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Computer science in high school graduation requirements

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Computer science and coding skills are widely recognized as a valuable asset in the current and projected job market. The Bureau of Labor Statistics projects 37.5 percent growth from 2012 to 2022 in the “computer systems design and related services” industry – from 1,620,300 jobs in 2012 to an estimated 2,229,000 jobs in 2022.¹

Yet some reports point to an alarming absence of female and minority students in courses such as Advanced Placement (AP) computer science. Of AP Computer Science A exam takers in the Class of 2013, 81 percent were male and 82.5 percent were white or Asian/Asian American/Pacific Islander.² [Code.org](#) reports nine out of 10 K-12 schools don’t offer computer programming coursework.³

This ECS Education Trends report identifies states that are allowing or requiring districts to apply computer science coursework toward completion of high school graduation requirements in math, science or foreign language. This report also highlights several states that require computer science courses to fulfill requirements for a specialized diploma or endorsement to the standard high school diploma.

To encourage districts to offer computer science courses – and to encourage students to complete computer science classes – some states have amended high school graduation requirements to either allow or require computer science to fulfill math, science or foreign language course requirements.

KEY TAKEAWAYS

Fourteen states require a student to be allowed to fulfill a math, science or foreign language credit for high school graduation by completing a computer science course.

Two states – Arizona and California – don’t require computer science to be recognized statewide as fulfilling graduation requirements, though districts may allow computer science courses to apply toward math requirements.

At least four states – Louisiana, Massachusetts, Texas and Virginia – award a special diploma, endorsement or other recognition to high school graduates who have earned certain computer science credits.



Policies mandating awarding of math, science or foreign language credit

Fourteen states require that students be allowed to apply specified computer science courses toward completion of mathematics, science or foreign language graduation requirements for the standard diploma.

- ◆ **Florida:** One math or science unit may be completed by one unit in computer science and the earning of related industry certifications. Computer science may not fulfill Algebra I or higher-level math, or Biology I or higher-level science credit requirements. (West's F.S.A. § 1007.2616(3)(a))
- ◆ **Georgia:** Fourth science unit may be completed by Advanced Placement (AP) computer science. (Ga. Comp. R. & Regs. 160-4-2-.20)
- ◆ **Idaho:** One math unit may be completed by an AP or dual credit computer science or dual credit engineering course if the student has completed Algebra II. One science unit may be completed by one of these courses. Students taking these courses may not count such courses as both a math and science credit. (IDAPA 08.02.03.105.01 (d), (e))
- ◆ **Illinois:** One math unit may be completed by an AP computer science course if the student completes Algebra II or an integrated math course with Algebra II content. If a school district offers an AP computer science course to high school students, the school board must designate that course as equivalent to a high school math course and note on the student's transcript that the AP computer science course qualifies as a mathematics-based, quantitative course. (105 ILCS 5/27-22(e)(3), (f-5))
- ◆ **Maryland:** AP computer science may fulfill a math credit towards graduation requirements. Another computer science course may fulfill a math credit requirement if the district determines the course meets the math standards required by regulation. (COMAR 13A.04.12.01(A)(2)(a))
- ◆ **Michigan:** The Algebra II credit may be partially or fully fulfilled by completing a department-approved formal career and technical education (CTE) program or curriculum, including in computer science, and in that program successfully completing the same content as the Algebra II benchmarks assessed on the department-prescribed state high school assessment, as determined by the department. The third science unit requirement may be fulfilled by completing a department-approved computer science program or curriculum. (M.C.L.A. 380.1278a(1)(a)(i), M.C.L.A. 380.1278b(1)(b))
- ◆ **Ohio:** Effective with students entering 9th grade in the 2014-15 school year (Class of 2018), one of the four math units must be chosen from computer programming, probability and statistics, applied mathematics or quantitative reasoning, or any other course approved by the department using standards established by the superintendent. (R.C. § 3313.603 (D)(5)(b))
- ◆ **Oklahoma:** 2014 legislation directs the state board to approve an AP computer science course to meet one of the math course requirements for the college preparatory/work ready curriculum if the course is taken in a student's senior year and the student is concurrently enrolled in or has successfully completed Algebra II. (70 Okl.St. Ann. § 11-103.6(G)(3))

In addition, computer science is one of the units or sets of competencies students opting out of the college preparatory/work ready curriculum may complete to fulfill a math credit. To earn math credit, the course must be taught by a teacher certified to teach mathematics. (70 Okl.St. Ann. § 11-103.6 (D)(2); Okla. Admin. Code 210:35-9-31 (e)(B)(ii))

- ◆ **South Carolina:** One unit computer science, if approved by the Department of Education, may be counted toward math requirements. (§ 59-39-100(B))
- ◆ **Texas:** The third math credit under the Foundation High School Program (default diploma option effective with entering 9th graders in 2014-15 and available to students in grades 10-12 in 2014-15) may be selected from one full credit or a combination of two half credits from two different courses, subject to prerequisite requirements, from a number of courses, including AP computer science and Discrete Mathematics for Computer Science. (19 TAC § 74.12(b)(2)(B))

Students under the existing Minimum, Recommended or Advanced high school programs (available to students in the Classes of 2015-2017) may earn one unit math credit for completing AP computer science or Discrete Mathematics for Computer Science.

(19 TAC § 111.61(d), 19 TAC § 74.72(b)(2)(B), 19 TAC § 74.73(b)(2)(B), 19 TAC § 74.74(b)(2)(A))

In addition, students under the Foundation High School Program may fulfill two units of Languages Other Than English (LOTE) by completing two credits in computer programming languages selected from Computer Science, I, II and III. To apply to the LOTE requirement, these credits must be earned before September 2016. Effective both before and after September 2016, if a student, in completing the first credit of LOTE, demonstrates that s/he is unlikely to be able to complete the second credit, the student may substitute another appropriate course, including computer programming languages. (19 TAC § 74.12(b)(5)(A), (B))

- ◆ **Utah:** The three science credits must be fulfilled, at a minimum, by two courses from the five science foundation areas, one of which is computer science. (R277-700-6(C)(3)(a))
- ◆ **Virginia:** 2014 legislation directs the state board to consider all computer science course credits to be math, science or CTE course credits, and to develop guidelines on how computer science credits can satisfy graduation requirements. (VA Code Ann. § 22.1-253.13:4(D)(8)) Under those guidelines, adopted by the state board in January 2015, AP Computer Science A may fulfill:
 - A standard graduation credit in math.
 - A standard graduation credit in science when students successfully complete lab science courses from the different science discipline areas in accordance with the 2012 Regulations Establishing Standards for Accrediting Public Schools in Virginia (SOA). For AP Computer Science A to be applied as a standard credit for lab science, the course must include a significant experimental component, as defined in state board guidelines. International Baccalaureate (IB) computer science coursework may be applied as a lab science as part of the recognized IB diploma requirement, which is currently governed under the 2012 SOA regulations.
 - A standard credit in CTE. (Virginia Board of Education Guidelines for the Use of Computer Science Courses to Satisfy Graduation Requirements, January 22, 2015)

In addition, Virginia permits a student to use a computer science exam as the student-selected end-of-course assessment to fulfill high school exit exam requirements, provided a student completes a CTE program sequence in programming or a related programming sequence and scores 3 or higher on the AP Computer Science A exam. (8 VAC 20-131-50(B)(2), (Virginia Board of Education Guidelines for the Use of Computer Science Courses to Satisfy Graduation Requirements, January 22, 2015))

- ◆ **Washington:** Local boards must approve AP computer science as equivalent to high school mathematics or science and denote on a student's transcript that AP computer science qualifies as a math-based quantitative course for seniors taking the course. For a board to approve AP computer science as equivalent to high school math, the student must be concurrently enrolled in or have successfully completed Algebra II. (West's RCWA 28A.230.097(1))
- ◆ **Wisconsin:** Effective with diplomas granted in the 2016-17 school year, one math unit may be completed by a computer science course approved by the department of education. (118.33(1)(a)1.)

Policies permitting awarding of math or science credit

In two states, authority to award math and/or science credit toward high school graduation resides with district boards.

- ◆ **Arizona:** A district or charter school governing board may approve a rigorous computer science course to fulfill a math credit requirement only if the course includes significant mathematics content and the governing board determines the high school that will offer the course has sufficient capacity, infrastructure and qualified staff, including competent teachers of computer science. (A.R.S. § 15-701.01(B)(2), § 15-183(E))
- ◆ **California:** A district that requires more than two units of math for high school graduation may award up to one math credit for successfully completing a category C-approved computer science course, defined as a course that meets the A-G admission requirements for the California State University and the University of California. (West's Ann. Cal. Educ. Code §51225.35)

Policies on awarding of credit for a specialized diploma/endorsement

In a small number of states, computer science credits may fulfill requirements for a specialized diploma or endorsement to the standard diploma.

- ♦ **Louisiana:** To complete a career area of concentration for the college diploma or career diploma, students must complete four elective primary credits in the career major and two related elective credits, including one computer/technology course. Computer Science I and II can each count toward completion of this requirement. (La. Admin Code. tit. 28, pt. CXV, § 2319(C)(2); La. Admin Code. tit. 28, pt. CXV, § 2318(C)(4))
- ♦ **Massachusetts:** To earn a Certificate of Mastery with Distinction, a student must, among other criteria, demonstrate accomplishment in both arts/humanities and mathematics/science (defined to include engineering and computer science). To demonstrate accomplishment, a student must achieve minimum scores on two AP exams, two SAT II exams, or one AP or SAT II exam, or one of these exams along with one other achievement, as defined in [regulation](#). (603 CMR 31.02, 603 CMR 31.05)
- ♦ **Texas:** A student may earn any of five endorsements to the high school diploma by completing a fourth unit in math, among other requirements. The fourth math unit may be selected from one full credit or a combination of two half credits from two different courses, subject to prerequisite requirements, from a number of courses, including AP computer science or Discrete Mathematics for Computer Science (these courses may fulfill the third math credit requirement under the Foundation High School Program). One of the available endorsements is a STEM endorsement. One of the five pathways for completing the STEM endorsement is completion of a coherent sequence of four computer science credits selected from 13 course options. (V.T.C.A., Education Code § 28.025(c-1)(1); Tex. Admin. Code tit. 19, § 74.13(e)(2), (f)(1)(B))
- ♦ **Virginia:** A student may earn the Board of Education's Seal of Advanced Mathematics and Technology by, among other criteria, passing a board-approved exam that confers college-level credit in a technology or computer science area. (8 VAC 20-131-50(H)(4))

ENDNOTES

- 1 United States Department of Labor, Bureau of Labor Statistics, Employment Projections, "Table 2.3, Industries with the Fastest growing and Most Rapidly Declining Wage and Salary Employment," December 2013, http://www.bls.gov/emp/ep_table_203.htm (accessed Jan. 14, 2015).
- 2 College Board, 10th Annual AP Report to the Nation, Subject Supplement: Computer Science A, 2014 <http://media.collegeboard.com/digitalServices/pdf/ap/rtn/10th-annual/10th-annual-ap-report-subject-supplement-computer-science-a.pdf> (accessed April 10, 2015).
- 3 Code.org, Summary of source data for Code.org infographic, n.d. https://docs.google.com/document/d/1gySkltxiJn_vwb8HIIKNXqen184mRtzDX12cux0ZgZk/pub (accessed April 10, 2015).

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