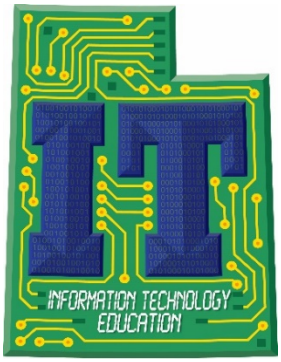
# STRANDS AND STANDARDS
# COMPUTER SCIENCE PRINCIPLES




## Course Description

Computer Science Principles is a new course that follows a project to develop a computer science course that seeks to broaden participation in computing and computer science. The course places emphasis on the principles of computer science rather than just programming. Big ideas and concepts include: (1) Computing is a creative activity. (2) Abstraction reduces information and detail to facilitate focus on relevant concepts. (3) Data and information facilitate the creation of knowledge. (4) Algorithms are used to develop and express solutions to computational problems. (5) Programming enables problem solving, human expression, and creation of knowledge. (6) The Internet pervades modern computing. (7) Computing has global impacts. Please Note: CSP course is currently a 1.0 credit course. There is a need to collect the most relevant concepts and include them into a semester of the course to match the Digital Studies requirement.

*AP CSP is currently a 1.0 course with the test weighted as a 1.0. CSP has the option to be taught as a 1.0 or a 0.5 semester course but the test weight is only given at a 0.5 no matter the duration of the course. This will facilitate the need for the CSP Concurrent enrollment credit as well as the goal to accomplish the Digital Studies graduation requirement.

Resources and standards from: http://csprinciples.org.

CTE® Learning that works for Utah

ADA Complaint: July 2018

| | |
|---|---|
| **Intended Grade Level** | 9-12 |
| Units of Credit | 0.5 or 1.0 |
| Core Code | 35.02.00.00.035 |
| Concurrent Enrollment Core Code | 35.02.00.13.035 |
| Prerequisite | Digital Literacy |
| Skill Certification Test Number | 803 |
| Test Weight | 0.5 |
| **License Type** | CTE and/or Secondary Education 6-12 |
| **Required Endorsement(s)** | |
| Endorsement 1 | Computer Science Level 1 |
| Endorsement 2 | Computer Science Level 2 |

## STRAND 1 (Semester 1 & 2)

**Creativity and computing are prominent forces in innovation; the innovations enabled by computing have had and will continue to have far-reaching impact. At the same time, computing facilitates exploration and the creation of knowledge. This course will emphasize these creative aspects of computing. Students in this course will create interesting and relevant artifacts with the tools and techniques of computer science.**

### Standard 1

Computing fosters the creation of artifacts.

- Use computing tools and techniques to create artifacts. [P2]
- Collaborate in the creation of computational artifacts. [P6]
- Analyze computational artifacts. [P4]

### Standard 2

Computing fosters creative expression.

- Use computing tools and techniques for creative expression. [P2]

### Standard 3

Programming is a creative process.

- Use programming as a creative tool. [P2]

## STRAND 2 (Semester 2)

**Abstraction reduce information and detail to facilitate focus on relevant concepts. Everyone uses abstraction daily to effectively manage complexity. In computer science, abstraction is a central problem-solving technique. It is a process, a strategy, and the result of reducing detail to focus on concepts relevant to understanding and solving problems. This course will include examples of abstractions used in modeling the world, managing complexity, and communicating with people as well as with machines. Students in this course will learn to work with multiple levels of abstraction while engaging with computational problems and systems.**

### Standard 1

A combination of abstractions built upon binary sequences can be used to represent all digital data.

- Describe the combination of abstractions used to represent data. [P3]
- Explain how binary sequences are used to represent digital data. [P5]

### Standard 2

Multiple levels of abstraction are used in computation.

- Develop an abstraction. [P2]
- Use multiple levels of abstraction in computation. [P3]

### Standard 3

Models and simulations use abstraction to raise and answer questions.

- Use models and simulations to raise and answer questions [P3]

## STRAND 3 (Semester 2)

**Data and information facilitate the creation of knowledge.**
**Computing enables and empowers new methods of information processing that have led to monumental change across disciplines, from art to business to science. Managing and interpreting an overwhelming amount of raw data is part of the foundation of our information society and economy. People use computers and computation to translate, process, and visualize raw data, and create information. Computation and computer science facilitate and enable a new understanding of data and information that contributes knowledge to the world. Students in this course will work with data using a variety of tools and techniques to better understand the many ways in which data is transformed into information and knowledge.**

### Standard 1

People use computer programs to process information to gain insight and knowledge.

- Use computers to process information to gain insight and knowledge. [P1]
- Collaborate when processing information to gain insight and knowledge. [P6]
- Communicate insight and knowledge gained from using computer programs to process information. [P5]

### Standard 2

Computing facilitates exploration and the discovery of connections in information.

- Use computing to facilitate exploration and the discovery of connections in information. [P1]
- Use large data sets to explore and discover information and knowledge. [P3]

### Standard 3

Computational manipulation of information requires consideration of representation, storage, security, and transmission.

- Analyze the considerations involved in the computational manipulation of information. [P4]

## STRAND 4 (Semester 1 & 2)

**Algorithms are fundamental to even the most basic everyday tasks. Algorithms realized in software have affected the world in profound and lasting ways. The development, use, and analysis of algorithms is one of the most fundamental aspects of computing. Students in this course will work with algorithms in many ways: they will develop and express original algorithms, they will implement algorithms in some language, and they will analyze algorithms both analytically and empirically.**

### Standard 1

An algorithm is a precise sequence of instructions for a process that can be executed by a computer.

- Develop an algorithm designed to be implemented to run on a computer. [P2]

### Standard 2

Algorithms are expressed using languages.

- Express an algorithm in a language. [P5]

### Standard 3

Algorithms can solve many but not all problems.

- Appropriately connect problems and potential algorithmic solutions. [P1]

### Standard 4

Algorithms are evaluated analytically and empirically.

- Evaluate algorithms analytically and empirically. [P4]

## STRAND 5 (Semester 1 & 2)

**Programming enables problem solving, human expression, and creation of knowledge. Programming and the creation of software have changed our lives. Programming results in the creation of software, and it facilitates the creation of more general computational artifacts including music, images, visualizations, and more. In this course, programming will enable exploration and the object of study. This course will introduce students to the concepts and techniques used in writing programs and to the ways in which programs are developed and used by people; the focus of the course is not on programming per se, but on all aspects of computation. Students in this course will create programs, translating human intention into computational artifacts.**

### Standard 1

Programs are written to execute algorithms.

- Explain how programs implement algorithms. [P3]

### Standard 2

Programming is facilitated by appropriate abstractions.

- Use abstraction to manage complexity in programs. [P3]

### Standard 3

Programs are developed and used by people.

- Evaluate a program for correctness. [P4]
- Develop a correct program. [P2]
- Collaborate to solve a problem using programming. [P6]

### Standard 4

Programming uses mathematical and logical concepts.

- Employ appropriate mathematical and logical concepts in programming. [P1]

## STRAND 6 (Semester 1)

**Internet pervades modern computing. The Internet and the systems built on it have had a profound impact on society. Computer networks support communication and collaboration. The principles of systems and networks that helped enable the Internet are also critical in the implementation of computational solutions. Students in this course will gain insight into how the Internet operates, study characteristics of the Internet and systems built upon it and analyze important concerns such as cybersecurity.**

### Standard 1

The Internet is a network of autonomous systems.

- Explain the abstractions in the Internet and how the Internet functions. [P3]

### Standard 2

Characteristics of the Internet and the systems built on it influence their use.

- Explain characteristics of the Internet and the systems built on it. [P5]
- Analyze how characteristics of the Internet and the systems built on it influence their use. [P4]

### Standard 3

Cybersecurity is an important concern for the Internet and the systems built on it.

- Connect the concern of cybersecurity with the Internet and the systems built on it. [P1]

## STRAND 7 (Semester 1 & 2)

**Computation has changed the way people think, work, live, and play. Our methods for communicating, collaborating, problem solving, and doing business have changed and are changing due to innovations enabled by computing. Many innovations in other fields are fostered by advances in computing. Computational approaches lead to new understandings, new discoveries, and new disciplines. Students in this course will become familiar with many ways in which computing enables innovation, and they will analyze the potential benefits and harmful effects of computing in several contexts.**

### Standard 1

Computing affects communication, interaction, and cognition.

- Analyze how computing affects communication, interaction, and cognition. [P4]
- Collaborate as part of a process that scales. [P6]

### Standard 2

Computing enables innovation in nearly every field.

- Connect computing with innovations in other fields. [P1]

### Standard 3

Computing has both beneficial and harmful effects.

- Analyze the beneficial and harmful effects of computing. [P4]

### Standard 4

Computing is situated within economic, social, and cultural contexts.

- Connect computing within economic, social, and cultural contexts. [P1]

## COMPUTATIONAL THINKING PRACTICES

### Standard 1

Connecting computing. Developments in computing have far-reaching effects on society and have led to significant innovations. These developments have implications for individuals, society, commercial markets, and innovation. Students in this course study these effects and connections, and they learn to draw connections between different computing concepts. Students are expected to:

- Identify impacts of computing;
- Describe connections between people and computing; and
- Explain connections between computing concepts.

### Standard 2

Developing computational artifacts. Computing is a creative discipline in which the creation takes many forms, ranging from remixing digital music and generating animations to developing websites, writing programs, and more. Students in this course engage in the creative aspects of computing by designing and developing interesting computational artifacts, as well as by applying computing techniques to creatively solve problems. Students are expected to:

- Create an artifact with a practical, personal, or societal intent;
- Select appropriate techniques to develop a computational artifact; and
- Use appropriate algorithmic and information-management principles.

### Standard 3

Abstracting-Computational thinking requires understanding and applying abstraction at multiple levels ranging from privacy in social networking applications, to logic gates and bits, to the human genome project, and more. Students in this course use abstraction to develop models and simulations of natural and artificial phenomena, use them to make predictions about the world, and analyze their efficacy and validity. Students are expected to:

- Explain how data, information, or knowledge are represented for computational use;
- Explain how abstractions are used in computation or modeling;
- Identify abstractions; and
- Describe modeling in a computational context.

### Standard 4

Analyzing problems and artifacts. The results and artifacts of computation, and the computational techniques and strategies that generate them, can be understood both intrinsically for what they are as well as for what they produce. They can also be analyzed and evaluated by applying aesthetic, mathematical, pragmatic, and other criteria. Students in this course design and produce solutions, models, and artifacts, and they evaluate and analyze their own computational work as well as the computational work that others have produced. Students are expected to:

- Evaluate a proposed solution to a problem;
- Locate and correct errors;
- Explain how an artifact function; and Justify appropriateness and correctness

### Standard 5

Communicating-Students in this course describe computation and the impact of technology and computation, explain and justify the design and appropriateness of their computational choices, and analyze and describe both computational artifacts and the results or behaviors of such artifacts. Communication includes written and oral descriptions supported by graphs, visualizations, and computational analysis. Students are expected to:

- Explain the meaning of a result in context;
- Describe computation with accurate and precise language, notation, or visualizations; and
- Summarize the purpose of a computational artifact.

### Standard 6

Collaborating-Innovation can occur when people work together or independently. People working collaboratively can often achieve more than individuals working alone. Students in this course collaborate in several activities, including investigation of questions using data sets and in the production of computational artifacts. Students are expected to:

- Collaborate with another student in solving a computational problem;
- Collaborate with another student in producing an artifact; and
- Collaborate at a large scale.

## Skill Certificate Test Points by Strand

| Test Name | Test # | Number of Test Points by Standard | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | Total Points | Total Questions |
| Computer Science Principles | 803 | 1 | 5 | 3 | 5 | 10 | 4 | 2 | 30 | 26 |