South Carolina Department of Education
Fall 2018 Computer Science Planning Committee
Final Document
December 2018

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Introduction

The South Carolina Department of Education (SCDE) Fall 2018 Computer Science (CS) Planning Committee was tasked with creating and recommending specific products and action items to aid the SCDE in continuing the growth of computer science in South Carolina and in aligning the state's computer science initiatives to industry demand for computational learning.

The courses and course pathways proposed in this document were not designed to incorporate all of the South Carolina Computer Science Standards for High School in their entirety. Additionally, the course sequences in the Computer Science Majors/Pathways are not intended to correspond to the levels of the South Carolina Computer Science Standards for High School. It is the intention of the committee that the South Carolina Computer Science Standards for High School be referenced in the course standards for each individual course.

Additionally, it is the recommendation of the committee that members of the SCDE Fall 2018 Computer Science Planning Committee be included in future work, including, but not limited to, standards writing, professional development, teacher certification, and identification of industry credentials for students to pursue.

This document contains the committee's recommendations, thoughts, and guidance regarding the following critical needs.

Future Phases of Work

1a. The committee has developed a Standards/Instructional Timeline to guide the SCDE's computer science-related work over the course of the next 1.5 years.

1b. To help guide upcoming standards writing committees, Course Planning Documents have been provided for courses that are recommended to be updated or created.

1c. Recommended Computer Science Majors/Pathways have been provided to outline course sequencing and recommended majors once the new coursework has been fully implemented.

1d. Although the Project Lead the Way courses remain separate in the committee's recommended changes, the committee has provided Project Lead the Way Recommendations to guide the SCDE, specifically the OCTE, if future work involves absorbing these courses into generic courses.

Courses to Fulfill Computer Science Graduation Requirement

2a. The committee created two lists of Courses to Fulfill Computer Science Graduation Requirement. The 2019-20 list is the same as the list released tentatively to districts as recently as December 2018 with the exception of the addition of Discovering Computer Science.

2b. The committee aligned the 2020-21 and Beyond list to the South Carolina Computer Science Standards for High School. Courses were reviewed and evaluated by the committee to determine alignment of standards and upcoming new coursework recommended by the committee.

Required Credentials

3a. The committee considered many factors affecting teacher certification in regards to computer science coursework. The Recommended Certification Timeline should guide the SCDE through the implementation of teacher certification requirements.

3b. The Recommended Required Credentials Revisions identify the required teacher credentials for the revised and new computer science courses recommended by the committee.

3c. Currently, computer science courses are taught by teachers who are certified in a variety of fields. The committee made recommendations based on many Considerations for Teacher Certification Requirements. It is the intent of the committee to have highly qualified instructors teaching computer science courses.

The SCDE Fall 2018 Computer Science Planning Committee recommends the SCDE establish clear, consistent communication with regard to the future of computer science in South Carolina as outlined throughout this document. The committee has identified the following actions to be the most urgent and immediate.

1. Recommendation #1:

The SCDE should communicate to all school districts in January 2019 about the introductory courses allowed to fulfill the computer science graduation requirement. The committee has the following recommendations to help guide district and school leaders in choosing which introductory course(s) will best fit the needs of their students. Although there are similarities between these courses, they each have a distinct purpose, as outlined below.

Discovering Computer Science*

(formerly CS Discoveries; will be assigned new course code)

Students will be exposed to introductory computer science topics with an emphasis on computational thinking and problem solving. Students will be empowered to create authentic artifacts and engage with computer science as a medium for creativity, communication, problem solving, and fun. Students will create their own websites, apps, and games.

- This course will be designed as one credit for students in grade 9 but will also be offered as two half-credits for students in the middle school taking the course for high school credit.
- This survey course will expose students to introductory computer science topics with an emphasis on computational thinking and problem solving applied to a variety of contexts. Students will be empowered students to create authentic artifacts and engage with computer science as a medium for creativity, communication, problem solving, and fun.

Fundamentals of Computing*

(formerly Exploring Computer Science)

This course is designed to introduce students to the field of computer science through an exploration of engaging and accessible topics. Through creativity and innovation, students will use critical thinking and problem solving skills to implement projects that are relevant to their lives. They will create a variety of computing artifacts while collaborating in teams. Students will gain a fundamental understanding of the history and operation of computers, programming, and web design. Additionally, students will be introduced to computing careers and will examine societal and ethical issues of computing.

- This course will be designed as one credit for students in grades 9 and 10 but will also be offered as two half-credits for students in the middle school taking the course for high school credit.
- This course will be very similar to Discovering Computer Science, but it will take a deeper dive into computer science careers and career-related topics. This course is recommended for students pursuing a computer science major or pathway.

AP Computer Science Principles*

AP Computer Science Principles offers a multidisciplinary approach to teaching the underlying principles of computation. The course introduces students to the creative aspects of programming, abstractions, algorithms, large data sets, the Internet, cybersecurity concerns, and computing impacts. AP Computer Science Principles also gives students the opportunity to use current technologies to create computational artifacts for both self-expression and problem solving. Together, these aspects of the course make up a rigorous and rich curriculum that aims to broaden participation in computer science.

- This course is designed as one credit for students in grades 9, 10, and 11.
- This course is similar to Fundamentals of Computing but is designed to be equivalent to a first-semester introductory college computing course.
- This course is designed for an inclusive audience and is intended to be a gateway for students interested in taking subsequent AP courses.
- It is recommended that students enrolled in this course have a strong foundation in Algebra 1.
- While there is no prerequisite for the course, students will still take the AP exam at the end of the course.

**Due to the similarities in course content, it is recommended that students take only one of the following courses: Discovering Computer Science, Fundamentals of Computing, and AP Computer Science Principles.*

Fundamentals of Web Page Design and Development

Students will gain the skills and knowledge needed to safely and effectively use internet applications and languages to create and maintain web pages using a structured development process. Students will learn the HTML, CSS, and basic scripting in a language like JavaScript needed to create websites that are well-organized, attractive, universally accessible, responsive, and easy to navigate. They will also learn the technological processes, requirements, and legal ramifications for publishing their websites.

- This course will be designed as one credit for students in grades 9, 10, and 11.
- This will be a specialized course focusing on one area of computer science and is recommended for students who are interested in learning web design and development industry languages. This course will prepare students for industry credentials.
- School districts may choose to require Discovering Computer Science or Fundamentals of Computing as a prerequisite.

IT Fundamentals

Students will learn essential Information Technology (IT) skills and knowledge needed to perform common entry-level IT tasks. Students will learn to install, repair, configure, secure, and manage computer hardware, operating systems, and software in home or corporate environments. Students will learn common practices for troubleshooting a variety of computer issues and customer service techniques for assisting computer users with their respective problems.

- This course will be heavily revised.
- This course will be designed as one credit for students in grades 9, 10, and 11; specifically, it is not recommended for students below grade 9.
- This course will be specialized and will afford students an opportunity to explore introductory IT topics, including networking, cybersecurity, operating systems, computer repair, and server administration. This rigorous course will prepare students for industry credentials in IT.
- This course will be designed as the introductory course for students pursuing IT majors or pathways. This course is not recommended for students pursuing other computer science majors.

2. Recommendation #2:

The SCDE should establish a committee to develop policies and procedures regarding the finalized Recommended 2020-21 and Beyond Courses to Fulfill Computer Science Graduation Requirement list to ensure that the integrity of the computer science standards is maintained when approving future courses. Specifically, the following considerations need to be addressed in the established solution.

- Approving the addition of CTE and academic courses to the list
- Adding Dual Credit, Virtual School, and Innovative Courses to the list

The CS Planning Committee recommends a rubric or committee-based vetting process. The committee used the following guidelines when selecting the recommended courses outlined in this document.

- Does the course teach computer science, defined as “the study of computers and algorithmic processes, including their principles, their hardware and software designs, their applications, and their impact on society”?
- Does the course allow for instruction based upon the South Carolina Computer Science Process Standards?
- Does the course relate to one or more of the 5 disciplines of computing: computer science, computer engineering, software engineering, information systems, or information technology?
- Does the course align, in part or in whole, to the 5 computing concepts: Computing Systems, Networks and the Internet, Data and Analysis, Algorithms and Programming, and Impact of Computing?
- Does the course have a strong correlation to the South Carolina Computer Science Standards for High School? Further, does the course contain course content that is more advanced than these standards?

Recommendation #3:

The SCDE should develop a 5-year strategic plan for professional development (PD) to meet the needs of districts, schools, and teachers with their implementation of the recommended changes to the Required Credentials for computer science courses and their training on new courses and pathways. The committee recommends the plan include considerations for the following.

- Professional development opportunities should begin Summer 2019 and a PD timeline should be communicated to districts in January 2019.
- Professional development opportunities that fulfill both the 30-hour PD recommendation and the need for content-specific PD should be made available.
- Resources to assist schools and districts with PD funding should be made available. (Traditional CTE funding sources limit the use of funds for tuition-based learning, so the SCDE should investigate options to help fund the transition of educators and should communicate options for funding to district instructional leaders.)
- Computer Science PRAXIS support for teachers pursuing the add-on certification by exam should be made available.
- Assistance to school leadership and counselors surrounding implementation plans to accommodate changes to computer science graduation requirements, courses, and majors should be made available.

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Section 1: Recommended Future Phases of Work

Section 1a: Standards/Instructional Timeline

Standards/Instructional Timeline		
Time Period	**Details of Work**	**Recommended Person(s)**
Ongoing	1. Communication should be ongoing and consistent to all possible groups (e.g., SCASA, CTE, counselors, conferences). 2. Create and maintain a comprehensive website containing information including all CS-related communications, documents, resources, and professional development opportunities (e.g., "one-stop-shop" for all audiences similar to Arkansas' Computer Science Initiative website).	All SCDE employees Designated SCDE CS employee
Ongoing	Develop a process for approving courses to be added to the finalized Recommended 2020-21 and Beyond Courses to Fulfill Computer Science Graduation Requirement list. The committee recommends a rubric or committee vetting process (see Recommendation #3 in the Introduction).	OCTE; OFSA; non-SCDE member of SCDE Fall 2018 CS Planning Committee
Ongoing	Establish a process for approving Dual Credit, Virtual School, and Innovative Courses that are requested to count for CS graduation credit (see Recommendation #3 in the Introduction).	OCTE; OFSA; OVE; non-SCDE member of SCDE Fall 2018 CS Planning Committee Internal SCDE employees should approve courses based on external committee recommendations of process/rubric.
Ongoing	Vendors should submit crosswalks from product to standards to inform district planning and curriculum selection decisions. Crosswalks and other vendor information should be released on the website described above.	Vendors

January 2019	Publish and effectively communicate finalized Recommended 2019-20 Courses to Fulfill Computer Science Graduation Requirement and Recommended 2020-21 and Beyond Courses to Fulfill Computer Science Graduation Requirement lists (to include new course codes as indicated).	OCTE; OFSA
January 2019	Publish and effectively communicate the differences among introductory course offerings available 2019-20 (see Recommendation #1 in Introduction) to give districts and schools the opportunity to make intentional decisions regarding which introductory course(s) will best fit their students' needs.	OCTE
Early Spring 2019	Revise standards for introductory CS courses: ● Discovering Computer Science ● Fundamentals of Web Page Design & Development ● IT Fundamentals Important components to be included in this process: ● Consider the SCDE Fall 2018 CS Planning Committee's overall vision and planning (see Course Planning Documents for each course) ● Standards should be mapped to the South Carolina Computer Science Standards for High School, when appropriate, and included as a crosswalk. ● South Carolina Computer Science Process Standards should be added to all computer science course standards documents moving forward. ● Supplemental resource lists should be included.	OCTE; non-SCDE member(s) of SCDE Fall 2018 CS Planning Committee; additional standards writing team members from the field
Early Spring 2019	Approve & publish finalized Computer Science Majors/Pathways document that includes the titles of new courses, years of phase-in/phase-out, new course codes as indicated in the finalized Recommended 2019-20 Courses to Fulfill Computer Science Graduation Requirement and Recommended 2020-21 and Beyond Courses to Fulfill Computer Science Graduation Requirement lists, course descriptions, and course major topics to assist districts in planning for future pathways (see Course Planning Documents for descriptions and major topics). NOTE:	OCTE

	Cybersecurity needs to be moved to IT from the STEM Cluster.	
Fall 2019	Revise standards for the following courses: ● Networking Fundamentals ● Advanced Networking ● Cybersecurity Fundamentals ● Advanced Cybersecurity ● Operating Systems ● Advanced Operating Systems ● Computer Forensics ● Server Administration ● Advanced Server Administration Important components to be included in this process: ● Consider the SCDE Fall 2018 CS Planning Committee's overall vision and planning (see Course Planning Documents for each course) ● Standards should be mapped to the South Carolina Computer Science Standards for High School, when appropriate, and included as a crosswalk. ● South Carolina Computer Science Process Standards should be added to all computer science course standards documents moving forward. ● Supplemental resource lists should be included.	OCTE; non-SCDE member(s) of SCDE Fall 2018 CS Planning Committee; additional standards writing team members from the field
2019-20 School Year	Revise courses and write new courses: ● Introduction to Computer Programming ● Intermediate Computer Programming ● Advanced Computer Programming ● Information Systems ● Gaming and Interactive Media Development ● Client-Side Scripting ● Server-Side Scripting ● Mobile App Development ● Introduction to Robotics and Control Systems ● Intermediate Robotics and Control Systems ● Advanced Robotics and Control Systems ● Computing Capstone Important components to be included in this process: ● Standards writing committees should be formed to write an entire major/pathway so that vertical articulation of courses can be considered throughout the writing process.	OCTE; non-SCDE member(s) of SCDE Fall 2018 CS Planning Committee; additional standards writing team members from the field

	• Consider the SCDE Fall 2018 CS Planning Committee's overall vision and planning (see Course Planning Documents for each course) • Standards should be mapped to the South Carolina Computer Science Standards for High School, when appropriate, and included as a crosswalk. • South Carolina Computer Science Process Standards should be added to all computer science course standards documents moving forward. • Supplemental resource lists should be included.	
2019-20	Call textbook adoption committees for computer science courses.	OIM; OCTE
January 2020	Publish and effectively communicate the finalized Computer Science Majors/Pathways document, as well as the finalized Recommended 2019-20 Courses to Fulfill Computer Science Graduation Requirement and Recommended 2020-21 and Beyond Courses to Fulfill Computer Science Graduation Requirement lists (to include new course codes as indicated) to remind districts of new majors in 2020-21. (This is intentionally repeated, because it needs to be clear that these lists are final.)	OCTE
By 2020-21	1. All former courses/majors are phased out (with the exception of needing to offer upper level courses for one more year to allow for completers). 2. All new courses/majors are phased in. 3. Full implementation of new majors and pathways inclusive of recommendations in Course Planning Documents is in effect starting this school year.	N/A
2021-Beyond	Technical Skills Assessments to be revised based on new majors/pathways for completers.	OCTE; committee members from the field

Section 1: Recommended Future Phases of Work

Section 1b: Course Planning Documents

The following pages contain Course Planning Documents for the courses that the committee recommends be changed.

The following courses were intentionally not included because no changes are recommended:

- Fundamentals of Computing

The following courses were intentionally not included because the committee recommends these courses be discontinued:

- Database Design and Programming with SQL
- Database Programming with PL/SQL
- SAS Programming 1
- SAS Programming 2
- GIS Technology 1
- GIS Technology 2

The following courses were intentionally not included because the committee recommends these courses be consolidated with or into other courses:

- Computer Programming 1
- Computer Programming 2
- Computer Programming 1 with JAVA
- Computer Programming 2 with JAVA
- Computer Programming 1 with Visual Basic
- Computer Programming 2 with Visual Basic
- Computer Programming 1 with C++
- Computer Programming 2 with C++
- Java Fundamentals and Java Programming
- Computer Repair and Service
- Advanced Computer Repair and Service
- Foundations of Animation
- Advanced Animation
- Game Design and Development

Section 1b: Course Planning Documents

Course Title
Introduction to Computer Programming
Prerequisites
Teacher Recommendation
Course Description
Students will be introduced to computer programming through the use of a high-level programming language. Students will learn problem-solving techniques, algorithm design, and fundamental programming constructs to properly design, develop, test, and implement computing solutions. This course will include a lab component. No previous programming experience is required.
Main Topics
• Problem Solving • Pseudocode and Algorithm Design • Designing, Testing, and Debugging Programs • Types of Errors • Data Types and Variables • Abstraction • Input/Output (Keyboard/Monitor, File) • Data Types and Control Structures (Loops, Conditionals) • Functions (Predefined, Programmer-Defined) • Arrays
Correlation to South Carolina Computer Science Standards for High School
• HS1.CS.1.2 • HS1.DA.1.2 • HS1.DA.1.3 • HS2.DA.1.3 • HS1.DA.2.1 • HS2.DA.2.1 • HS3.DA.2.1 • HS1.DA.3.2 • HS1.AP.1.1 • HS2.AP.1.1 • HS3.AP.1.1 • HS1.AP.2.1 • HS2.AP.2.1 • HS1.AP.2.2 • HS2.AP.2.2

- HS1.AP.3.1
- HS2.AP.3.1
- HS1.AP.4.1
- HS1.AP.4.2
- HS2.AP.4.2
- HS1.AP.4.3
- HS2.AP.4.3
- HS1.AP.5.1
- HS1.IC.1.1
- HS1.IC 3.3

Additional Notes

1. Schools should choose a programming language and build the course path using that language.
2. This course combines the following historical courses: Computer Programming 1 with Java, Computer Programming 1 with Visual Basic, Computer Programming 1 with C++, Computer Programming 1, and Java Fundamentals and Java Programming.

Section 1b: Course Planning Documents

Course Title
Intermediate Computer Programming
Prerequisites
Introduction to Computer Programming
Course Description
Students will explore intermediate computer programming fundamentals to design, implement, and test larger programs using high-level programming languages. Students will learn the importance of design using larger code bases and libraries, and system development tools. This course includes a lab component.
Main Topics
• Arrays and Structs • Classes/Objects • Inheritance, Polymorphism, and Information Hiding • Elementary Data Structures (Lists, Queues, Stacks) • Operator Overloading • Simple Version Control • Unit Testing • Recursion • Dynamic Memory • Introduction to Big-O Notation • Application Programming Interfaces (APIs)
Correlation to South Carolina Computer Science Standards for High School
• HS2.CS.1.1 • HS3.CS.1.1 • HS2.CS.1.2 • HS4.CS.2.1 • HS1.NI.2.2 • HS2.NI.2.1 • HS2.NI.2.2 • HS1.DA.1.1 • HS2.DA.1.1 • HS2.DA.1.2 • HS4.DA.2.1 • HS3.AP.2.1 • HS3.AP.2.2 • HS3.AP.3.1 • HS2.AP.4.1

- HS3.AP.4.2
- HS4.AP.4.2
- HS3.AP.4.3
- HS1.AP.4.4
- HS2.AP.4.4
- HS2.AP.5.1
- HS2.IC.3.3

Additional Notes

This course consolidates the following historical courses: Computer Programming 2 with Java, Computer Programming 2 with Visual Basic, Computer Programming 2 with C++, Computer Programming 2.

Section 1b: Course Planning Documents

Course Title
Advanced Computer Programming
Prerequisites
Intermediate Computer Programming
Course Description
Students will build sophisticated computer programs using high-level programming languages, integrated development environments, and system development tools such as version control and repositories. Students will learn advanced data structures and properly properly analyze the complexity of designed solutions. This course will include a lab component.
Main Topics
• Algorithm Design and Analysis • Advanced Data Structures (Trees, Priority Queues, Maps, Graphs) • Hashing • Sorting • Graph Algorithms • Integrated Development Environments (IDEs) • Application Programming Interfaces (APIs) • Parallel Computing • Version Control and Repositories • Stream Programming • Multithreading
Correlation to South Carolina Computer Science Standards for High School
• HS4.CS.1.1 • HS3.CS.1.2 • HS4.CS.1.2 • HS4.CS.1.3 • HS4.NI.2.1 • HS3.NI.2.2 • HS4.NI.2.2 • HS3.DA.1.1 • HS4.DA.1.1 • HS3.DA.1.2 • HS4.DA.1.2 • HS4.AP.1.1 • HS4.AP.3.1 • HS3.AP.4.1

• HS4.AP.4.1 • HS4.AP.4.3 • HS3.AP.4.4 • HS4.AP.4.4 • HS3.AP.5.1 • HS4.AP.5.1 • HS2.IC.1.1 • HS3.IC.3.3
Additional Notes
None

Section 1b: Course Planning Documents

Course Title
Information Systems
Prerequisites
Discovering Computer Science OR Fundamentals of Computing OR AP Computer Science Principles OR Fundamentals of Web Page Design and Development
Course Description
Students will study the flow and structure of information within a system. They will examine common techniques for managing and manipulating data such as relational and other database management systems, electronic data interchange, automated data analysis, and machine learning. Students will also gain practical skills in managing and manipulating data using some of these techniques.
Main Topics
• Model the flow and structure of information within various organizations • Understand database concepts • Structure data with a Data Definition Language such as SQL • Extract and modify data with a Data Manipulation Language such as SQL • Use an appropriate tool such as SAS to analyze data to solve a specific problem
Correlation to South Carolina Computer Science Standards for High School
• HS1.DA.1.1 • HS2.DA.1.1 • HS1.DA.1.2 • HS2.DA.1.2 • HS1.DA.2.1 • HS2.DA.2.1 • HS1.DA.2.2 • HS2.DA.2.2 • HS1.DA.3.1 • HS2.DA.3.1
Additional Notes
None

Section 1b: Course Planning Documents

Course Title
Gaming and Interactive Media Development
Prerequisites
Discovering Computer Science OR Fundamentals of Computing OR AP Computer Science Principles OR Fundamentals of Web Page Design and Development
Course Description
Students will design, develop and program interactive media and games for a variety of audiences. Students will learn game theory, visual and interactive design, story development, animation, simulation and programming. Students will develop an understanding of game design concepts through a combination of practical implementation, playtesting and in-class game critique.
Main Topics
• Understand the basics of game design • Understand character development and animation • Understand game theory • Understand the basics of interactive media • Understand programming languages for game design
Correlation to South Carolina Computer Science Standards for High School
• HS1.AP.1.1 • HS1.AP.2.1 • HS2.AP.2.1 • HS1.AP.2.2 • HS1.AP.3.1 • HS1.AP.4.1
Additional Notes
This course consolidates the following historical courses: Game Design & Development, Foundations of Animation, and Advanced Animation.

Section 1b: Course Planning Documents

Course Title
Fundamentals of Web Page Design and Development
Prerequisites
None
Course Description
Students will gain the skills and knowledge needed to safely and effectively use internet applications and languages to create and maintain web pages using a structured development process. Students will learn the HTML, CSS, and basic scripting in a language like JavaScript needed to create websites that are well-organized, attractive, universally accessible, responsive, and easy to navigate. They will also learn the technological processes, requirements, and legal ramifications for publishing their websites.
Main Topics
• Add the following to the existing course: • Write all HTML without relying on an HTML generator. • Write all CSS without relying on a CSS generator. • Include appropriate scripting within Web pages to include the use of simple selection and iteration control structures.
Correlation to South Carolina Computer Science Standards for High School
• HS1.NI.1.1 • HS2.NI.1.1 • HS1.NI.2.1 • HS2.NI.2.1 • HS1.NI.2.2 • HS2.NI.2.2 • HS1.AP.1.1 • HS2.AP.1.1 • HS1.AP.4.1 • HS2.AP.4.1 • HS1.AP.4.4 • HS2.AP.4.4
Additional Notes
None

Section 1b: Course Planning Documents

Course Title
Client-Side Scripting
Prerequisites
Advanced Web Page Design and Development
Course Description
Students will extend their skills in enhancing Web pages by including original client-side scripting content, incorporating but not relying on the inclusion of scripting libraries. Students will explore techniques for dynamic formatting of text, graphics and other content, navigation, data representation, pattern matching, and accessing remote content asynchronously. They will manage browser compatibility, responsiveness and universal access issues in creating dynamic websites.
Main Topics
• Dynamically alter CSS and HTML content and format using a client-side scripting language • Structure content using an object notation • Validate the contents of Web form elements using pattern matching such as regular expressions • Call remote procedures to update content asynchronously • Manage accessibility and responsiveness across many platforms, including mobile, tablet and desktop browsers
Correlation to South Carolina Computer Science Standards for High School
• HS1.AP.1.1 • HS2.AP.1.1 • HS2.NI.1.1 • HS1.AP.2.1 • HS2.AP.2.1 • HS1.AP.2.2 • HS2.AP.2.2 • HS1.AP.3.1 • HS1.AP.3.1
Additional Notes
None

Section 1b: Course Planning Documents

Course Title
Server-Side Scripting
Prerequisites
Advanced Web Page Design and Development
Course Description
Students will create websites using a server-side scripting language written to communicate with separate database and/or application servers. They will study client-server system concepts, different varieties of database and application servers, and common security threats and techniques for protecting against them, including encryption and data sanitization. This course will require students to incorporate the definition of classes, functions and common data structures to create new websites, without reliance on tools such as content management systems.
Main Topics
• Incorporate structured blocks of server-side script into Web pages • Access remote server content • Understand how servers process dynamic Web pages, including session management • Know how to protect sites against common security threats • Use class libraries such as PDO, MySQLi or MS Entity Framework to access and structure data from Database Management Systems • Create class definitions to simplify the task of accessing specific sets of data
Correlation to South Carolina Computer Science Standards for High School
• HS1.AP.1.1 • HS2.AP.1.1 • HS2.NI.1.1 • HS1.DA.2.1 • HS2.DA.2.1 • HS3.DA.2.1 • HS1.DA.2.1 • HS2.DA.2.1 • HS1.AP.2.1 • HS2.AP.2.1 • HS1.AP.2.2 • HS2.AP.2.2 • HS1.AP.3.1 • HS1.AP.3.1
Additional Notes

None

Section 1b: Course Planning Documents

Course Title
Mobile App Development
Prerequisites
Fundamentals of Web Page Design and Development, Fundamentals of Computing, OR Gaming and Interactive Media
Course Description
Students will explore the foundations of how mobile applications are designed, developed, and tested. Students will explore the interface and user accessibility by using problem solving skills from previous coursework. In this course, students will work with prototypes and app development to learn programming, abstraction, and proper syntax to develop a solution.
Main Topics
• Describe the functions and marketability of apps • Develop and design an app by working through the problem solving process (identify a current need) • Mobile App Design Basics and Platform • Hardware and software interactions for app design • Analyze data through abstraction - write data pools. • Explore the syntax, file structure, and core components of applications on smart technologies. • Design mobile app layouts and interface qualities for end user • Create, test, and refine application by bringing it to life through a prototype • Troubleshoot problems and add flexibility and scale to apps • Impact of mobile applications on users daily lives
Correlation to South Carolina Computer Science Standards for High School
• Process Standards • HS2.CS.1.1 • HS3.CS.1.2 • HS2.CS.1.3 • HS3.CS.1.3 • HS4.CS.1.3 • HS2.NI.2.1 • HS3.DA.1.2 • HS2.AP.1.1 • HS3.AP.1.1 • HS2.AP.2.1 • HS2.AP.2.2 • HS3.AP.4.1

• HS2.AP.4.2 • HS3.AP.4.2 • HS2.IC.2.1 • HS2.IC.4.1
Additional Notes
None

Section 1b: Course Planning Documents

Course Title
Introduction to Robotics and Control Systems
Prerequisites
None
Course Description
Students will explore basic development, building, and programming of robots. Students will work hands-on in teams to design, build, and program robots, and document their progress. Topics discussed may include motor control, gear ratios, torque, friction, sensors, timing, program loops, logic gates, decision-making, timing sequences, propulsion systems and binary number systems.
Main Topics
• Understand hardware requirements of robot • Understand software requirements of robot • Understand how to program a robot to solve a problem
Correlation to South Carolina Computer Science Standards for High School
• HS1.CS.1.1 • HS2.CS.1.1 • HS1.AP.1.1 • HS1.AP.2.1 • HS2.AP.2.1 • HS1.AP.2.2 • HS1.AP.3.1
Additional Notes
None

Section 1b: Course Planning Documents

Course Title
Intermediate Robotics and Control Systems
Prerequisites
Introduction to Robotics and Control Systems
Course Description
Students will gain in-depth experience with programming language(s) for the robotics platform. The course will provide instruction and application of industry standard programming language(s) with a focus on robotics applications. Robot construction will not be covered in any depth as it is assumed the student will have or acquire hardware-building skills separately.
Main Topics
• Use an industry standard programming language • Solve more complex problems
Correlation to South Carolina Computer Science Standards for High School
• HS3.CS.1.1 • HS1.AP.1.1 • HS2.AP.1.1 • HS3.AP.1.1 • HS4.AP.1.1 • HS1.AP.2.1 • HS2.AP.2.1 • HS3.AP.2.1 • HS1.AP.2.2 • HS2.AP.2.2 • HS3.AP.2.2 • HS1.AP.3.1 • HS2.AP.3.1 • HS1.AP.4.2 • HS2.AP.4.2 • HS3.AP.4.2
Additional Notes
None

Section 1b: Course Planning Documents

Course Title
Advanced Robotics and Control Systems
Prerequisites
Intermediate Robotics and Control Systems
Course Description
Students will extend their knowledge and skills in robotics, exploring concepts from the fields of electrical engineering, mechanical engineering and computer science. Topics covered include sensor performance and integration, electric and pneumatic actuators, power transmission, controls and programmable embedded computer systems, system integration and robotic applications.
Main Topics
• Develop competencies with: • Sensor performance and integration • Electric and pneumatic actuators • Power transmission • Controls and programmable embedded computer systems • System integration and robotic applications • Solve more complex problems with both hardware and software modifications
Correlation to South Carolina Computer Science Standards for High School
• HS4.CS.1.1 • HS3.CS.1.2 • HS3.AP.2.2 • HS3.AP.3.1 • HS4.AP.3.1
Additional Notes
None

Section 1b: Course Planning Documents

Course Title
Discovering Computer Science (formerly CS Discoveries)
Prerequisites
None; recommended for students in Grade 9
Course Description
Students will be exposed to introductory computer science topics with an emphasis on computational thinking and problem solving. Students will be empowered to create authentic artifacts and engage with computer science as a medium for creativity, communication, problem solving, and fun. Students will create their own websites, apps, and games.
Main Topics
● Standards will be similar to Fundamentals of Computing (March 2018 version); however, the following will be removed: ○ F. Evolution of Computing (entire standard/indicators) ○ G. Computing Systems (only indicators 4-8) ○ K. Ethical, Legal & Social Issues of Computing (only indicators 4-6) ○ L. Computing Careers (entire standards/indicators)
Correlation to South Carolina Computer Science Standards for High School
● HS1.CS.1.1 ● HS1.NI.2.2 ● HS1.DA.1.1 ● HS1.DA.1.2 ● HS1.DA.2.2 ● HS1.DA.3.1 ● HS1.AP.1.1 ● HS1.AP.3.1 ● HS1.AP.4.1 ● HS1.AP.4.2 ● HS1.IC.1.1 ● HS1.IC.3.1 ● HS1.IC.3.3
Additional Notes
1. OFSA/OCTE to assign new CTE course code (must be available as two ½ credit codes or one 1 credit code) and delete any additional academic codes that are in the system. 2. The recommended curriculum for this course is Code.org's Computer Science Discoveries.

Section 1b: Course Planning Documents

Course Title
IT Fundamentals
Prerequisites
None
Course Description
Students will learn essential Information Technology (IT) skills and knowledge needed to perform common entry-level IT tasks. Students will learn to install, repair, configure, secure, and manage computer hardware, operating systems, and software in home or corporate environments. Students will learn common practices for troubleshooting a variety of computer issues and customer service techniques for assisting computer users with their respective problems.
Main Topics
• IT Concepts (comprehend notational systems, illustrate the basics of computing and explain the value of data and troubleshooting) • Infrastructure/Hardware (know how to set up and install common peripheral devices to a laptop/PC or secure a basic wireless network) • Operating Systems (install and support Windows OS including command line and client support) • Applications & Software (manage applications software, understand the various components of an operating system, and explain the purpose of methods of application architecture) • Networking (explain types of networks and connections including TCP/IP, WIFI, and SOHO) • Software Development (comprehend programming language categories, interpret logic, and understand the purpose of programming concepts) • Database Fundamentals (explain database concepts, structures, and purpose, as well as understands methods used to interface) • Security Fundamentals (understand confidentiality, integrity, and availability concerns of secure devices and best practice methods) • Operational Procedures (follow best practices for safety, environmental impacts, and communication and professionalism) • Troubleshooting (troubleshoot device and network issues) • Should align with the CompTIA ITF+ and CompTIA A+ Certification exam objectives/topics
Correlation to South Carolina Computer Science Standards for High School
• HS1.CS.1.1 • HS2.CS.1.1

- HS3.CS.1.1
- HS4.CS.1.1
- HS1.CS.1.2
- HS2.CS.1.2
- HS3.CS.1.2
- HS4.CS.1.2
- HS1.CS.1.3
- HS2.CS.1.3
- HS3.CS.1.3
- HS4.CS.1.3
- HS1.CS.2.1
- HS2.CS.2.1
- HS3.CS.2.1
- HS4.CS.2.1
- HS1.NI.1.1
- HS2.NI.1.1
- HS1.NI.1.2
- HS2.NI.1.2
- HS3.NI.1.2
- HS1.NI.2.1
- HS2.NI.2.1
- HS1.NI.2.2
- HS2.NI.2.2
- HS3.NI.2.2
- HS1.AP.4.4
- HS1.IC.1.1
- HS2.IC.1.1
- HS3.IC.1.1
- HS1.IC.1.2
- HS2.IC.1.2
- HS3.IC.1.2
- HS1.IC.2.2
- HS2.IC.2.2
- HS3.IC.2.2
- HS4.IC.2.2
- HS1.IC.3.1
- HS1.IC.4.1
- HS2.IC.4.1

Additional Notes

This course consolidates IT Fundamentals and Computer Service & Repair.

Section 1b: Course Planning Documents

Course Title
Networking Fundamentals
Prerequisites
IT Fundamentals
Course Description
Students will perform common networking tasks including systems administrators, network administrators, network engineers and related careers. Students learn the basics of managing hardware and software networking components including IP configuration, setting up wireless and wired networks, managing networks, basic network security, software updates, hardware upgrades and network protocols. Students will learn about configuring and maintaining networks in home and corporate environments.
Main Topics
• Networking Concepts (explain the purpose of a variety of networking concepts and implement them appropriately) • Networking Hardware/Device Configuration/Infrastructure (determine and explain the appropriate cabling, device, and storage technologies) • Network Management (use best practices to manage the network, determine policies, and ensure business continuity) • Network Security (summarize physical security and common attacks while securing the wired and wireless network) • Network Troubleshooting (explain the network troubleshooting methodology and appropriate tools to support connectivity and performance) • This course should align with the CompTIA Network+ and Testout Network Pro certification exam objectives/topics.
Correlation to South Carolina Computer Science Standards for High School
• HS3.CS.1.1 • HS4.CS.1.1 • HS3.CS.1.2 • HS4.CS.1.2 • HS1.CS.1.3 • HS2.CS.1.3 • HS3.CS.1.3 • HS4.CS.1.3 • HS1.CS.2.1 • HS2.CS.2.1 • HS3.CS.2.1 • HS4.CS.2.1

• HS1.NI.1.1 • HS2.NI.1.1 • HS3.NI.1.1 • HS4.NI.1.1 • HS1.NI.1.2 • HS2.NI.1.2 • HS3.NI.1.2 • HS4.NI.1.2 • HS1.NI.2.1 • HS2.NI.2.1 • HS3.NI.2.1 • HS4.NI.2.1 • HS1.NI.2.2 • HS2.NI.2.2 • HS3.NI.2.2 • HS4.NI.2.2 • HS4.IC.2.2
Additional Notes
None

Section 1b: Course Planning Documents

Course Title
Advanced Networking
Prerequisites
Networking Fundamentals
Course Description
Continuation of Networking Fundamentals; standards writing committee should determine appropriate point of division between the two courses
Main Topics
● *Continuation of Networking Fundamentals*
Correlation to South Carolina Computer Science Standards for High School
● *See Networking Fundamentals*
Additional Notes
None

Section 1b: Course Planning Documents

Course Title
Computer Operating Systems
Prerequisites
IT Fundamentals
Course Description
Students will explore characteristics and features of a variety of operating systems. Students will gain application support and desktop support skills including installation and monitoring of an operating system, managing access for users and groups, managing hardware and applications, and working with networks, printing, and security. Students will learn how to install, configure and maintain devices within a corporate server environment. They will also learn how to configure local and remote network connectivity and storage, explore how to configure data security, device security, and network security. In addition students will discover how to maintain, update, and recover devices.
Main Topics
• Windows installation and configuration • Identity • Access (including Remote Access) • Application and services • Hardware • Storage • Networking • Printing • System protection • Updates & Recovery • The old courses aligned to the Windows Certification exams (70-698 and 70-697). These exams are retiring in March 2019 and may not be replaced. The standards should align with any new exams that are created. If new exams aren't created, then the content of these courses will need to be re-evaluated. • This course should also align with the TestOut Client Pro certification exam.
Correlation to South Carolina Computer Science Standards for High School
• HS1.CS.1.1 • HS2.CS.1.1 • HS3.CS.1.1 • HS4.CS.1.1 • HS1.CS.1.2 • HS2.CS.1.2 • HS3.CS.1.2

- HS4.CS.1.2
- HS1.CS.1.3
- HS2.CS.1.3
- HS3.CS.1.3
- HS4.CS.1.3
- HS1.CS.2.1
- HS2.CS.2.1
- HS3.CS.2.1
- HS4.CS.2.1
- HS1.NI.1.1
- HS1.NI.1.2
- HS1.NI.2.2
- HS2.NI.2.2
- HS3.NI.2.2
- HS4.NI.2.2
- HS1.IC.1.1
- HS2.IC.1.1
- HS3.IC.1.1
- HS1.IC.2.2
- HS2.IC.2.2
- HS3.IC.2.2
- HS4.IC.2.2
- HS1.IC.3.1
- HS2.IC.3.1
- HS3.IC.3.1
- HS4.IC.3.1
- HS1.IC.3.3
- HS2.IC.3.3
- HS3.IC.3.3
- HS4.IC.3.3
- HS1.IC.4.1
- HS2.IC.4.1
- HS3.IC.4.1

Additional Notes

None

Section 1b: Course Planning Documents

Course Title
Advanced Computer Operating Systems
Prerequisites
Computer Operating Systems
Course Description
Continuation of Computer Operating Systems; standards writing committee should determine appropriate point of division between the two courses
Main Topics
• *Continuation of Computer Operating Systems*
Correlation to South Carolina Computer Science Standards for High School
• *See Computer Operating Systems*
Additional Notes
None

Section 1b: Course Planning Documents

Course Title
Cybersecurity Fundamentals
Prerequisites
IT Fundamentals OR Fundamentals of Computing
Course Description
Students will configure systems to secure applications, networks, and devices; perform threat analysis and respond with appropriate mitigation techniques; participate in risk mitigation activities; and operate with an awareness of applicable policies, laws, and regulations. Students learn to perform these tasks to support the first principles of cybersecurity.
Main Topics
• Threats, Attacks & Vulnerabilities (Detect various types of compromise and have an understanding of penetration testing and vulnerability scanning concepts) • Technologies & Tools (Install, configure, and deploy network components while assessing and troubleshooting issues to support organizational security) • Architecture & Design (Implement secure network architecture concepts and systems design) • Identity & Access Management (Install and configure identity and access services, as well as management controls) • Risk Management (Implement and summarize risk management best practices and the business impact) • Cryptography & PKI (Install and configure wireless security settings and implement public key infrastructure) • This course should align with the CompTIA Security+ and Testout Security Pro certification exam objectives / topics. • Also, this course should reference the first principles of cybersecurity: minimization, simplicity, abstraction, information hiding, least privilege, modularity, layering, resource encapsulation, process isolation, and domain separation.
Correlation to South Carolina Computer Science Standards for High School
• HS1.CS.1.1 • HS2.CS.1.1 • HS3.CS.1.1 • HS4.CS.1.1 • HS1.CS.2.1 • HS2.CS.2.1 • HS3.CS.2.1 • HS4.CS.2.1 • HS1.NI.2.1

• HS2.NI.2.1 • HS3.NI.2.1 • HS4.NI.2.1 • HS1.NI.2.2 • HS2.NI.2.2 • HS3.NI.2.2 • HS4.NI.2.2 • HS1.IC.2.2 • HS2.IC.2.2 • HS3.IC.2.2 • HS4.IC.2.2 • HS4.IC.2.3 • HS1.IC.3.1 • HS2.IC.3.1 • HS3.IC.3.1 • HS4.IC.3.1 • HS1.IC.4.2 • HS2.IC.4.2
Additional Notes
None

Section 1b: Course Planning Documents

Course Title
Advanced Cybersecurity
Prerequisites
Cybersecurity Fundamentals
Course Description
Continuation of Cybersecurity Fundamentals; standards writing committee should determine appropriate point of division between the two courses
Main Topics
• *Continuation of Cybersecurity Fundamentals*
Correlation to South Carolina Computer Science Standards for High School
• *See Cybersecurity Fundamentals*
Additional Notes
None

Section 1b: Course Planning Documents

Course Title
Computer Forensics
Prerequisites
IT Fundamentals
Course Description
Students will gain a fundamental knowledge of computer forensics and investigation of computer-related crimes. They will learn to collect, preserve, present, and prepare computer-based evidence for the purposes of criminal law enforcement or civil litigation. Students will present digital evidence to both business and legal audiences. Students will learn to use tools to locate and analyze digital evidence on a variety of devices, how to keep up to date with changing technologies, and laws and regulations in digital forensics.
Main Topics
• Introduction to Computer Forensics • Investigative Techniques/Procedures / Reporting • Evidence Collection • Forensic Software • Recovery (Data, Files, Passwords, Email) • Encryption / Compression • Storage Media • Documentation
Correlation to South Carolina Computer Science Standards for High School
• HS1.CS.1.1 • HS2.CS.1.1 • HS3.CS.1.1 • HS4.CS.1.1 • HS1.CS.2.1 • HS2.CS.2.1 • HS3.CS.2.1 • HS4.CS.2.1 • HS1.NI.2.1 • HS2.NI.2.1 • HS3.NI.2.1 • HS4.NI.2.1 • HS1.NI.2.2 • HS2.NI.2.2 • HS3.NI.2.2 • HS4.NI.2.2

- HS1.DA.1.1
- HS2.DA.1.1
- HS3.DA.1.1
- HS4.DA.1.1
- HS1.DA.1.2
- HS2.DA.1.2
- HS3.DA.1.2
- HS4.DA.1.2
- HS1.DA.1.3
- HS2.DA.1.3
- HS1.DA.2.1
- HS2.DA.2.1
- HS3.DA.2.1
- HS4.DA.2.1
- HS1.DA.2.2
- HS2.DA.2.2
- HS3.DA.2.2
- HS4.DA.2.2
- HS1.DA.3.1
- HS2.DA.3.1
- HS3.DA.3.1
- HS4.DA.3.1
- HS1.DA.3.2
- HS2.DA.3.2
- HS3.DA.3.2
- HS1.IC.1.1
- HS2.IC.1.1
- HS3.IC.1.1
- HS1.IC.2.1
- HS2.IC.2.1
- HS3.IC.2.1
- HS4.IC.2.1
- HS1.IC.2.2
- HS2.IC.2.2
- HS3.IC.2.2
- HS4.IC.2.2
- HS1.IC.2.3
- HS2.IC.2.3
- HS3.IC.2.3
- HS4.IC.2.3
- HS1.IC.3.1
- HS2.IC.3.1
- HS3.IC.3.1
- HS4.IC.3.1
- HS1.IC.3.3
- HS2.IC.3.3
- HS1.IC.4.2

• HS2.IC.4.2
Additional Notes
None

Section 1b: Course Planning Documents

Course Title
Server Administration
Prerequisites
Advanced Networking
Course Description
Students will be introduced to concepts and practices of server administration, including server architecture, server management and maintenance, software installation and configuration, troubleshooting, storage management, networking configuration and management, security and disaster recovery, virtualization and shell scripting.
Main Topics
• Add to the existing course an introduction to shell scripting. • This course should align with CompTIAA Server+ certification.
Correlation to South Carolina Computer Science Standards for High School
• HS2.CS.1.1 • HS1.CS.1.2 • HS2.CS.1.2 • HS1.CS.1.3 • HS2.CS.1.3 • HS3.CS.1.3 • HS1.CS.2.1 • HS2.CS.2.1 • HS3.CS.2.1 • HS4.CS.2.1 • HS1.NI.1.1 • HS2.NI.1.1 • HS1.NI.1.2 • HS2.NI.1.2 • HS3.NI.1.2 • HS1.NI.2.1 • HS2.NI.2.1 • HS3.NI.2.1 • HS4.NI.2.1
Additional Notes
None

Section 1b: Course Planning Documents

Course Title
Advanced Server Administration
Prerequisites
Server Administration
Course Description
Continuation of Server Administration; standards writing committee should determine appropriate point of division between the two courses
Main Topics
● *Continuation of Server Administration*
Correlation to South Carolina Computer Science Standards for High School
● *See Server Administration*
Additional Notes
None

Section 1b: Course Planning Documents

Course Title
Computing Capstone
Prerequisites
Minimum of 2 computing courses and teacher recommendation
Course Description
This course is designed to be a capstone experience for students who are enrolled in a computer science program of study. Students will conduct a self-directed project which consists of researching, designing, building and presenting a computing solution to a real-world problem.
Main Topics
N/A
Correlation to South Carolina Computer Science Standards for High School
N/A
Additional Notes
This course allows for flexible implementation. Districts may choose to offer this course on campus as part of the school day or as an independent study with a teacher, mentor, and portfolio of work.

Section 1: Recommended Future Phases of Work

Section 1c: Computer Science Majors/Pathways

Information Support & Services **151202**
(3-unit CTE program)

Required Courses:
Operating Systems
Advanced Operating Systems

Additional approved courses if needed to meet state-recognized program requirements:

IT Fundamentals	**The following courses count until phased out in 2020-21:**
Networking Fundamentals	Computer Repair and Service
Advanced Networking	Advanced Computer Repair and Service
Server Administration	
Advanced Server Administration	
Cyber Security	
Advanced Cyber Security	
Computer Forensics	

Networking Systems **110901**
(3-unit CTE program)

Required Courses:
Networking Fundamentals
Advanced Networking

Additional approved courses if needed to meet state-recognized program requirements:

IT Fundamentals	**The following courses count until phased out in 2020-21:**
Operating Systems	Computer Repair and Service
Advanced Operating Systems	Advanced Computer Repair and Service
Server Administration	
Advanced Server Administration	
Cyber Security	
Advanced Cyber Security	
Computer Forensics	

Computer and Information Systems Security/Information Assurance **111003**
(should be moved from STEM Cluster)
(3-unit CTE program)

Required Courses:
Cybersecurity

Advanced Cybersecurity

Additional approved courses if needed to meet state-recognized program requirements:

IT Fundamentals	**The following courses count until phased out in 2020-21:**
Discovering Computer Science	Computer Programming 1
Fundamentals of Computing	Computer Programming 2
Operating Systems	Computer Programming 1 with JAVA
Advanced Operating Systems	Computer Programming 2 with JAVA
Server Administration	Computer Programming 1 with Visual Basic
Advanced Server Administration	Computer Programming 2 with Visual Basic
Introduction to Computer Programming	Computer Programming 1 with C++
Intermediate Computer Programming	Computer Programming 2 with C++
Networking Fundamentals	Java Fundamentals and Java Programming
Advanced Networking	Computer Repair and Service
Computer Forensics	Advanced Computer Repair and Service

Programming & Software Development **110201**
(3-unit CTE program)

Required Courses:
Introduction to Computer Programming
Intermediate Computer Programming

Additional approved courses if needed to meet state-recognized program requirements:

Discovering Computer Science	**The following courses count until phased out in 2020-21:**
Fundamentals of Computing	Computer Programming 1
IT Fundamentals	Computer Programming 2
Advanced Computer Programming	Computer Programming 1 with JAVA
Gaming and Interactive Media Development	Computer Programming 2 with JAVA
Mobile App Development	Computer Programming 1 with Visual Basic
Information Systems	Computer Programming 2 with Visual Basic
Operating Systems	Computer Programming 1 with C++
Advanced Operating Systems	Computer Programming 2 with C++
Cybersecurity	Java Fundamentals and Java Programming
Advanced Cybersecurity	Foundations of Animation
Fundamentals of Web Page Design and Development	Advanced Animation
Advanced Web Page Design and Development	Game Design and Development
Introduction to Robotics and Control Systems	Database Design and Programming with SQL
Intermediate Robotics and Control Systems	Database Programming with PL/SQL
Advanced Robotics and Control Systems	GIS Technology 1
Client-Side Scripting	GIS Technology 2
Server-Side Scripting	SAS Programming 1
	SAS Programming 2

Web and Digital Communications **110801**
(3-unit CTE program)

Required Courses:
Fundamentals of Web Page Design and Development
Advanced Web Page Design and Development

Additional approved courses if needed to meet state-recognized program requirements:

IT Fundamentals	**The following courses count until phased out in 2020-21:**
Discovering Computer Science	Computer Programming 1
Fundamentals of Computing	Computer Programming 2
Client-Side Scripting	Computer Programming 1 with JAVA
Server-Side Scripting	Computer Programming 2 with JAVA
Information Systems	Computer Programming 1 with Visual Basic
Gaming and Interactive Media Development	Computer Programming 2 with Visual Basic
Mobile App Development	Computer Programming 1 with C++
Introduction to Computer Programming	Computer Programming 2 with C++
Intermediate Computer Programming	Java Fundamentals and Java Programming
Advanced Computer Programming	Foundations of Animation
Cybersecurity Fundamentals	Advanced Animation
Advanced Cybersecurity	Game Design and Development
Digital Multimedia	Database Design and Programming with SQL
Image Editing	Database Programming with PL/SQL
Digital Publication Design	
Social Media in Business	
Digital Media Marketing	
Digital Art and Design 1	

Gaming and Application Development **[NEW PROGRAM 2020-21]**
(3-unit CTE program)

Required Courses:
Gaming and Interactive Media Development
Mobile App Development

Additional approved courses if needed to meet state-recognized program requirements:

IT Fundamentals	
Discovering Computer Science	
Fundamentals of Computing	
Introduction to Computer Programming	
Intermediate Computer Programming	
Advanced Computer Programming	
Fundamentals of Web Page Design and Development	
Advanced Web Page Design and Development	
Operating Systems	

Robotics **[NEW PROGRAM 2020-21]**
(3-unit CTE program)

Required Courses:
Introduction to Robotics and Control Systems
Intermediate Robotics and Control Systems

Additional approved courses if needed to meet state-recognized program requirements:

Discovering Computer Science	
Fundamentals of Computing	
IT Fundamentals	
Advanced Robotics and Control Systems	
Introduction to Computer Programming	
Intermediate Computer Programming	
Advanced Computer Programming	
Mechanical Design 1	
Mechanical Design 2	
Core Engineering 1	
Core Engineering 2	
Core Engineering 3	
Core Engineering 4	

Section 1: Recommended Future Phases of Work

Section 1d: Project Lead the Way (PLTW) Recommendations

If the SCDE decides to modify the PLTW courses in the future, the following recommendations should be considered.

Recommendation #1:
Consolidate existing PLTW computer science courses and one engineering course as outlined below.

New or Consolidated Course	PLTW Course
Fundamentals of Computing	PLTW Computer Science for Innovators and Makers Application Creators PLTW CS Essentials (formerly Introduction to Computer Science)
Introduction to Robotics and Control Systems	PLTW Principles of Engineering
Cybersecurity Fundamentals	PLTW Cybersecurity

Recommendation #2:

Since PLTW Computer Science Applications and PLTW Computer Science Principles align with the College Board's respective AP Computer Science course offerings, the committee recommends that new courses be created to consolidate these into two state-approved courses. The committee discussed the following considerations as well.

- PLTW courses have CTE course numbers and the AP courses have academic course numbers. This discrepancy does not allow these courses to be treated equally for considerations regarding course weighting, funding or inclusion in CTE majors.
- These new courses could be taught as non-AP or AP.

New Course	Course to Consolidate
Computer Science	AP Computer Science A PLTW Computer Science Applications
Computer Science Principles	AP Computer Science Principles PLTW Computer Science Principles

Section 2: Recommended Courses to Fulfill Computer Science Graduation Requirement Lists

Section 2a: Recommended 2019-20 Courses to Fulfill Computer Science Graduation Requirement

Recommended 2019-20 Courses to Fulfill Computer Science Graduation Requirement	
Course	**Code**
Computer Science SL	471D IB
Computer Science HL-1	471B IB
Computer Science HL-2	471C IB
AP Computer Science A	4771
AP Computer Science Principles	4775
Fundamentals of Computing	5023 (must be available as two ½ credit codes or 1 credit codes)
IT Fundamentals	5025
Fundamentals of Web Page Design and Development	5031
Advanced Web Page Design and Development	5033
Computer Programming 1	5050
Computer Programming 2	5051
Computer Programming 1 with JAVA	5052
Computer Programming 2 with JAVA	5053
Computer Programming 1 with Visual Basic	5054
Computer Programming 2 with Visual Basic	5055
Computer Programming 1 with C++	5056
Computer Programming 2 with C++	5057
Java Fundamentals and Java Programming	5058
Networking Fundamentals	5310

Advanced Networking	5311
Server Administration	5312
Advanced Server Administration	5313
Computer Repair and Service	5320
Advanced Computer Repair and Service	5321
Computer Operating Systems	5322
Advanced Computer Operating Systems	5323
Database Design and Programming with SQL	5324
Database Programming with PL/SQL	5326
SAS Programming 1	5327
SAS Programming 2	5328
Foundations of Animation	5350
Advanced Animation	5351
Game Design and Development	5352
GIS Technology 1	5361
GIS Technology 2	5362
Cybersecurity Fundamentals	5370
Advanced Cybersecurity	5372
Computer Forensics	5374
PLTW Principles of Engineering	6050
PLTW Computer Science Essentials	6372
PLTW Computer Science Applications	6373
PLTW Computer Science Principles	6377
PLTW Cybersecurity	6378
Discovering Computer Science	XXXX; OFSA/OCTE to assign new CTE course code (must be available as two ½ credit codes or one 1 credit code)

Section 2: Recommended Courses to Fulfill Computer Science Graduation Requirement Lists

Section 2b: Recommended 2020-21 and Beyond Courses to Fulfill Computer Science Graduation Requirement

Recommended 2020-21 and Beyond Courses to Fulfill Computer Science Graduation Requirement	
Course	**Code**
Computer Science SL	471D IB
Computer Science HL-1	471B IB
Computer Science HL-2	471C IB
AP Computer Science A	4771
AP Computer Science Principles	4775
Fundamentals of Computing	5023 (must be available as two ½ credit codes or 1 credit codes)
IT Fundamentals	5025
Fundamentals of Web Page Design and Development	5031
Advanced Web Page Design and Development	5033
Networking Fundamentals	5310
Advanced Networking	5311
Operating Systems	5322
Advanced Operating Systems	5323
Cybersecurity Fundamentals	5370
Advanced Cybersecurity	5372
Computer Forensics	5374
Server Administration	5312
Advanced Server Administration	5313

Discovering Computer Science	XXXX; OFSA/OCTE to assign new CTE course code (must be available as two ½ credit codes or one 1 credit code)
Introduction to Computer Programming	XXXX
Intermediate Computer Programming	XXXX
Advanced Computer Programming	XXXX
Information Systems	XXXX
Gaming and Interactive Media	XXXX
Client-Side Scripting	XXXX
Server-Side Scripting	XXXX
Mobile App Development	XXXX
Introduction to Robotics and Control Systems	XXXX
Intermediate Robotics and Control Systems	XXXX
Advanced Robotics and Control Systems	XXXX

Section 3: Recommended Teacher Certification Requirements

Section 3a: Recommended Certification Timeline

Recommended Certification Timeline		
Time Period	**Details of Work**	**Recommended Person(s)**
January 2019	Provide an initial communication regarding upcoming Required Credentials changes to assist districts, schools, and teachers with selecting appropriate professional development opportunities for the Summer 2019. (This is critical to ensure that districts can make informed decisions for 2019-20.)	OES; OCTE
January 2019	1. Develop a standardized process for approving teacher credentials for courses with additional requirements (“+”). Begin accepting teacher submissions. 2. Establish procedures and guidelines for teachers who currently or previously held out-of-state computer science certification to obtain computer science certification through reciprocity. 3. Communicate PD timeline for Summer 2019 to stakeholders and ensure all PD information is posted on website (see Standards/Instructional Timeline)	OES; OCTE
Spring 2019	1. Coordinate with the Commission on Higher Education to advocate for computer science professional development and pre-service program needs. 2. Hold an informational meeting with institutions of higher education to discuss next steps and a process for approval of pre-service programs.	OES; OCTE
Spring 2019	Develop communication and consideration for funding opportunities for Computer Science PRAXIS and computer science required coursework.	OES; OCTE
Spring 2019	Develop a strategic plan for computer science professional development for at least the next 5 years.	OES; OCTE
Summer 2019	Begin hosting a variety of course-specific professional development opportunities for teachers.	OCTE; designated PD providers

Fall 2019	Recruit vendors and institutions of higher education to provide training and coursework options to prepare teachers to pass the Computer Science PRAXIS.	OCTE
Fall 2019	Publish and communicate new required credentials manual for computer science coursework full implementation 2020-21.	OCTE/Office of Educator Services

Section 3: Recommended Teacher Certification Requirements

Section 3b: Recommended Required Credentials Revisions

Prekindergarten – Grade 6

Keyboarding General Technology	01 4B 79	Elementary Business/Marketing/Computer Technology Computer Science

Grades 7-8

Keyboarding (not for high school credit)	4B 79	Business/Marketing/Computer Technology Computer Science
General Technology (not for HS credit)	4B 79 NC	Business/Marketing/Computer Technology Computer Science Middle-level/school certification in any area

Grades 9-12

Note to SCDE: The committee based decisions regarding certification areas on the following: Introductory courses can be taught by an array of certification fields. Higher level courses require demonstration of competency in the course content (e.g., Computer Science certification for CS courses or approved industry credentials for IT courses).
***Because the committee does not have an IB expert on the committee, our recommendations are preliminary for this course sequence.*

Activity Code	**Course Title**	**Cert.**	**Acceptable Certification and Mandatory Attendant Training**
4771	AP Computer Science A	10+ 79+ ED+	Mathematics Computer Science Information Technology – Programming **+AP endorsement in the course**
4774 4775	AP Computer Science Lab AP Computer Science Principles	NC+	Bachelor's degree and any high school certification **+AP endorsement in the course**
471A 471B 471C 471D	Computer Science SL Computer Science HL-1 Computer Science HL-2 IB Computer Science SL Seminar	10+ 12+ 4B+ 79+ ED+	Mathematics ~~Science**~~ ~~Business/Marketing/Computer Technology**~~ Computer Science Information Technology – Programming **+IB training in the specific subject**
5023	Fundamentals of Computing	79	Computer Science

XXXX 5031	Discovering Computer Science Fundamentals of Web Page Design and Development	EH EE ED NC+	Information Technology Information Technology – Networking Information Technology – Programming Any high school certification **+additional training or courses approved by the Office of Career and Technology Education or approved Industry Credential**
5025 5322 5323 5370 5371 5374 5310 5311 5312 5313	IT Fundamentals Operating Systems Advanced Operating Systems Cybersecurity Fundamentals Advanced Cybersecurity Computer Forensics Networking Fundamentals Advanced Networking Server Administration Advanced Server Administration	EH EE ED 79 NC+	Information Technology Information Technology – Networking Information Technology – Programming Computer Science Any high school certification **+approved Industry Credential**
#### #### #### #### #### #### #### ####	Introduction to Computer Programming Intermediate Computer Programming Advanced Computer Programming Information Systems Gaming and Interactive Media Development Client Side Scripting Server Side Scripting Mobile App Development	79 ED	Computer Science Information Technology – Programming
#### #### ####	Introduction to Robotics and Control Systems Intermediate Robotics and Control Systems Advanced Robotics and Control Systems	79 ED NC+	Computer Science Information Technology – Programming Any high school certification **+additional training or courses approved by the Office of Career and Technology Education or approved Industry Credential**
6050 6090 6096	Principles of Engineering Pre-Engineering/Engineering & Industrial Technology Education, work-based credit Computer Software Engineering	NC+	Bachelor's degree and any high school certification **+ Project Lead the Way certification** **Special approval by the Office of Career and Technology Education is required for certified teachers without a bachelor's**

6372 6373 6377	Computer Science Essentials (CSE) Computer Science Applications (CSA) Computer Science Principles (CSP)		**degree.**
####	Computing Capstone	NC+	Any high school certification **+experience teaching a related CS pathway (including advanced courses)**
5390	Information Technology, work-based credit	4B 79 EH EE ED	Business/Marketing/Computer Technology Computer Science Information Technology Information Technology – Networking Information Technology – Programming

The following historical certification areas should be added to the required credentials above where applicable:

Wherever ***Business/Marketing/Computer Technology*** is indicated as a required credential, the following should be added:	
43 44 48 47 40 46 32 45 41 42	Accounting* Accounting and Related Business* Accounting and Related Economics* Business Education* Commerce* Data/Information Processing* Distributive Education* Secretarial Science* Shorthand* Typing*

Wherever ***Mathematics*** is indicated as a required credential, the following should be added:	
11	General Mathematics*

Wherever ***Computer Science*** is indicated as a required credential, the following should be added:	
4A	Computer Programming*

Section 3: Recommended Teacher Certification Requirements

Section 3c: Considerations for Teacher Certification Requirements

Clarifications
In many cases, the recommended Required Credentials allows for NC+ Any High School Certification (where "+" refers to additional training or courses approved by the Office of Career and Technology Education or approved Industry Credential).

1. Clarification on ***additional training or courses approved by the Office of Career and Technology Education***

    a. The committee recommends that the SCDE require a 30 hour PD experience (current within the last 5 years) or one college course in computer science or a field directly related to the course.

    Professional Development experiences should align to the South Carolina Digital Literacy and Computer Science Standards (Grades 6-8), South Carolina Computer Science Standards for High School, CSTA K-12 Computer Science Standards, ISTE Computational Thinking Competencies, or the K-12 Computer Science Framework.

    b. The committee identified a variety of options for teachers to satisfy this requirement, including, but not limited to the following:
        - Code.org – CS Discoveries, CS Principles
        - College Board Approved AP CS Principles Providers, such as:
            - UTeach CS
            - Code.org
            - Beauty and Joy of Computing
            - MobileCSP
        - Exploring Computer Science
        - PLTW Computer Science
        - Oracle Academy
        - Google CS First PD

2. Clarification on ***approved Industry Credential***

    a. The committee recommends that the SCDE allow teachers to teach individual courses by obtaining a course-specific, state approved industry credential for each course.

    b. The committee concluded that if a teacher has been teaching a computer science course previously without being computer science certified, they should be able to demonstrate competency through either an approved industry credential or the exam-based CS certification add-on without much need for additional coursework or PD.

For example, teachers who currently teach Fundamentals of Web Page Design & Development could take the state-approved Microsoft Technology Associate: Introduction to Programming Using HTML and CSS (Exam 98-383). Or, teachers currently teaching Networking Fundamentals and Advanced Networking could take the CompTIA Network+ Certification.

Grandfathering Current Teachers

The committee recommends that teachers who have a history of teaching introductory computer science courses (i.e., Discovering Computer Science, Fundamentals of Computing, IT Fundamentals or Fundamentals of Web Page Design and Development) should be able to apply to receive a waiver on a case-by-case basis to continue teaching the course without additional training.

Timeline

The committee recommends for teachers to have until Summer 2022 to obtain the Required Credentials for the courses they teach.