



## *Computer Security* *INFSCI 1074* *3 Credits*

**Description:** This course covers the fundamental concepts in computer security and privacy. The course is intended to expose the various security threats and vulnerabilities in computer systems and provide an understanding of the various defense and protection mechanisms. Primarily, the course will focus on models and mechanisms related to insuring confidentiality, integrity, and availability related to computer and information systems. We will cover the basic concepts of cryptography including symmetric and public key encryption schemes. We then focus on program security issues such as buffer overflow attacks and discuss various control mechanisms to handle malicious code. The second half of the course will cover the topics of Database Security and general security issues in Operating Systems. Towards the end, we discuss various security and privacy issues in the context of emerging cloud computing systems.

### **Prerequisites:**

- Basic mathematics: a basic knowledge of algebra and trigonometry
- An intro course in information science (INFSCI 0010 or 0011)
- A course in structured programming (INFSCI 1017, CS 0007, or any structured programming course). This course will involve some Java programming for the Labs and final project.
- A Basic knowledge of Java and data structures, database systems, and networks. Students not sure about the required background should meet with the instructor as early as possible.

### **Grading (suggested):**

- Labs – 15% Homework – 15% Quiz – 15 %
- Reading Assignment – 10%
- Two Exams – 30%
- Final Programming Project – 15%
- Class participation – 5% extra credit

**Textbook:** The course requires the text *Security in Computing*, 3<sup>rd</sup> or 4<sup>th</sup> Edition, Charles P. Pfleeger, Prentice Hall (Online). Instructors may also use additional resources including *Introduction to Computer Security* by Matt Bishop (ISBN: 0-201-44099-7), Addison-Wesley (Available online for Pitt Students) and *Computer Security: Art and Science* by Matt Bishop (ISBN: 0-201-44099-7), Addison-Wesley. Faculty liaison will consider alternative textbooks on a case-by-case basis.

### **Learning Objectives:**

- Recognize, understand and evaluate the various security threats and challenges in computer systems
- Understand basic defense and protection mechanisms to deal with common security threats
- Apply the basics of symmetric key and public key cryptographic techniques for ensuring confidentiality, integrity and non-repudiation.
- Understand the various risks related to program security and learn about various controls against program threat
- Recognize the key security challenges in Database Systems and analyze various defense mechanisms to ensure confidentiality and integrity of database
- Describe/identify security and privacy threats in emerging cloud computing systems.



The following topics are covered in the University of Pittsburgh INFSCI 1074 course:

1. **Security/Privacy Basics**
  - Confidentiality, Integrity, Availability concepts
  - Threat models and vulnerabilities
2. **Basic Cryptography**
  - Introduction to cryptography
  - Substitution and Transposition ciphers
  - Other symmetric key encryption schemes
  - Public Key Encryption
3. **Program Security**
  - Different types of Malicious code
  - Buffer overflow and TOCTOU attacks
  - Virus and targeted malicious code
  - Controls Against program threats
4. **Database Security**
  - Database Reliability and Integrity
  - Disclosure of Sensitive Data
  - Multi-level Databases
5. **Security in General-purpose Operating System**
  - Control of Access to General Objects
  - User Authentication
  - Unix examples
6. **Security and Privacy in Cloud Computing**
  - Introduction to Cloud Computing
  - Security considerations in Public Cloud
7. **Data Privacy Challenges and defense mechanisms**
8. **Location Privacy threats and countermeasure**

**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 [www.as.pitt.edu/fac/policies/academic-integrity](http://www.as.pitt.edu/fac/policies/academic-integrity).

**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.