

Introduction to Cybersecurity and Networking

Overview

This is a full-year course for students in 10th grade and above. It is designed to foster interest in Information Technology and networking careers. Through hands-on projects, students learn to install and administer operating systems, to have computers communicate with each other and to detect and repair vulnerabilities in systems and networks. This course also covers connections of computing and society, including ethics, security and privacy in on-line communication. Students taking this course will be expected to take the CompTIA ETF+ and CompTIA A+ certification exams.

Objectives

- To have students understand the fundamentals of computers, including system management, hardware configuration, software installation, troubleshooting of operating system issues and resolution of problems with common applications.
- To introduce students to basic cybersecurity concepts.
- To prepare students to successfully take the CompTIA ETF+ and CompTIA A+ certification exams by the end of the course.
- To help students prepare for the CompTIA Network+ certification exam, which may require some further study after completing this course.
- To prepare students for more advanced cybersecurity, digital forensics courses and networking courses.

Assessment

Formative assessment includes worksheets, several practice activities and quizzes for each lesson. Summative assessment includes a test and a project for each unit, and a final exam.

Course Essentials

Equipment and Resources	Cost/Unit
Classroom set of computers	\$0 if you already have some, \$500-600 per computer if you need to purchase them.
Network switch, cables and USB keys.	About \$50-\$100 for everything.
Set of spare used computers	Cost may vary, depending on whether they can be donated to the school, bought at surplus stores or otherwise collected from retired inventory. Budget for the whole set should not go over \$500.
Set of Raspberry Pi computer kits	Approximately \$750 for 10 kits each including a raspberry Pi, RGB LED-strip, breadboard, MOSFETs, power jack, power supply and jumper wires.

Course Outline

Unit 1: Operating Systems	Installing Linux in real and virtual hardware, managing and using Linux, automating routine tasks. Other operating systems, managing and using Windows, troubleshooting common issues
Unit 2: Hardware and software configuration	Installing and configuring hardware components, device drivers, interfacing with electronic circuits, sensors and actuators. Raspberry Pi binary clock.
Unit 3: Cybersecurity fundamentals	Authentication, access controls, vulnerabilities, attacks, defenses, secure software design, secure communication, encryption protocols, human-in-the-loop vulnerabilities, social engineering
Unit 4: Networking	OSI network model, Network protocols, wireless and wired networks, network management, analysis of network traffic, techniques for defending networks, ethics of online communication
Unit 5: Cryptology	Theoretical foundations, bitwise operations, encoding systems, cryptanalysis of classical cyphers, modern crypto, practical uses: https, block chain, drm, UEFI
Unit 6: Malware and digital forensics	Malicious software, types of malware, functionality, analysis, defense. Legal issues: evidence acquisition and preservation, digital forensic analysis, storage forensics, live forensics, memory analysis, reporting findings



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CYBERSECURITY

1. Materials

Internet access, 1-to-1 computer use daily, and access to LSU servers.

Hardware/Reusable Material	Recommended Unit	Cost/Unit
Raspberry Pi 3 Model B+ Starter Kit - 16 GB (CanaKit)	1 per 3-4 students	\$99.95
Mouse/Keyboard/Monitors for at least 1 Raspberry Pi	1 or more (RPIs can be used remotely)	Varies*
Wireless Access Point (TP-Link)	1 per classroom	\$24.99
Any adapters for using existing school hardware (for monitors): HDMI/VGA adapter or DVI/HDMI adapter	1 per Raspberry Pi	\$6-8

*Varies depending on the number of components needed (\$20 for mouse/keyboard - \$200 if monitor is also needed)

2. Required software, networking access, and access to LSU servers

- Students will need to sign up with online development and testing environments, including but not limited to those listed below.
- Students will need access to YouTube instructional videos relevant to the course, as well as other educational video repositories.
- Teachers will need to be able to access the LSU servers using several Internet protocols including but not limited to HTTPS and SSH.
- Principals will need to communicate with the district's information technology department to ensure that there are no technological restrictions that block access to the LSU servers in the lsu.edu, college-readiness.lsu.edu or stempathways.lsu.edu domains on any port.
- Teachers must supervise student internet usage and activities. Teachers are encouraged to teach students their district's responsible usage of technology policy. Teachers are encouraged to get student and parent signatures on a contract of ethical computer usage.
- In addition to the sites mentioned above, students may need access to additional website.

3. Required teacher collaborations

Teachers may communicate with LSU instructors via emails, apps hosted on the LSU servers, webpages or other methods as indicated by the LSU instructors. Teachers will need to share sample student work with their designated LSU Pathway Point-of-Contact.

4. Required administration of course content, pre/post test, and research instruments

All required materials and instruments will be either posted in the LSU server or their location announced via email.

7. Course Work

Teachers must present the course material in sequence or as approved by collaboration with the LSU Pathway Point-of-Contact. Teachers are expected to deliver a minimum of 80% of the course material.



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5. Other

As this is a project-based learning class, we strongly suggest that each section of the course be limited to a *maximum* of 20 students. The course is dependent on the teacher providing feedback and reviewing student code. The course requires that teachers have adequate time to interact with each student.