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Cybersecurity: ICT Essentials 1

Pioneer High School (053861)

Basic Course Information

Abbreviations:

Abbreviation	Course code
CyberSecurity 1	ICT Ess

Length of course:

Full Year (2 semesters; 3 trimesters; 4 quarters)

Subject area:

Subject area	Discipline
College-Preparatory Elective ("g")	Interdisciplinary

UC honors designation:

No

Grade levels:

9th	10th	11th	12th
	✔	✔	✔

Course learning environment:

Classroom	Online
✔	

Is this course an integrated course?

Yes

Course Description

Overview:

Cybersecurity: ICT Essentials 1 prepares students for a career in network administration, and technical support with a focus on cybersecurity. The course includes a series of technical subjects that provide hands-on knowledge and skills in computer hardware, operating systems, networking, and security concepts. Industry-based curricula are utilized in a networked environment to assist in preparing students for industry recognized certifications. Students go through intricate problem solving exercises that mimic the technical challenges of the real world. The program targets students preparing for careers in Cybersecurity and Information and Communications Technology.

Prerequisites:

Prerequisite	Required / Recommended
Math 1	Required
Technology 9	Recommended

Co-requisites:

Corequisite	Required / Recommended
Math 2	Recommended

Course content:

Ethics and Technology
Topics include:

- Blown to Bits - Chapters 1 and 2.
- The purpose of the U.S. Patriot Act and the Computer Security Act.
- The purpose of COPPA - Children's Online Privacy Protection Act.
- Maintaining privacy of others.
- Common federal, state, and international laws related to computer use and security.
- Intellectual property.
- Common copy-write and plagiarism violations and infringements, e.g. software, media, etc.

Key assignments include:

- Debate – analyze a security issue whose ethics are questionable, form an opinion and verbally support position through a debate. Students must respond thoughtfully to diverse perspectives, synthesize comments, claims and evidence made on all sides of the issue, resolve contradictions when possible, and determine what additional information or research is required to deepen the investigation.

    - Within this assignment, students will:
        - Utilize critical thinking to make sense of problems and persevere in solving them.
        - Model integrity, ethical leadership, and effective management.
        - Work productively in teams while integrating cultural/global competence.
        - Conduct research to solve a problem unique to the Information Technology and Systems industry using critical and creative thinking, logical reasoning, analysis, inquiry, and problem-solving techniques.Initiate and participate effectively in collaborative discussions, building on others ideas and expressing their own clearly and persuasively.
- Using Expository Reading and Writing (ERWC) and MLA strategies and formatting, research and write a 2-3 page essay on how laws and ethics shape policy in regards computer access and security protocols. Students must draw evidence from informational texts to support their analysis, reflection, and research.
    - Within this assignment, students will:
        - Conduct research to narrow or broaden the inquiry, synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.
        - Integrate and evaluate multiple sources of information in order to address a question or solve a problem.
        - Practice professional, ethical, and legal behavior, responding thoughtfully to diverse perspectives and resolving contradictions when possible, consistent with applicable laws, regulations, and organizational norms.

Technology Mathematics
Topics and assignments include:

- Proper technical notations when calculating rates and capacities of specific computer components and technologies.
- Converting and applying decimal binary and hexadecimal expressions using basic arithmetic functions, exponent relations, or algebraic fundamentals.

Hardware Fundamentals
Topics include:

- Names, purposes, and characteristics of key components and system modules common to a PC.
- Names and performance characteristics of common ports, associated connectors, cabling and the peripherals that use them.

- Basic procedures for upgrading or replacing common field replaceable modules including CPU, RAM, drives and add-on cards.
- Procedures for installing/replacing a new device including loading and configuring device drivers.
- The Intel x86 microprocessor genealogy and its relationship to the MS Operating System
- Primary and secondary storage devices.
- Different power supplies and how they apply to different form factors, including connector pin-outs and their electrical values.
- Differences between direct current (DC) and alternating current (AC).
- Popular motherboard form factors, components, and features.
- Configuration of typical CMOS parameters when setting up a new motherboard.
- Procedures to optimize PC operations by reducing latency, using specialized devices, or applying temperature control practices.
- Identifying and selecting appropriate Input and Output Devices and their connections.
- Differentiating between different printer types.
- Common printer problems and techniques used to resolve them.

Key assignments include:

- Compare and contrast the characteristics of popular CPU architecture and RAM form factor, and chart their relationship to various operating system bit structures. Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively to identify established patterns and predict emerging technologies.
    - Within this assignment, students will:
        - Apply knowledge of language to understand how language functions in different contexts, to make effective choices for meaning or style, and to comprehend more fully when reading or listening.
        - Integrate and evaluate multiple sources of information.
        - Draw evidence from informational texts to support analysis and predictions.
- Students will repair a failing computer system by installing device drivers to correct the lack of audio, poor video, and/or Internet connectivity.
    - Within this assignment, students will:
        - Use existing and emerging technology, to investigate, research, and produce a service as required in the workplace environment.
        - Conduct short research to create alternative solutions to answer questions and solve problems using critical and creative thinking, logical reasoning, analysis, inquiry, and problem-solving techniques.
        - Acquire and accurately use academic and domain-specific words and phrases.

Operating Systems

Topics include:

- Major desktop components, user interfaces, and their functions.
- Typical system resource (IRQ, DMA, I/O address) allocations and demonstrate procedures for altering these device settings.
- Basic system boot sequences and boot methods, and how to create an emergency boot disk with utilities.
- Installation of any Linux distribution.
- Procedures for installing current PC-based operating systems from a bootable CD including related CMOS settings.
- Basic procedures for creating and managing drives, directories, and files using their respective utilities and editors.
- Proper command line use and syntax.

Key assignments include:

- Conduct on-campus surveys collecting quantitative and qualitative data on preferred operating systems. Create a database to record and identify trends and customer preferences. Present findings to class communicating clearly, effectively, and with reason.
    - Within this assignment, students will:
        - Conduct research to answer a question synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.
        - Produce clear and coherent writing in which the development, organization, and style are appropriate to task.
        - Use technology to produce shared writing products in response to feedback and new information.
- Conduct research and synthesize multiple sources to compare and contrast operating systems based on available features and security enhancements. Develop and present a business proposal to upgrade an existing computer system to meet a client's expanding needs.
    - Within this assignment, students will:
        - Produce clear and coherent writing in which the development, organization, and style are appropriate to task.
        - Use technology to produce shared writing products in response to feedback and new information.
        - Communicate clearly, effectively, and with reason.
- Students will install a multi-boot computer operating system (Windows/Linux, Windows/Android, etc.).
    - Within this assignment, students will:
        - Use existing and emerging technology, to investigate, research, and produce products and services, including new information, as required in the workplace environment.
        - Conduct research to create alternative solutions to solve a problem unique to the sector using critical and creative thinking, logical reasoning, analysis, inquiry, and problem-solving techniques.
        - Practice professional, ethical, and legal behavior consistent with applicable laws, regulations, and organizational

norms.
        - Demonstrate independence in gathering vocabulary knowledge. Determine the meaning of symbols and key terms as they are used in a specific technical context.
- Students will troubleshoot and bring to a running-state a non-booting computer (dead PC). Students will document findings, actions, and outcomes. Students will apply these skills to create an emergency boot disk that will automate this process.
    - Within this assignment, students will:
        - Use existing and emerging technology, to investigate, research, and produce products and services, including new information, as required in the workplace environment.
        - Conduct research to create alternative solutions to solve a problem unique to the sector using critical and creative thinking, logical reasoning, analysis, inquiry, and problem-solving techniques.
        - Demonstrate health and safety procedures, regulations, and personal health practices.
        - Diagnose and solve software, hardware, networking, and security problems.
        - Integrate and evaluate multiple sources of information presented in different media or formats in order to address a question or solve a problem.

System Utilities and Troubleshooting

Topics include:

- Demonstrate system recovery and restore using Windows Boot Options Menu.
- Common audible and visual POST codes to isolate operating system boot failures from peripheral device failures.
- Purpose of the registry and its use.
- Common disk management tasks, including partitioning.
- Best practices for using built-in operating system diagnostic tools including drive utilities, e.g. MSCONFIG.

Key assignments include:

- Configure, troubleshoot, and recover boot failure using CMOS/BIOS.
- Develop plugin for MMC to manage and troubleshoot resources in Windows.
- Partition a hard drive to install Windows and Linux in parallel.
- Debate – Compare and contrast the benefits and consequences with upgrading Operating System software in an enterprise environment, form an opinion and verbally support position through a debate. Students must respond thoughtfully to diverse perspectives, synthesize comments, claims and evidence made on all sides of the issue, resolve contradictions when possible, and determine what additional information or research is required to deepen the investigation.

- On a computer running a Windows desktop operating system, after running the Windows Experience Index, write a research-base, one-page essay that identifies the steps that one could take to improve system performance.

Preventative Maintenance Techniques

Topics include:

- Various preventative maintenance measures including proper cleaning, ventilation, and surge protection.
- Common backup procedures.

Key assignments include:

- Install system updates including drivers, service packs, anti-virus, and security patches.
- Create and maintain a computer repair/maintenance log.
- Conducting research of freeware applications that would be useful for a PC technician, identify an appropriate freeware tool and prepare an in-class presentation.
- Create a batch program or script to automate system maintenance procedures (e.g. clear system caches, network scanning, etc.) that will culminate in a custom system utility disk the students will retain.
    - Within this assignment, students will:
        - Use existing and emerging technology, to investigate, research, and produce products and services, including new information, as required in the workplace environment.
        - Conduct research to create alternative solutions to solve a problem unique to the sector using critical and creative thinking, logical reasoning, analysis, inquiry, and problem-solving techniques.
        - Practice professional, ethical, and legal behavior consistent with applicable laws, regulations, and organizational norms.
        - Demonstrate independence in gathering vocabulary knowledge. Determine the meaning of symbols and key terms as they are used in a specific technical context.

Basic TCP/IP Networking

Topics include:

- Identify common technologies for Internet connectivity, related cabling and components, and their performance

characteristics.
- Configuring Windows systems to connect to a LAN/WAN and troubleshooting a TCP/IP network using various procedures including the command line interface.
- Configuring Cisco devices to connect to a LAN/WAN and troubleshoot a TCP/IP network using various procedures including the command line interface.
- Configuring Linux systems to connect to a LAN/WAN and troubleshoot a TCP/IP network using various procedures including the command line interface.
- Three major types of network media.
- Seven layers of the OSI model and four layers of TCP/IP model.

Key assignments include:

- Enumerate IP addresses using both binary and hexadecimal notations to provide evidence of proper network settings and configuration.
- Manually configure mobile devices using Wi-Fi connectivity.
- Install, configure, and troubleshoot a Network Interface Card.
- Create crossover and straight-through cables using UTP cable and an RJ45 connector.
- Demonstrate the various steps used to troubleshoot network connectivity problems using TCP/IP utilities.
- Install, configure, and test TCP/IP addresses including subnet, gateway, and DNS settings.
- Students will create a UTP network cable and test by connecting two devices.
    - Within this assignment, students will:
        - Acquire and use accurately terminology and protocols at the career and college readiness level for communicating effectively.
        - Investigate, research, and produce product.
        - Conduct research to answer a question and solve a problem.
        - Demonstrate health and safety procedures, regulations, and personal health practices.
        - Access and transmit information in a networked environment.
        - Diagnose and solve software, hardware, networking, and security problems.
        - Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.
- Installation and configuration of a TCP/IP network, applying the suite of network commands to troubleshoot and monitor performance issues.
    - Within this assignment, students will:
        - Use existing and emerging technology, to investigate, research, and produce.
        - Conduct research to create alternative solutions to answer a question and solve a problem using critical and creative thinking, logical reasoning, analysis, inquiry, and problem-solving techniques.

        - Practice professional, ethical, and legal behavior consistent with applicable laws, regulations, and organizational norms.
        - Diagnose and solve software, hardware, networking, and security problems.
        - Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.
- Install, configure and share a network printer.
    - Within this assignment, students will:
        - Enumerate IP addresses using both binary and hexadecimal notations to prove network settings.
        - Manually configure mobile devices using Wi-Fi connectivity.
        - Install, configure, and troubleshoot a Network Interface Card.
        - Implement the various steps used to troubleshoot network connectivity problems using TCP/IP utilities.
        - Identify the three major types of network media. Install, configure, and test TCP/IP addresses including subnet, gateway, and DNS settings.

System and Network Security

Topics include:

- Use of various real time antivirus software and virus scanners to prevent and remove malicious software.
- Firewall components including: common ports, router access control lists, and port forwarding used to secure the network perimeter.
- Different virus types and how they are transmitted.
- Authentication technologies utilized for security purposes.
- The characteristics of a strong password security system.

Key assignments include:

- Configure user and file security using NTFS permissions.
- Create permissions for user and group accounts and demonstrate access control.
- Demonstrate proper installation techniques of anti-virus software.
- Configure security options for various Internet browsers.
- Demonstrate intrusion detection to identify and resolve potential threats.
- Diagnose and remove viruses without further damaging the system, bringing the computer back to a running state.
    - Within this assignment, students will:
        - Acquire and use sector terminology and protocols at the career and college readiness level for communicating

effectively in all formats.
        - Use existing and emerging technology, to investigate, research, and produce services.
        - Conduct research to create alternative solutions to solve a problem using critical and creative thinking, logical reasoning, analysis, inquiry, and problem-solving techniques.
        - Practice professional, ethical, and legal behavior consistent with applicable laws, regulations, and organizational norms.
        - Administer and maintain software and systems. Identify requirements for maintaining secure network systems. Diagnose and solve software, hardware, networking, and security problems.
        - Acquire and use academic and domain-specific words and phrases, and demonstrate independence in gathering vocabulary knowledge.
        - Integrate and evaluate multiple sources of information presented in different formats in order to solve a problem.
- Install service packs and updates to maintain device drivers and system security.
    - Within this assignment, students will:
        - Administer and maintain software and systems.
        - Acquire, install, and implement software and systems.
        - Use existing and emerging technology, to investigate, research, and produce services as required in the sector environment.
        - Conduct research to create alternative solutions to solve a problem unique to the sector using critical and creative thinking, logical reasoning, analysis, inquiry, and problem-solving techniques.
        - Acquire and use academic and domain-specific words and phrases, sufficient for reading, writing, speaking, and listening at the college and career readiness level.
        - Integrate and evaluate multiple sources of information presented in different media or formats as well in order to address a question or solve a problem.

Career Readiness Portfolio
Topics Include:

- Prepare and publish a professional resume and cover letter.
- Explore careers in internet engineering, information systems, and related ICT job titles Investigate career ladders in ICT, including but not limited to to Chief Technology Officer, Manager of Information Systems, and Senior Network Engineer.

Key assignments include:

- Demonstrate professional communications during an interview.
- Demonstrate learning outcomes through a professional portfolio.
    - Students produce a cumulative college and career readiness portfolio that provides evidence of meeting the course learning outcomes. Specific pieces of evidence are required resume, cover letter, professional writing sample, and college-ready work samples.
- College and Career Portfolio Defense (Mock Interview)
    - ICT professionals and educators from the industry sector or post-secondary education participate in mock interviews. Interview skills workshops with professionals and educators scaffold the final interview, where each student defends their College and Career Readiness.
    - Portfolio to a professional or educator. Common assessment rubrics are used by the interviewing adults to calibrate feedback.

Course Materials

Textbooks

Title	Author	Publisher	Edition	Website	Primary
Networking Fundamentals	Microsoft	John Wiley and Sons	2011	http://www.wiley.com/WileyCDA/WileyTitle/productCd-EHEP001833.html	Yes
CompTIA A+ Training Kit	Darril Gibson	Microsoft Press	2011	https://www.microsoftpressstore.com/store/comptia-a-plus-training-kit-exam-220-801-and-exam-220-9780735662667	Yes
IT Essentials: PC Hardware and Software	Cisco Networking Academy	Cisco Press	5th	http://www.ciscopress.com/store/it-essentials-9781587133084	Yes

Companion Guide, Fifth Edition					
Cyber Security Essentials	James Graham	Auerback Publications	2011	https://www.crcpress.com/Cyber-Security-Essentials/Graham-Olson-Howard/9781439851234	No
The Network Security Essentials	Pete Herzog, Glenn Norman, Bob Monroe & Marta Barceló Jordan	ISECOM	Volume 1 2015	http://www.isecom.org/store.html	No

Literary Texts

Title	Author	Publisher	Edition	Website	Read in entirety
Blown to Bits	Hal Albeson, Ken Ledeen, Harry Lewis	Addison-Wesley Professional	2008	http://www.bitsbook.com/	No

Websites

Title	Author(s)/Editor(s)/Compiler(s)	Affiliated Institution or Organization	URL
Professor Messer's CompTIA SY0-401 Security+ Training Course	James "Professor" Messer	professormesser.com	http://www.professormesser.com/security-plus/sy0-401/sy0-401-course-index/