sequencing, selection, and repetition).
CSI-4.4	Implement data variables and constants.
CSI-4.5	Compare local scope and global scope.
CSI-4.6	Construct a fundamental control structure.
CSI-4.7	Implement arrays.
CSI-4.8	Create programmer defined functions and methods to break down program logic and support reuse.
CSI-4.9	Compare the graphical user interface and the command line interface.
CSI-4.10	Recognize the order of operations used by a computer when performing calculations.
CSI-4.11	Define simple and compound conditionals (Boolean - not, and, or).
CSI-4.12	Implement simple and compound conditionals.
CSI-4.13	Adhere to industry standard programming conventions for accuracy and readability.

Domain – Program Verification and Debugging
Core Standard 5 Students prove a computer program solution works by using verification and debugging techniques.

Standards

CSI-5.1	Predict and explain programming outcomes.
CSI-5.2	Identify cause/effect for input/output.
CSI-5.3	Understand input validation.
CSI-5.4	Peer review documentation and code.
CSI-5.5	Conduct testing to identify performance errors.
CSI-5.6	Differentiate between syntax and logic errors.
CSI-5.7	Debug code using techniques such as: code tracing, print statements, boundary testing, breakpoints, etc.
CSI-5.8	Review computing artifacts to reduce bias, increase equity, and support accessibility.

Domain – Documentation

Core Standard 6 Students document their computing artifacts as part of the software development lifecycle.

    Standards

CSI-6.1	Describe the function of a computing artifact (for example, code or design).
CSI-6.2	Identify the purposes of a computing artifact.
CSI-6.3	Explain concepts related to a computing artifact.
CSI-6.4	Describe how to use a computing artifact.
CSI-6.5	Explain cause/effect by interpreting input and output.
CSI-6.6	Create documentation for computing artifact such as comments or user manual/readme.

Domain – Security and Privacy

Core Standard 7 Students will be able to understand the laws and ethical implications of privacy, security, and intellectual property.

    Standards

CSI-7.1	Examine the dynamic between privacy and security.
CSI-7.2	Explain the privacy concerns related to the collection and generation of data through implicit and explicit processes.
CSI-7.3	Evaluate the social and emotional implications of privacy in the context of safety, law, and ethics.
CSI-7.4	Give examples to illustrate how sensitive data can be affected by malware and other attacks.
CSI-7.5	Discuss the concepts and justifications for using secure design techniques.
CSI-7.6	Discuss the laws surrounding intellectual property.

Domain – Careers

Core Standard 8 Students will investigate various careers within the field of computer science.

    Standards

CSI-8.1	Identify computer science occupations and the roles and responsibilities of each.
CSI-8.2	Report job outlook, demand, and projected wages for computer science careers.
CSI-8.3	Explore the job opportunities that are available in computer science.
CSI-8.4	Investigate post-secondary training opportunities and industry certifications that are available.