

Kenneth P. Dietrich School of Arts and Sciences
College in High School

2024-2025

Introduction to Information Security
INFSCI 1049--3 Credits

Description: The objective of this course is to provide an understanding of information security ranging from threats, vulnerabilities, and attacks, to protection, detection, and response, as well as develop the ability to converse with the terminology used in information security (e.g., confidentiality, authentication, integrity, etc.). The course will cover the architecture and generalized protocol/operational aspects of information networks to motivate how security attacks (e.g., denial of service) are possible. Preliminaries related to security mechanisms such as cryptography, firewalls, and secure protocols will be presented.

Prerequisites: None. However, the following concepts will be required to understand some lectures in the course: Algebra, Binary Arithmetic, Combinatorial Math.

Textbook: No textbook is required. Lectures will be drawn from several sources (books, articles, papers) as most available texts do not cover all of the course material or at the appropriate depth. Recommended Book: Chuck Easttom, *Computer Security Fundamentals*, Pearson, 2014.

Other References:

- *Computer Security: Principles and Practice*, Fourth Edition, by W. Stallings & Lawrie Brown, 5th Edition, Pearson, 2018
- Articles from newspapers, magazines, and journals

Grading:

- Homework 25%, Quiz 40%, Paper/Presentation 35%

Course Objectives:

- *State* security services and their role in securing information
- *Describe* the security attack process and the security implementation process
- *Sketch* general communication pathways for data and how they may face security threats
- *Demonstrate* the use of secret key and public key encryption in communication protocols & relate key sizes to security
- *Investigate* the security implications of new information technology proposals

Policies:

- All work must be the student's own unless collaboration is explicitly permitted
- Late assignments will not be accepted unless there are exceptional circumstances
- Homework will be assigned regularly unless otherwise mentioned
- All written work must be legible and clear to receive credit. Vagueness in your work leading to misinterpretation is not a valid reason for credit

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Course Outline/Tentative Schedule:

Please note that this schedule may change depending on how each class progresses.

Topic	Notes
1	Introduction to the class
	Information Security Terminology
2	Basic concepts: What is digital and what are its implications on security
	Quiz 1; Basic concepts continued; examples of security problems
3	Computers, architecture, OS, access, clients and servers
	Quiz 2; host level security issues; entity authentication
4	Host protection, phishing, malware classification
	Quiz 3; Anti-virus, CVEs, examples – zero-day exploits
5	Networks and layering; Protocols;
	Quiz 4; Protocols continued and roles/visibility of various layers
6	Example technologies and vulnerabilities; DoS
	Quiz 5; Remote authentication; Spoofing; Spam
7	Firewalls and IDS
	Quiz 6; Limitations of firewalls and IDS; ML/AI in anomaly detection
8	Cryptography 101: The Shift Cipher
	Quiz 7; Substitutions & Permutations
9	AES and modern block ciphers
	Quiz 8; Key sizes for security; message integrity and authentication
10	Hash functions, Public key algorithms
	Quiz 9; Digital signatures
11	Certificates; X.509
	Quiz 10; SSL/TLS
12	Privacy
	Usable Security
13	Introduction to Blockchain
	Presentations 1
14	Presentations 2
	Presentations 3
15	Presentations/Make-up if necessary

Related educational materials:

High school teachers are strongly encouraged to use the following educational modules while teaching the course. The modules can be downloaded from the SADET project website:

https://www.sis.pitt.edu/lersais/research/sadet/module_menu.html

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INFSCI 1049	Relevant SADET module
Topic 2	Module C.2: Data Security Basics Confidentiality, Integrity, and Availability
Topic 2	Module C.3: Vulnerabilities and Threats to Data
Topic 3	Module D.3: Protecting Data using Role Based Access Control
Topic 7	Module D.9: Network Intrusion Detection
Topic 7	Module D.7: Securing Data from Insider threats
Topics 8 and 9	Module D.1: Protecting Data Confidentiality using Cryptography -I
Topics 8 and 9	Module D.2: Protecting Data Confidentiality using Cryptography - II
Topics 12	Module D.5: Data Privacy

The module on introduction to blockchains (Week 13) can be accessed from the following project website:
https://www.sis.pitt.edu/lersais/research/nsf-time-release/module_1.html

Academic Integrity: All College in High School teachers, students, and their parents/guardians are required to review and be familiar with the University of Pittsburgh’s Academic Integrity Policy located online at <https://www.as.pitt.edu/faculty/policies-and-procedures/academic-integrity-code>.

Grades: Grade criteria in the high school course may differ slightly from University of Pittsburgh standards. A CHS student could receive two course grades: one for high school and one for the University transcript. In most cases the grades are the same. These grading standards are explained at the beginning of each course.

Transfer Credit: University of Pittsburgh grades earned in CHS courses appear on an official University of Pittsburgh transcript, and the course credits are likely to be eligible for transfer to other colleges and universities. Students are encouraged to contact potential colleges and universities in advance to ensure their CHS credits would be accepted. If students decide to attend any University of Pittsburgh campuses, the University of Pittsburgh grade earned in the course will count toward the student grade point average at the University. At the University of Pittsburgh, the CHS course supersedes any equivalent AP credit.

Drops and Withdrawals: Students should monitor progress in a course. CHS teacher can obtain a Course Drop/Withdrawal Request form from the CHS office or Aspire. The form must be completed by the student, teacher and parent/guardian and returned to teacher by deadlines listed. Dropping and withdrawing from the CHS course has no effect on enrollment in the high school credits for the course.