

PLTW | Computer Science

Courses, Sequence, and Development Timeline

The PLTW Computer Science™ program of study engages high school students in computational thinking and prepares a computationally aware and capable workforce. The Computer Science program comprises introductory, foundation, and specialty courses. Schools that choose to implement Computer Science will bring on two year-long foundation courses: Computer Science and Software Engineering (CSE) and Computer Science Applications (CSA). Schools can then choose from an introductory course and variety of specialty courses to complete a minimum of three (3) years of content for the program.

Overview of Courses

Introductory Course

Introduction to Computer Science (ICS, 0.5 year)

Foundation Courses

Computer Science and Software Engineering (CSE, 1 year)

Computer Science Applications (CSA, 1 year)

Specialization Courses

Simulation and Modeling (SAM, 0.5 year)

Artificial Intelligence (AI, 0.5 year)

Cybersecurity (SEC, 0.5 year)

Capstone Course

Computational Problem Solving (CPS, 1 year)

Sequence of Courses

The program offers options depending on a student's prior experience with computer science, and we expect two common sequences of courses. For students with no programming experience, ICS followed by CSE and then CSA provides students with a strong foundation of computer science knowledge and skills. Following CSA, students would be prepared to take any of the specialization or capstone courses.

For students with previous programming experience, either through coursework or self-directed activities, or for students who have demonstrated strong academic performance in other disciplines, CSE is the starting point. Following CSE, students would then take the second foundational course, CSA. This sequence allows students to build upon their previous knowledge of programming and develop a common set of computer science knowledge and skills. After CSA, students would be prepared for any of the specialization or capstone courses.

Course Descriptions

The descriptions of the specialization and capstone courses are tentative and represent current thinking about options to complete a rigorous four-year high school computer science program of study.

Introductory Course

Introduction to Computer Science (ICS, 0.5 year)

Designed to be the first computer science course for students who have never programmed before, ICS is an optional starting point for the PLTW Computer Science program. Students create interactive stories in Scratch™ (an easy-to-use programming language); work in teams to create simple apps for mobile devices using App Inventor; and analyze data about students' health, social habits, and interests using functions in Excel®. Students will learn the impact of computing in society and the application of computing across career paths. They will also transfer the understanding of programming gained in App Inventor to a third language, Python®, in which they learn introductory elements of text-based programming. The course aligns with the Computer Science Teachers Association (CSTA) 3A standards.

Foundation Courses

Computer Science and Software Engineering (CSE, 1 year)

CSE implements the College Board's 2013 CS Principles framework. Using Python® as a primary tool and incorporating multiple platforms and languages for computation, this course aims to develop computational thinking, generate excitement about career paths that utilize computing, and introduce professional tools that foster creativity and collaboration. This course can be a student's first course in computer science, although we encourage students without prior computing experience to start with Introduction to Computer Science. CSE helps students develop programming expertise and explore the workings of the Internet. Projects and problems include app development, visualization of data, cybersecurity, robotics, and simulation. The course aligns with CSTA 3B standards.

Computer Science Applications (CSA, 1 year)

CSA focuses on integrating technologies across multiple platforms and networks, including the Internet. Students collaborate to produce programs that integrate mobile devices and leverage those devices for distributed collection and data processing. Students analyze, adapt, and improve each other's programs while working primarily in Java™ and other industry-standard tools. This course prepares students for the College Board's Advanced Placement CS-A test and aligns with CSTA Level 3C Standards.

Specialization Courses

Simulation and Modelling (SAM, 0.5 year)

In SAM, students create models and simulate social, physical, and biological systems. Students apply statistics and data analysis to understand systems and predict behavior, and they compare models to complex, real data. Students create simulations to communicate central ideas in the physical, biological, and social sciences and deepen their understanding of concepts in discrete math and computer science. This course emphasizes collaboration, professional writing, and the scientific method. It aligns with CSTA Level 3C Standards.

Artificial Intelligence (AI, 0.5 year)

AI students will develop artificially intelligent systems that create solutions to real problems found in science and industry. Students analyze problems for computational difficulty and analyze solutions for computational efficiency. Students engage in a wide array of applications, including automated vehicles and computer vision. This course aligns with CSTA Level 3C Standards.

Cybersecurity (SEC, 0.5 year)

SEC introduces the tools and concepts of cybersecurity and encourages students to create solutions that allow people to share computing resources while protecting privacy. Nationally, computational resources are vulnerable and frequently attacked; in SEC, students solve problems by understanding and closing these vulnerabilities. This course raises students' knowledge of and commitment to ethical computing behavior. It also aims to develop students' skills as consumers, friends, citizens, and employees who can effectively contribute to communities with a dependable cyber-infrastructure that moves and processes information safely. The course aligns with CSTA Level 3C Standards.

Capstone Course

Computational Problem Solving (CPS, 1 year)

As a capstone course, CPS offers students the opportunity to work in a team to deliver a software solution to a real-world design problem. Teams start by defining problems, which might originate from CPS students, community, or industry clients, or students in other problem-based courses, and use the Agile design process to develop a software solution. Effective practices in problem solving, documentation, software development, presentation, and collaboration are central to the course. The course aligns with CSTA Level 3C Standards.

Development Timeline

During the development phase, PLTW staff and other subject matter experts write curriculum and assessments. Following development, select schools in our pilot program provide feedback on curriculum and accompanying tools, in preparation for full release to the network in the following fall.

Course	Development	Pilot	Full Release
ICS	2014-2015	2015-2016	2016-2017
CSE	2013-2014	2013-2014	2014-2015
CSA	2014-2015	2015-2016	2016-2017
SAM	2015-2016	2016-2017	2017-2018
AI	2015-2016	2016-2017	2017-2018
SEC	2016-2017	2017-2018	2018-2019
CPS	2016-2017	2017-2018	2018-2019

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