Computer Science (PLTW)

HIGH WAGE
CAREER & TECHNICAL EDUCATION
WASHINGTON DC

HIGH SKILL
CAREER & TECHNICAL EDUCATION
WASHINGTON DC

IN DEMAND
CAREER & TECHNICAL EDUCATION
WASHINGTON DC

Office of the State Superintendent of Education
Postsecondary and Career Education Division
Career and Technical Education Department

The purpose of this document is to communicate the required Career and Technical Education (CTE) academic standards for the Computer Science (PLTW) Program of Study, which includes the following courses: Computer Science Essentials, Computer Science Principles, Computer Science A, and Cybersecurity. The academic standards in this document are theoretical and performance-based. They contain content from the states of Colorado, Maryland, Tennessee, and Texas and were validated by DC business and industry partners. All content is used with permission.

In addition to academic standards, OSSE has incorporated into this document Labor Market Information (LMI) definitions and explanations for the Program of Study; program aligned Industry Recognized Credentials; and, Work-Based Learning resources and requirements by course level.

This document is intended for use by educational administrators and practitioners. A similar document is available for each state-approved CTE Program of Study.

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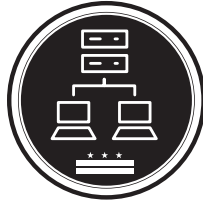### Tanya Mackall
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Computer Science (PLTW) Program of Study

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Computer Science (PLTW) Program of Study

Level I Course	Level II Course	Level III Course	Level IV Course
Computer Science Essentials OSSEID: 5110401	**Computer Science Principles** OSSEID: 5110402	**Computer Science A** OSSEID: 5110403	**Cybersecurity** OSSEID: 5110404

Computer Science Essentials (OSSEID: 5110401)

Grades: 9-12

Prerequisite: None

Description: In Computer Science Essentials, students will use visual, block-based programming and seamlessly transition to text-based programming with languages such as Python to create apps and develop websites, and learn how to make computers work together to put their design into practice. They'll apply computational thinking practices, build their vocabulary, and collaborate just as computing professionals do to create products that address topics and problems important to them.

Computer Science Principles (OSSEID: 5110402)

Grades: 10-12

Prerequisite: Computer Science Essentials

Description: Computer Science Principles helps students develop programming expertise and explore the workings of the Internet. Projects and problems include app development, visualization of data, cybersecurity, and simulation. PLTW is recognized by the College Board as an endorsed provider of curriculum and professional development for AP® Computer Science Principles (AP CSP). This endorsement affirms that all components of PLTW CSP's offerings are aligned to the AP Curriculum Framework standards and the AP CSP assessment.

Computer Science A (OSSEID: 5110403)

Grades: 11-12

Prerequisite: Computer Science Principles

Description: Computer Science A focuses on further developing computational-thinking skills through the medium of Android™ App development for mobile platforms. The course utilizes industry-standard tools such as Android Studio, Java™ programming language, XML, and device emulators. Students collaborate to create original solutions to problems of their own choosing by designing and implementing user interfaces and Web-based databases. PLTW is recognized by the College Board as an endorsed provider of curriculum and professional development for AP® Computer Science A (AP CS A). This endorsement affirms that all components of PLTW CS A's offerings are aligned to the AP Curriculum Framework standards and the AP CS A assessment.

Cybersecurity (OSSEID: 5110404)

Grades: 12

Prerequisite: Computer Science A

Description: Cybersecurity 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 Cybersecurity, 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.

Industry Certifications

None

Work-Based Learning Examples and Resources

Level I Course	Level II Course	Level III Course	Level IV Course
Career Exploration Industry Visits Guest Speakers Participate in a CTSO	**Career Awareness** *All of Level I, plus:* Postsecondary Visits Program-Specific Site Tours Mock Interviews	**Career Preparation** *All of Level I and II, plus:* Job Shadow Paid/Unpaid Internships	**Career Preparation** Paid/Unpaid Internships Apprenticeships

Several resources are available to help instructors meet the Level I and Level II WBL requirements, including:

Career Coach DC (http://careercoachdc.emsicc.com). Online site designed to help students find and connect to a career pathway by providing the most current local data on wages, employment, job postings, and associated education and training. Resource includes a Career Assessment for students.

Nepris (https://www.nepris.com). Connects educators and learners with a network of industry professionals, virtually, bringing real-world relevance and career exposure to all students. Nepris also provides a skills-based volunteering platform for business and industry professionals to extend their educational outreach.

Virtual Job Shadow (https://virtualjobshadow.com). Provides interactive tools which embower students to discover, plan, and pursue their dreams. Rich video library presents a "day in the life of" view for thousands of occupations.

Labor Market Information Definitions and Data

Career and Technical Education programs of study in the District of Columbia must meet at least one of the High Wage, High Skill, and In Demand definitions, below, to be considered as appropriate for our students and regional labor market. These definitions were created in collaboration with Career and Technical Education leaders from District of Columbia LEA's, the University of the District of Columbia Community College, and national guidance from Research Triangle International (RTI) and Education Northwest. Additionally, previous work was consulted from researchers at MIT's Labor Wage Index Project and the DC CTE Task Force's 2012 Strategic Plan for the District of Columbia.

High Wage: Those occupations that have a 25th percentile wage equal to or greater than the most recent MIT Living Wage Index for one adult in the District of Columbia, and/or leads to a position that pays at least the median hourly or annual wage for the Washington, DC, metropolitan statistical area. *(Note: A 25th percentile hourly wage of $17.02 or greater is required to meet this definition).*

High Skill: Those occupations located within the Washington, DC, metropolitan statistical area with education or training requirements of: completion of an apprenticeship program; completion of an industry recognized certification or credential; associate's degree, or higher.

In Demand: Those occupations in the Washington, DC, metropolitan statistical area having more than the median number of total (growth plus replacement) annual openings over a five-year period. *(Note: An occupation is required to have an annual growth plus replacement rate of 105 openings, or greater, between 2020-25 to meet this definition).*

Data for the Computer Science (PLTW) Program of Study *(source: EMSI, August 2019)***:**
(Due to multiple relevant SOC values, hourly wage and annual openings numbers are averaged)
Standard Occupational Code (SOC): 15-1131.00—Computer Programmers; 15-1122.00—Information Security Analysts
Hourly Wages
    25th Percentile: $38.81
    50th Percentile: $50.98
    75th Percentile: $64.79
Annual Openings (Growth and Replacement): 842
Typical Entry Level Education: Bachelor's Degree

Model Six-Year Plan: Computer Science (PLTW) Program of Study

College: University of the District of Columbia Community College
Program/CIP:
Plan:

Entity: Office of the State Superintendent of Education
Career Cluster: Information Technology
Program of Study: Computer Science (PLTW)

Subject	High School				College			
	9th Grade	10th Grade	11th Grade	12th Grade	Semester I	Semester II	Semester III	Semester IV
English (4)	English I	English II	English III	English IV				
Math (4)	Algebra I	Geometry	Algebra II	Math				
Science (4)	Biology	Lab Science	Lab Science	Science				
Social Studies (4)	World History and Geography I: Middle Ages	World History and Geography II: Modern World	U.S. History	U.S. Government (.5) and DC History (.5)				
Health (.5) and Physical Ed (1)	Health (.5) Physical Ed (.5)	Physical Ed (.5)						
World Languages (2)			World Language I	World Language II				
Art (.5)		Art (.5)						
Music (.5)		Music (.5)						
Elective / Major Courses	Computer Science Essentials	Computer Science Principles	Computer Science A	Cybersecurity				
Total possible college credits completed in high school: XX					*Credit hours required to complete the AAS program: XX*			

Computer Science Essentials (PLTW)

(a) **General requirements.** This course is recommended for students in Grades 9-12. Prerequisite: none. Students shall be awarded one credit for successful completion of this course.

(b) **Introduction.**
    (1) Career and technical education instruction provides content aligned with challenging academic standards and relevant technical knowledge and skills for students to further their education and succeed in current or emerging professions.
    (2) The Information Technology (IT) Career Cluster focuses on building linkages in IT occupations for entry level, technical, and professional careers related to the design, development, support, and management of hardware, software, multimedia, and systems integration services.
    (3) In Computer Science Essentials, students will use visual, block-based programming and seamlessly transition to text-based programming with languages such as Python to create apps and develop websites, and learn how to make computers work together to put their design into practice. They'll apply computational thinking practices, build their vocabulary, and collaborate just as computing professionals do to create products that address topics and problems important to them.
    (4) Students will participate in at least two Career Exploration Work-Based Learning experiences in this course, which might include guest speakers and work-place tours relevant to the program of study.
    (5) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other leadership or extracurricular organizations.

(c) **Knowledge and Skills.** Content requirements for Project Lead the Way Computer Science Essentials are prescribed in the Project Lead the Way Computer Science Essentials publication: Computer Science Essentials, published by Project Lead the Way.

Computer Science Principles (IT) (PLTW)

(a) **General requirements.** This course is recommended for students in Grades 10-12. Prerequisite: Computer Science Essentials. Students shall be awarded one credit for successful completion of this course.

(b) **Introduction.**
(1) Career and technical education instruction provides content aligned with challenging academic standards and relevant technical knowledge and skills for students to further their education and succeed in current or emerging professions.
(2) The Information Technology (IT) Career Cluster focuses on building linkages in IT occupations for entry level, technical, and professional careers related to the design, development, support, and management of hardware, software, multimedia, and systems integration services.
(3) Computer Science Principles helps students develop programming expertise and explore the workings of the Internet. Projects and problems include app development, visualization of data, cybersecurity, and simulation. PLTW is recognized by the College Board as an endorsed provider of curriculum and professional development for AP® Computer Science Principles (AP CSP). This endorsement affirms that all components of PLTW CSP's offerings are aligned to the AP Curriculum Framework standards and the AP CSP assessment.
(4) Students will participate in at least two Career Awareness Work-Based Learning experiences in this course, which might include informational interviews or job shadowing relevant to the program of study.
(5) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other leadership or extracurricular organizations.

(c) **Knowledge and Skills.** Content requirements for Project Lead the Way Computer Science Principles are prescribed in the Project Lead the Way Computer Science Principles publication: Computer Science Principles, published by Project Lead the Way.

Computer Science A (PLTW)

(a) **General requirements.** This course is recommended for students in Grades 11-12. Prerequisite: Computer Science Principles. Students shall be awarded one credit for successful completion of this course.

(b) **Introduction.**
   (1) Career and technical education instruction provides content aligned with challenging academic standards and relevant technical knowledge and skills for students to further their education and succeed in current or emerging professions.
   (2) The Information Technology (IT) Career Cluster focuses on building linkages in IT occupations for entry level, technical, and professional careers related to the design, development, support, and management of hardware, software, multimedia, and systems integration services.
   (3) Computer Science A focuses on further developing computational-thinking skills through the medium of Android™ App development for mobile platforms. The course utilizes industry-standard tools such as Android Studio, Java™ programming language, XML, and device emulators. Students collaborate to create original solutions to problems of their own choosing by designing and implementing user interfaces and Web-based databases. PLTW is recognized by the College Board as an endorsed provider of curriculum and professional development for AP® Computer Science A (AP CS A). This endorsement affirms that all components of PLTW CS A's offerings are aligned to the AP Curriculum Framework standards and the AP CS A assessment.
   (4) Students will participate in a Career Preparation Work-Based Learning experience in this course, which might include paid or unpaid internship experiences relevant to the program of study.
   (5) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other leadership or extracurricular organizations.

(c) **Knowledge and Skills.** Content requirements for Project Lead the Way Computer Science A are prescribed in the Project Lead the Way Computer Science A publication: Computer Science A, published by Project Lead the Way.

Cybersecurity (PLTW)

(a) **General requirements.** This course is recommended for students in Grades 12. Prerequisite: Computer Science A (PLTW). Students shall be awarded one credit for successful completion of this course.

(b) **Introduction**.
  (1) Career and technical education instruction provides content aligned with challenging academic standards and relevant technical knowledge and skills for students to further their education and succeed in current or emerging professions.
  (2) The Information Technology (IT) Career Cluster focuses on building linkages in IT occupations for entry level, technical, and professional careers related to the design, development, support, and management of hardware, software, multimedia, and systems integration services.
  (3) Cybersecurity 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 Cybersecurity, 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.
  (4) Students will participate in a Career Preparation Work-Based Learning experience in this course, which includes paid or unpaid internship, pre-apprenticeship, or apprenticeship experiences relevant to the program of study.
  (5) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other leadership or extracurricular organizations.

(c) **Knowledge and Skills.** Content requirements for Project Lead the Way Cybersecurity are prescribed in the Project Lead the Way Cybersecurity publication: Cybersecurity, published by Project Lead the Way.