

# School District of Springfield Township

## Springfield Township High School Course Overview

**Course Name: Computer Science Basics**

**Grade(s) Level: 9-12**

### Course Description

Computer Science Basics provides students with general knowledge about computer hardware, software, languages, networks and their impact in the modern world. Students acquire a fundamental understanding of the operation of computers and computer networks and create programs implementing simple algorithms. By developing web pages that include images, sound, and text, students acquire a working understanding of the Internet, common formats for data transmission, and insight into the design of a human computer interface. **Meets graduation requirement**

### Course Prerequisites

None

### Unit Titles

Unit 1: Humans and Computers

Unit 2: Problem Solving

Unit 3: Web Design

Unit 4: Introduction to Programming

### Essential Questions

1. How are computers and computer networks organized?
2. What problem-solving techniques are employed by computer scientists?
3. What does it mean to be human in a world of technology?
4. How do we share intelligence with machines, and should we?

### Big Ideas/Enduring Understandings

Unit 1: Humans and Computers

- All computers are comprised of component systems that work together.
- Any connection between multiple computers is a network.

Unit 2: Problem Solving

- Many problems can be efficiently solved with an algorithmic problem solving process.
- Advances in technology and computer science have raised new and difficult legal and ethical issues.
- Complex concepts can be abstracted and converted into hierarchies as useful representations of information.
- Number systems, Boolean expressions and functions are common to both mathematics and computer science.

### Unit 3: Web Design

- The Internet is a global network that provides many useful services and requires careful risk assessment.
- Creating a web site requires planning, thinking about your user, and creating well-formed markup code.
- Each type of multimedia has its own issues and uses.

### Unit 4: Introduction to Programming

- “Intelligent” machine behavior is not “magic” but the result of algorithms applied to useful representations of information.
- Computer Science has broad, interdisciplinary applications in the modern world.
- Writing a program means giving the computer specific instructions.

### Key Competencies/Skills/Procedures

#### Unit 1: Humans and Computers

- Describe functions of major components of computing systems and networks
- Apply basic computer operations of input, output, processing, and networking
- Productive use of electronic communications
- Choose the correct software to solve a particular problem
- Communicate effectively using computer based systems
- Compose writing with effective organization, style and content
- Revise and edit writing to improve conventions and style
- Present written work for publication to authentic audience
- Read articles and create précis free of personal opinion; include author bias
- Summarize assigned readings with appropriate use of paraphrasing
- Create annotated bibliographies that support the original article

#### Unit 2: Problem Solving

- Algorithmic problem solving
- Organize technical processes in a variety of ways – create multiple taxonomies
- Model multiple layers of abstraction in real life and computing
- Create abstract algorithms to solve classes of problems in software development
- Compare elements of mathematics and computer science (binary numbers, logic, sets, and functions)
- Use logic to understand technological processes such as programming
- Simplify complex processes via creation of functions as patterns
- Productive use of electronic communications
- Choose the correct software to solve a particular problem
- Communicate effectively using computer based systems
- Compose writing with effective organization, style and content
- Revise and edit writing to improve conventions and style
- Read articles and create précis free of personal opinion; include author bias
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### Unit 3: Web Design

- Evaluate the potential consequences of technology on humanity
- Analyze how human and technological innovation improve quality of life
- Distinguish the differences between high-level languages, machine languages, instruction sets, and logic circuits
- Analyze the relationship between society and technology
- Apply technological design process to solve software and web design problems
- Encode, compress, transmit, receive, store, retrieve and decode files in web design
- Productive use of electronic communications
- Choose the correct software to solve a particular problem
- Communicate effectively using computer based systems
- Compose writing with effective organization, style and content
- Revise and edit writing to improve conventions and style
- Present written work for publication to authentic audience
- Read articles and create précis free of personal opinion; include author bias
- Summarize assigned readings with appropriate use of paraphrasing
- Create annotated bibliographies that support the original article

### Unit 4: Introduction to Programming

- Define intelligence as it relates to humans and machines
- Describe changes in programs
- Apply technological design process to solve software and web design problems
- Productive use of electronic communications
- Choose the correct software to solve a particular problem
- Communicate effectively using computer based systems
- Compose writing with effective organization, style and content
- Revise and edit writing to improve conventions and style
- Read articles and create précis free of personal opinion; include author bias
- Summarize assigned readings with appropriate use of paraphrasing
- Create annotated bibliographies that support the original article

### **Core Vocabulary**

#### Unit 1: Humans and Computers

*Motherboard, CPU, bit, byte, kilo, mega, giga, tera, peripheral, cache, RAM, ROM, fiber optics, coaxial, twisted pair, port, input, output, client, server*

#### Unit 2: Problem Solving

*binary, hexadecimal, algorithm, compression, protocol, encode, decode, encryption, decryption, Boolean algebra (AND, OR, NOT)*

#### Unit 3: Web Design

*HTML, XHTML, CSS, HTTP, accessibility, TCP/IP, packet, GIF, JPEG, PNG, layout, specifications, markup*

#### Unit 4: Introduction to Programming

*program, sequential processing, conditional execution, iteration, function, storyboard, implement, pseudocode, syntax, state, script, method, control statement, argument, expression, recursion, abstraction, inheritance, parameter*

### **Core Resources**

Teacher created materials available on our Moodle

*Computer Concepts Seventh Edition, Enhanced* by June Jamrich Parsons, 2010

*Understanding Computers Today and Tomorrow, 12th edition* by Deborah Morley and Charles S. Parker, 2010

*Learning to Program With Alice* by Wanda Dann, Stephen Cooper and Randy Pausch, 2006

### **Pennsylvania State Standards**

#### **PA State Science and Technology Standards:**

- 3.1.10.A. Discriminate among the concepts of systems, subsystems, feedback and control in solving technological problems.
- 3.1.10.B. Describe concepts of models as a way to predict and understand science and technology.
- 3.1.10.C. Apply patterns as repeated processes or recurring elements in science and technology.
- 3.1.10.D. Apply scale as a way of relating concepts and ideas to one another by some measure.
- 3.1.10.E. Describe patterns of change in nature, physical and man made systems.
- 3.2.10.A. Apply knowledge and understanding about the nature of scientific and technological knowledge.
- 3.2.10.B. Apply process knowledge and organize scientific and technological phenomena in varied ways.
- 3.2.10.C. Apply the elements of scientific inquiry to solve problems.
- 3.2.10.D. Identify and apply the technological design process to solve problems.
- 3.6.10.B. Apply knowledge of information technologies of encoding, transmitting, receiving, storing, retrieving and decoding.
- 3.6.10.C. Apply physical technologies of structural design, analysis and engineering, personnel relations, financial affairs, structural production, marketing, research and design to real world problems.
- 3.7.10.A. Identify and safely use a variety of tools, basic machines, materials and techniques to solve problems and answer questions.
- 3.7.10.B. Apply appropriate instruments and apparatus to examine a variety of objects and processes.
- 3.7.10.C. Apply basic computer operations and concepts.
- 3.7.10.D. Utilize computer software to solve specific problems.
- 3.7.10.E. Apply basic computer communications systems.
- 3.8.10.A. Analyze the relationship between societal demands and scientific and technological enterprises.
- 3.8.10.B. Analyze how human ingenuity and technological resources satisfy specific human needs and improve the quality of life.
- 3.8.10.C. Evaluate possibilities consequences and impacts of scientific and technological solutions.

#### **PA State Language Arts Standards:**

- 1.5.11.A. Write with a sharp, distinct focus.
- 1.5.11.B. Write using well-developed content appropriate for the topic.
- 1.5.11.C. Write with controlled and/or subtle organization.
- 1.5.11.D. Write with a command of the stylistic aspects of composition.
- 1.5.11.E. Revise writing to improve style, word choice, sentence variety and subtlety of meaning after rethinking how questions of purpose, audience and genre have been addressed.

1.5.11.F. Edit writing using the conventions of language.

1.5.11.G. Present and/or defend written work for publication when appropriate.

**CSTA Model Curriculum for K-12 Computer Science (Level II):**

1. Principles of computer organization and the major components
2. The basic steps in algorithmic problem-solving
3. The basic components of computer networks
4. Organization of Internet elements, Web page design, and hypermedia
5. The notion of hierarchy and abstraction in computing, including high-level languages, translation, machine languages, instruction sets, and logic circuits
6. The connection between elements of mathematics and computer science, including binary numbers, logic, sets, and functions
7. The notion of computers as models of intelligent behavior and what distinguishes humans from machines
8. Examples that identify the broad interdisciplinary utility of computers and algorithmic problem-solving in the modern world
9. Ethical issues that relate to computers and networks, and the positive and negative impact of technology on human culture
10. Identification of different careers in computing and their connection with the subjects studied in this course

Prepared September 2010—TP

Approved—chr