FUNDAMENTALS OF COMPUTING
COURSE CODE: 5023
502800CH (grade 7 for ½ high school credit)
502900CH (grade 8 for ½ high school credit)

COURSE DESCRIPTION: Fundamentals of Computing is designed to introduce students to the field of computer science through an exploration of a variety of computing topics. Through creativity and innovation, students will use critical thinking and problem solving skills to implement projects that are relevant to students' lives. They will create a variety of computational artifacts through individual and team projects. Students will gain a fundamental understanding of the operation of computers, programming, web design, computational data, physical computing, machine learning, societal and ethical issues of computing. Students will also be introduced to computing careers and how computing is an essential supporting aspect of all other career fields.

OBJECTIVE: Given the necessary equipment, software, supplies, and facilities, the student will be able to successfully complete the following core standards for courses that grant one unit of credit.

RECOMMENDED GRADE LEVELS: 9-12 (Preference 9-10)

COURSE CREDIT: 1 unit (120 hours)

COMPUTER REQUIREMENTS: One computer per student with Internet access

RESOURCES: See attached Resource List

A. SAFETY & ETHICS

Industry professionals know the academic subject matter, including safety as required for proficiency within their area. They will use this knowledge as needed in their role. The following accountability criteria are considered essential for students in any program of study.

1. Identify major causes of work-related accidents in offices.
2. Describe the threats to a computer network, methods of avoiding attacks, and options in dealing with virus attacks.
3. Identify potential abuse and unethical uses of computers and networks.
4. Explain the consequences of illegal, social, and unethical uses of information technologies, e.g., piracy; illegal downloading; licensing infringement; and inappropriate uses of software, hardware, and mobile devices.
5. Differentiate between freeware, shareware, and public domain software copyrights.
6. Discuss computer crimes, terms of use, and legal issues such as copyright laws, fair use laws, and ethics pertaining to scanned and downloaded clip art images, Creative Commons, photographs, documents, video, recorded sounds and music, trademarks, and other elements for use in Web publications.

7. Identify netiquette including the use of email, social networking, blogs, texting, and chatting.
8. Describe ethical and legal practices in business professions such as safeguarding the confidentiality of business-related information.
9. Discuss the importance of cyber safety and the impact of cyber bullying.

B. STUDENT ORGANIZATIONS

Proficient professionals know the academic subject matter, including professional development, required for proficiency within their area. They will use this knowledge as needed in their role. The following accountability criteria are considered essential for students in any program of study.

1. Identify the purpose and goals of a Career and Technology Student Organization (CTSO).
2. Explain how CTSOs are integral parts of specific clusters, majors, and/or courses.
3. Explain the benefits and responsibilities of being a member of a CTSO.
4. List leadership opportunities that are available to students through participation in CTSO conferences, competitions, community service, philanthropy, and other activities.
5. Explain how participation in CTSOs can promote lifelong benefits in other professional and civic organizations.

C. TECHNOLOGY KNOWLEDGE

Proficient professionals know the academic subject matter, including the ethical use of technology as needed in their role. The following accountability criteria are considered essential for students in any program of study.

1. Demonstrate proficiency and skills associated with the use of technologies that are common to a specific occupation (e.g., keying speed).
2. Identify proper netiquette when using e-mail, social media, and other technologies for communication purposes.
3. Identify potential abuse and unethical uses of laptops, tablets, computers, and/or networks.
4. Explain the consequences of social, illegal, and unethical uses of technology (e.g., cyberbullying, piracy; illegal downloading; licensing infringement; inappropriate uses of software, hardware, and mobile devices in the work environment).
5. Discuss legal issues and the terms of use related to copyright laws, fair use laws, and ethics pertaining to downloading of images, photographs, Creative Commons, documents, video, sounds, music, trademarks, and other elements for personal and professional use.
6. Describe ethical and legal practices of safeguarding the confidentiality of business-and personal-related information.
7. Describe possible threats to a laptop, tablet, computer, and/or network and methods of avoiding attacks.
8. Evaluate various solutions to common hardware and software problems.

D. PERSONAL QUALITIES AND EMPLOYABILITY SKILLS

Proficient professionals know the academic subject matter, including positive work practices and interpersonal skills, as needed in their role. The following accountability criteria are considered essential for students in any program of study.

1. Demonstrate creativity and innovation.
2. Demonstrate critical thinking and problem-solving skills.
3. Demonstrate initiative and self-direction.
4. Demonstrate integrity.
5. Demonstrate work ethic.
6. Demonstrate conflict resolution skills.
7. Demonstrate listening and speaking skills.
8. Demonstrate respect for diversity.
9. Demonstrate customer service orientation.
10. Demonstrate teamwork.

E. PROFESSIONAL KNOWLEDGE

Proficient professionals know the academic subject matter, including positive work practices and interpersonal skills, as needed in their role. The following accountability criteria are considered essential for students in any program of study.

1. Demonstrate global or “big picture” thinking.
2. Demonstrate career and life management skills and goal-making.
3. Demonstrate continuous learning and adaptability skills to changing job requirements.
4. Demonstrate time and resource management skills.
5. Demonstrates information literacy skills.
6. Demonstrates information security skills.
7. Demonstrates information technology skills.
8. Demonstrates knowledge and use of job-specific tools and technologies.
9. Demonstrate job-specific mathematics skills.
10. Demonstrates professionalism in the workplace.
11. Demonstrate reading and writing skills.
12. Demonstrates workplace safety.

F. ETHICAL, LEGAL & SOCIAL ISSUES OF COMPUTING

Industry professionals demonstrate knowledge in ethical, legal, and social issues in computing. The following accountability criteria are considered essential for students in any program of study.

1. Examine the consequences resulting from issues involving ethics around security, privacy, copyright, fair use, intellectual property, social media and licensing.
2. Explain the importance of Acceptable Use Policies.

3. Explain the importance of data security and physical security.
4. Explain the concepts of confidentiality, integrity, and availability (CIA).
5. Identify computing threats (e.g., spyware, adware, malware, viruses, ransomware, phishing, hacking, software piracy, identity theft, etc.) and their potential impacts on society.
6. Explain the concept of encryption and how it is used on a daily basis.
7. Explain the social implications of constant data collection via Wi-Fi-enabled devices (Internet of Things [IoT]).

G. PROBLEM SOLVING & COMPUTING (IMPLEMENTED THROUGHOUT THE COURSE)

Industry professionals demonstrate appropriate problem solving skills in computing. The following accountability criteria are considered essential for students in Information Technology programs of study.

1. Identify and define the functional components of a computing device (input devices, output devices, processor, operating system, software applications, memory, storage, etc.)
2. Describe how software and hardware interact.
3. Describe how computer programs and apps can be used to solve various problems (e.g., desktop, mobile, enterprise).
4. Solve a problem by applying appropriate problem solving techniques (understand the problem, plan the solution, carry out the plan, review and discuss).

H. FUNDAMENTALS OF WEB DESIGN

Industry professionals demonstrate fundamental skills in web page design. The following accountability criteria are considered essential for students in Information Technology programs of study.

1. Evaluate the results of Internet searches and the reliability of information found on Web sites.
2. Describe how Web sites are used to communicate and exchange data.
3. Plan a web page considering subject, devices, audience, layout, color, links and graphics.
4. Create a web page that contains a variety of HTML elements (e.g., hyperlinks, ordered and unordered lists, images, headings, paragraph).
5. Create and attach a stylesheet that includes a variety of CSS rule sets to format HTML elements used to organize web page content.
6. Incorporate digital media in accordance with copyright and fair use laws, and ethics pertaining to downloading of images, photographs, Creative Commons, documents, video, sounds, music, trademarks, and other elements for personal and professional use.

I. FUNDAMENTALS OF PROGRAMMING

Industry professionals demonstrate fundamental skills in programming. The following accountability criteria are considered essential for students in Information Technology programs of study.

1. Classify application software according to its primary function (e.g., operating systems, productivity, entertainment, system).
2. Demonstrate an understanding of algorithms and their practical applications.
3. Create, evaluate, and adjust algorithms to solve a variety of problems using flowcharts and/or pseudocode.
4. Analyze and explain how a particular program functions.
5. Solve problems of increasing complexity using visual block-based programming individually and collaboratively.
6. Write code that uses variables, events, functions, operators (i.e. arithmetic, relational, logical), conditional control structures (e.g., if, if-else) and repetition/iteration control structures (e.g., while, for).
7. Differentiate between text, numerical and Boolean variables.
8. Implement pattern recognition to edit, compile/run, test, and debug a program.

J. FUNDAMENTALS OF COMPUTATIONAL DATA

Industry professionals understand the importance of data and its use in making decisions. The following accountability criteria are considered essential for students in Information Technology programs of study.

1. Define and demonstrate how and why the binary system is used to represent data in a computer (e.g., RAM, ROM, Peta-, Tera-, Giga-, Mega- Kilo-, Hz, Bit, Byte, Binary, etc.)
2. Describe how a picture, sound/song, and video are digitized and represented in a computer.
3. Analyze the importance of data security and physical security.
4. Evaluate the concepts of confidentiality, integrity, and availability (CIA).
5. Apply the concept of encryption and decryption and how it is used on a daily basis.
6. Collect data using various methods and transform it to make it more useful and reliable.
7. Develop a visual representation of data that assists in making a decision or recommendation.

K. COMPUTING CAREERS

Industry professionals demonstrate knowledge of computing careers found throughout various disciplines. The following accountability criteria are considered essential for students in Information Technology programs of study.

1. Compare and contrast the five disciplines of computing: computer science, software engineering, information technology, information systems, and computer engineering.

2. Compare and contrast careers in computing along with their education, training requirements, industry certifications and salary ranges.
3. Identify gender, diversity and geographic related issues in computing.
4. Identify how computing is used in other career fields.
5. Identify key individuals and their impact on the field of computing.

L. FUNDAMENTALS OF PHYSICAL COMPUTING (OPTIONAL - AFTER FUNDAMENTALS OF PROGRAMMING)

Industry professionals demonstrate knowledge of practices related to physical computing. The following accountability criteria are considered essential for students in Information Technology programs of study.

1. Identify the role physical computing plays in the Internet of Things (IoT).
2. Identify and categorize physical sensors based on capability (e.g., light, sound, temperature, movement.)
3. Differentiate and apply inputs and outputs that are available on a physical device vs software development.
4. Use an API to develop code that controls a physical computing device.
5. Create prototypes that use a physical device to solve real-world problems.

M. FUNDAMENTALS OF MACHINE LEARNING (OPTIONAL - AFTER FUNDAMENTALS OF COMPUTATIONAL DATA)

Industry professionals demonstrate knowledge of machine learning practices. The following accountability criteria are considered essential for students in Information Technology programs of study.

1. Identify how machine learning impacts data-driven decision making.
2. Analyze patterns in data to determine the features that predict categorization.
3. Evaluate a dataset with features to illustrate how computers can learn to classify things.
4. Explain the importance of avoiding bias when creating machine learning models.
5. Contrast the unique characteristics of human learning with the ways machine learning operates.

Course Materials and Resources

Course Academic Standards and Indicators

Computer Science Academic Standards and Indicators