PROGRAM CONCENTRATION: Business & Computer Science
CAREER PATHWAY(S): Computing
Computer Systems and Support
Interactive Media
COURSE TITLE: Computing in the Modern World

The goal of this course is to provide all students with an introduction to the principles of computer science and its place in the modern world. This course should also help students to use computers effectively in their lives, thus providing a foundation for successfully integrating their own interests and careers with the resources of a technological society.

In this course, high school students can acquire a fundamental understanding of the operation of computers and computer networks and create useful programs implementing simple algorithms. By developing Web pages that include images, sound, and text, they can acquire a working understanding of the Internet, common formats for data transmission, and some insights into the design of the human-computer interface. Exposure to career possibilities and discussion of ethical issues relating to computers should also be important threads in this course.

CAREERS, ETHICS, AND HISTORY OF COMPUTING

Students will explore careers in the field of computing, identify key developments in the history of computing, and identify professional and ethical issues involved with computing in our society.

BCS-CMW-1. Students will explore the different careers available in the field of computing.

a. Identify the certifications available.
b. Compare and contrast careers in computing along with their education, training requirements, and salary ranges.
c. Identify the college majors that require at least one course in computing.
d. Investigate how computing is used in other disciplines.
e. Demonstrate understanding of education and career development as a lifelong learning process.
f. Identify gender and diversity related issues in computing.
g. List and describe professional organizations in the field of computing.

Academic Standards:
ELA10W2 The student demonstrates competence in a variety of genres.

ELA10W3 The student uses research and technology to support writing.

ELA10RL2 The student identifies, analyzes, and applies knowledge of theme in literary works and provides evidence from the works to support understanding.

ELA10RL4 The student employs a variety of writing genres to demonstrate a comprehensive grasp of significant ideas in sophisticated literary works. The student composes essays, narratives, poems, or technical documents.

ELA10RL5 The student understands and acquires new vocabulary and uses it correctly in reading and writing.

ELA10RC3 The student acquires new vocabulary in each content area and uses it correctly.

ELA10RC4 The student establishes a context for information acquired by reading across subject areas.

ELA10LSV1The student participates in student-to-teacher, student-to-student, and group verbal interactions.

BCS-CMW-2. Students will identify key developments and individuals relating to the history of computing and explore emerging technologies.

a. Describe the development of hardware, programming languages, and applications.
b. Identify persons with major contributions to the field of computing.
c. Outline the history and development of the Internet and explain its effects on computing and society.
d. Identify and describe emerging technologies.
e. Demonstrate an understanding of Moore's Law and its applicability to emerging technologies.

Academic Standards:
MM2A2 Students will explore exponential functions.

ELA10RL2 The student identifies, analyzes, and applies knowledge of theme in literary works and provides evidence from the works to support understanding.

ELA10RL4 The student employs a variety of writing genres to demonstrate a comprehensive grasp of significant ideas in sophisticated literary works. The student composes essays, narratives, poems, or technical documents.

ELA10RL5 The student understands and acquires new vocabulary and uses it correctly in reading and writing.

ELA10RC3 The student acquires new vocabulary in each content area and uses it correctly.

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ELA10W2 The student demonstrates competence in a variety of genres.

ELA10W3 The student uses research and technology to support writing.

ELA10LSV1The student participates in student-to-teacher, student-to-student, and group verbal interactions.

BCS-CMW-3. Students will examine the professional and ethical issues involved in the use of computer technology

a. Identify and describe the relevant professional codes.
b. Explain the pros and cons of hacking and cracking.
c. Explain the consequences of software piracy on software developers and the role of relevant enforcement organizations.
d. Identify the benefits and drawbacks of public domain software.
e. Determine the reliability of information posted on the Internet.
f. Explain ethics issues involving security, privacy, intellectual property, and licensing.
g. Identify and explain the effects of technology crimes such as viruses, hacking, and identity theft.

Academic Standards:
ELA10W2 The student demonstrates competence in a variety of genres.

ELA10W3 The student uses research and technology to support writing.

ELA10LSV1The student participates in student-to-teacher, student-to-student, and group verbal interactions.

Sample Tasks:

- Research a career that involves computing at http://www.thefunworks.org/ and present it to the class. Include information on salaries, sample tasks, and what preparation is needed.
- Interview a computing professional.
- Research one of the people at http://www.computerhistory.org/events/hall_of_fellows/ or http://www.hitmill.com/computers/history/index.html and give a presentation about his or her contribution to computing.
- Research one of the key developments that led to computers at http://www.maxmon.com/history.htm and give a presentation to the class.

- Make a timeline of significant events in the history of computing.

HARDWARE AND SOFTWARE COMPONENTS

Students will be able to describe the major hardware and software components of a computer and their interaction. Students will be able to compare and contrast computer features. Students will demonstrate an understanding of how numbers, characters, images, sounds/songs, and videos are represented in a computer.

BCS-CMW-4. Students will describe the major hardware and software components of a computer and their interactions.

a. Identify and define the key functional components (input devices, output devices, processor, operating system, software applications, memory, storage, etc).
b. Understand the terms and units that are used to describe major hardware components (RAM, ROM, GHz, MHz, GB, MB, MHz, CD, DVD, RW, etc).
c. Describe the interaction between functional components in the execution of a software application.
d. List the steps in setting up a new computer.

Academic Standards:
ELA10RL5 The student understands and acquires new vocabulary and uses it correctly in reading and writing.

ELA10RC3 The student acquires new vocabulary in each content area and uses it correctly.

ELA10W1 The student produces writing that establishes an appropriate organizational structure, sets a context and engages the reader, maintains a coherent focus throughout, and signals closure.

BCS-CMW-5. Students will compare and contrast computer features.

a. Choose computers based on commercial descriptions for use in different contexts.
b. Make recommendations to improve a computer system.

Academic Standard:
ELA10W2 The student demonstrates competence in a variety of genres.

BCS-CMW-6. Students will demonstrate an understanding of how numbers and characters are represented in a computer.

a. Define the terms bit and byte.

b. Encode/decode a text message using ASCII or Unicode.
c. Determine the number of patterns possible given the number of bits used.
d. Convert numbers between decimal and binary.

Academic Standards:
MM2P4 Students will make connections among mathematical ideas and to other disciplines.

ELA10RL5 The student understands and acquires new vocabulary and uses it correctly in reading and writing.

ELA10RC3 The student acquires new vocabulary in each content area and uses it correctly.

BCS-CMW-7. Students will demonstrate an understanding of how pictures, sounds, and video are represented in a computer.

a. Describe how a picture is digitized and represented in a computer.
b. Describe how a sound/song is digitized and represented in a computer.
c. Describe how video is represented in a computer.
d. Compare and contrast image formats, sound/song formats, and video formats.

Academic Standard:
ELA10W2 The student demonstrates competence in a variety of genres.

Sample Tasks:

- Take apart a computer and identify the major components. (CSTA Level II Activity for Topic 1)
- Assemble a computer including installing: the operating system, software applications, attaching peripherals, and attaching the computer to a network. (ACM Sample Activities for Level II)
- Role play with students performing the tasks of the major hardware and software components of a computer. (CSTA Level II Activity for Topic 1)
- Create a matrix rating features for three different computers for personal use. (CSTA Level II Activity for Topic 1)
- Introduce binary numbers by initiating finger counting on one hand—no fingers up is zero, thumb up is a one, index finger up is two, middle finger up is a four, ring finger is eight, and pinkie finger represents sixteen. Students demonstrate counting to 31 on one hand.
- Complete the lesson on digital information at http://www97.intel.com/discover/JourneyInside/TJI_DigitalInfo/default.aspx Write a message in ASCII using numbers to represent the letters. Exchange and decode messages with another student.

NETWORKING BASICS

Students will demonstrate knowledge of basic computer components and networks. Student will demonstrate knowledge of the issues in connecting a computer to a network, data transmission, and networking trends.

BCS-CMW-8. Students will demonstrate knowledge of basic components of computer networks.

a. Define key terms: servers, file protection, routing protocols, spoolers, transmission types, LANS, WANS, queues, shared resources, fault/tolerance, and IP addresses.
b. List the types of network topology: ring, star, and peer to peer.
c. Compare and contrast types of networks, including LANs versus WANs and wireless versus wired.
d. Compare and contrast network protocols: http, https, and ftp.
e. Identify some of the security issues when using a network.

Academic Standards:
ELA10RL5 The student understands and acquires new vocabulary and uses it correctly in reading and writing.

ELA10RC3 The student acquires new vocabulary in each content area and uses it correctly.

BCS-CMW-9. Students will demonstrate knowledge of the issues involved in connecting a computer to a network.

a. State hardware requirements.
b. List the steps involved in connecting a computer to a network.

Academic Standard:
ELA10LSV1The student participates in student-to-teacher, student-to-student, and group verbal interactions.

BCS-CMW-10. Students will demonstrate an understanding of key issues in data transmission.

a. Demonstrate knowledge of how data is passed in packets.
b. Create a data collision.
c. Explore ways to deal with network failure.
d. Explain hierarchical addressing schemes.

Academic Standards:
ELA10RL5 The student understands and acquires new vocabulary and uses it correctly in reading and writing.

ELA10RC3 The student acquires new vocabulary in each content area and uses it correctly.

BCS-CMW-11. Students will demonstrate knowledge of networking trends and issues.

a. List reasons for installing a network.
b. List important events in the evolution of networks.
c. Analyze current trends and developments.

Academic Standards:
ELA10W2 The student demonstrates competence in a variety of genres.

ELA10W3 The student uses research and technology to support writing.

WEB DESIGN/INTERNET ESSENTIALS STANDARDS

Students will execute Internet searches, explain the importance of Internet security, create basic Web sites, and evaluate Web sites.

BCS-CMW-12. Students will demonstrate the ability to search for information and evaluate search results.

a. Demonstrate basic searching techniques using Internet search engines.
b. Use logic and set operators to refine a search.
c. Evaluate search results with respect to relevance, reliability, and credibility.

Academic Standards:
ELA10W2 The student demonstrates competence in a variety of genres.

ELA10W3 The student uses research and technology to support writing.

BCS-CMW-13. Students will examine Internet security issues and recognize the importance of working in a secure environment.

a. Explain the potential dangers of working in an insecure environment.
b. Identify, compare, and contrast anti-virus software.
c. Explain the purpose of a firewall.
d. Describe the purpose of spyware/adware.
e. Explain the concept of encryption and how it is used on a daily basis.

Academic Standards:

ELA10RL5 The student understands and acquires new vocabulary and uses it correctly in reading and writing.

ELA10RC3 The student acquires new vocabulary in each content area and uses it correctly.
ELA10W2 The student demonstrates competence in a variety of genres.

ELA10W3 The student uses research and technology to support writing.

BCS-CMW-14. Students will evaluate, compare, and contrast Web sites.

a. List the important issues in evaluating Web sites.
b. Identify and critique the layout, navigation, and accessibility of a Web site based on its purpose.

Academic Standards:
ELA10W2 The student demonstrates competence in a variety of genres.

ELA10W3 The student uses research and technology to support writing.

BCS-CMW-15. Students will design and create a basic Web site.

a. Demonstrate knowledge of basic HTML and scripting techniques.
b. Use hypertext links to load new pages or activate processes.
c. Use tools to express the design of a Web site.
d. Demonstrate the ability to use various Web development software programs.
e. Compare and contrast creating a Web page manually versus using a software development program.

Academic Standards:
ELA10C1 The student demonstrates understanding and control of the rules of the English language, realizing that usage involves the appropriate application of conventions and grammar in both written and spoken formats.

ELA10C2 The student demonstrates understanding of manuscript form, realizing that different forms of writing require different formats.

ELA10LSV2 The student analyzes visual and oral texts of different media presentations of the same issue

Sample Tasks:

- Read the lessons and complete one of the projects at http://webmonkey.wired.com/webmonkey/kids/projects/index.html

- Read the information at http://computer.howstuffworks.com/search-engine3.htm and then try to find two words that yield a result of just one page (Googlewhack).
- Read about blogs at http://computer.howstuffworks.com/blog.htm and create a blog the class. At the end of each day add an entry on what learned that day.
- Go on a scavenger hunt that uses Internet searching techniques to find the information.

PROBLEM SOLVING

Students will focus on developing various problem-solving strategies. Students will apply problem-solving strategies to solve specific problems.

BCS-CMW-16. Students will discuss examples that identify the broad interdisciplinary utility of computers and algorithmic problem solving in the modern world.

a. List the different ways computers are used.
b. Define algorithm.
c. Identify examples of algorithmic problem solving in everyday life.

Academic Standards:
ELA10RL5 The student understands and acquires new vocabulary and uses it correctly in reading and writing.

ELA10RC3 The student acquires new vocabulary in each content area and uses it correctly.

ELA10LSV1The student participates in student-to-teacher, student-to-student, and group verbal interactions.

BCS-CMW-17. Students will apply strategies to solve various problems.

a. Solve a variety of logic problems and identify the strategies used.
b. List strategies for solving problems.

Academic Standard:
ELA10W1 The student produces writing that establishes an appropriate organizational structure, sets a context and engages the reader, maintains a coherent focus throughout, and signals closure.

BCS-CMW-18. Students will apply algorithmic thinking to solve problems.

a. Evaluate algorithmic definitions for various problems and identify errors and or weaknesses.
b. Correct algorithmic definitions for various problems.

c. Complete, evaluate, and adjust an algorithm for a problem.

Academic Standards:
SCSh3 Students will identify and investigate problems scientifically.

ELA10W1 The student produces writing that establishes an appropriate organizational structure, sets a context and engages the reader, maintains a coherent focus throughout, and signals closure.

BCS-CMW-19. Students will demonstrate an understanding of the basic steps in algorithmic problem solving.

a. Formulate a formal problem statement.
b. Explore the problem using strategies.
c. Communicate the design of an algorithm.
d. Code, test, and verify a solution.

Academic Standards:
ELA10W1 The student produces writing that establishes an appropriate organizational structure, sets a context and engages the reader, maintains a coherent focus throughout, and signals closure.

ELA10W2 The student demonstrates competence in a variety of genres.

ELA10LSV1The student participates in student-to-teacher, student-to-student, and group verbal interactions.

Sample Tasks:
- Program a telephone answering machine or a voice mail system.
- Solve a Sudoku puzzle and explain the solution.

PROGRAMMING

Students will be introduced to basic programming concepts.

BCS-CMW-20. Students will demonstrate an understanding of basic programming concepts.

a. Define basic programming concepts: variable, data type, procedure, parameter, conditional, iteration, flowchart, and pseudocode.
b. Use variables of different data types in programs.
c. Write programs with sequences, conditionals, and iteration.
d. Use procedures in programs including ones that take parameters.
e. Use tools to express the design of a program: flowcharts and pseudocode.
f. Edit, compile, run, and test a program.
g. Format a program to give a pleasing, consistent appearance.

h. Discuss syntax, run-time, and logic errors.
i. Debug a simple program.

Academic Standards:
ELA10RL5 The student understands and acquires new vocabulary and uses it correctly in reading and writing.

ELA10RC3 The student acquires new vocabulary in each content area and uses it correctly.
ELA10W1 The student produces writing that establishes an appropriate organizational structure, sets a context and engages the reader, maintains a coherent focus throughout, and signals closure.

ELA10W2 The student demonstrates competence in a variety of genres.

ELA10LSV1The student participates in student-to-teacher, student-to-student, and group verbal interactions.

LIMITS OF COMPUTING

Students will understand that there are limits to computing.

BCS-CMW-21. Students will demonstrate an understanding of the limitations of algorithms.

a. Discuss problems for which an algorithm can't be written.
b. Compare and contrast faster and slower ways to solve problems.

Academic Standard:
ELA10LSV1The student participates in student-to-teacher, student-to-student, and group verbal interactions.

BCS-CMW-22. Students will identify limits on computing imposed by the laws of physics.

a. Define miniaturization.
b. Explore alternatives to transistors.

Academic Standards:
ELA10RL5 The student understands and acquires new vocabulary and uses it correctly in reading and writing.

ELA10RC3 The student acquires new vocabulary in each content area and uses it correctly.

ELA10W2 The student demonstrates competence in a variety of genres.

ELA10W3 The student uses research and technology to support writing.

DATA STRUCTURES

Students will show the ability to use an ordered data structure.

BCS-CMW-23. Students will show the ability to use an ordered data structure.
Write a program that iterates through an ordered data structure such as a list or array.

Academic Standards:

ELA10W1 The student produces writing that establishes an appropriate organizational structure, sets a context and engages the reader, maintains a coherent focus throughout, and signals closure.

ELA10W2 The student demonstrates competence in a variety of genres.

Sample Tasks:

- Walk through the samples in an array of sound samples and change the volume.
- Walk through the frames of a movie and lighten each picture.
- Walk through a list of 3D objects and tell each one to do something.

CTAE Foundation Skills

The Foundation Skills for Career, Technical and Agricultural Education (CTAE) are critical competencies that students pursuing any career pathway should exhibit to be successful. As core standards for all career pathways in all program concentrations, these skills link career, technical and agricultural education to the state's academic performance standards.

The CTAE Foundation Skills are aligned to the foundation of the U. S. Department of Education's 16 Career Clusters. Endorsed by the National Career Technical Education Foundation (NCTEF) and the National Association of State Directors of Career Technical Education Consortium (NASDCTEc), the foundation skills were developed from an analysis of all pathways in the sixteen occupational areas. These standards were identified and validated by a national advisory group of employers, secondary and postsecondary educators, labor associations, and other stakeholders. The Knowledge and Skills provide learners a broad foundation for managing lifelong learning and career transitions in a rapidly changing economy.

CTAE-FS-1 Technical Skills: Learners achieve technical content skills necessary to pursue the full range of careers for all pathways in the program concentration.

CTAE-FS-2 Academic Foundations: Learners achieve state academic standards at or above grade level.

CTAE-FS-3 Communications: Learners use various communication skills in expressing and interpreting information.

CTAE-FS-4 Problem Solving and Critical Thinking: Learners define and solve problems, and use problem-solving and improvement methods and tools.

CTAE-FS-5 Information Technology Applications: Learners use multiple information technology devices to access, organize, process, transmit, and communicate information.

CTAE-FS-6 Systems: Learners understand a variety of organizational structures and functions.

CTAE-FS-7 Safety, Health and Environment: Learners employ safety, health and environmental management systems in corporations and comprehend their importance to organizational performance and regulatory compliance.

CTAE-FS-8 Leadership and Teamwork: Learners apply leadership and teamwork skills in collaborating with others to accomplish organizational goals and objectives.

CTAE-FS-9 Ethics and Legal Responsibilities: Learners commit to work ethics, behavior, and legal responsibilities in the workplace.

CTAE-FS-10 Career Development: Learners plan and manage academic-career plans and employment relations.

CTAE-FS-11 Entrepreneurship: Learners demonstrate understanding of concepts, processes, and behaviors associated with successful entrepreneurial performance.