**COEN-4840 Computer Security**

**Credits and contact hours:** 3

**Course coordinator:** Cristinel Ababei, Ph.D., Assistant Professor

**Text:** Wenliang Du, Computer Security: A Hands-on Approach, CreateSpace Independent Publishing Platform, 2017, ISBN-10: 154836794X.

**Catalog description:** Introduction to the important issues in computer security, including cryptography, program security, operating system security, database security, and network security. Also discusses the legal, ethical and privacy issues that arise in computer security. Programming projects enable the student to practice implementing many of the security measures discussed in class.

**Prerequisites:** COSC-2010 Data Structures for Engineers, COSC-2100 Data Structures and Algorithms, or equivalent experience.

**Selected Elective** in ELEN Computer Hardware & Software area, COEN Intelligent Systems area (depth only)

**Professional component:**

Engineering science – 50%

Engineering design – 50%

**Course Goals:**

* Introduce the problems of security in computing
* Present elementary principles of cryptography including substitution ciphers, permutations, symmetric and asymmetric encryption systems, the Data Encryption Standard, public key encryption, and using encryption
* Introduce techniques for program security including detecting and correcting program flaws and faults, viruses, malicious code, and controlling against program threats
* Present techniques for operating system security including memory and address protection, access control, file protection, user authentication, and operating system security models
* Describe techniques for database security including database reliability, database integrity, sensitive data, and multilevel databases and their security
* Introduce issues in network security including threats in networks, protocol flaws, spoofing, message confidentiality and integrity, controlling network security with encryption and authentication, firewalls, intrusion detection, and email security
* Present techniques for administering security in including planning, risk analysis, security policies, and physical security
* Discuss the legal, ethical, and privacy issues in computer security

**Specific outcomes of instruction***By the end of this course, you should....*

1. Describe the sources of security problems in computing.
2. Use various ciphers including substitution and permutation ciphers.
3. Know the various types of encryption systems and be able to implement simple encryption systems.
4. Understand the DES and AES algorithms and how they are used.
5. Be able to describe and use public key encryption.
6. Be able to use encryption for hash functions, key exchange, digital signatures, and certificates.
7. Be able to identify and create a secure program.
8. Describe various types of viruses, know how they work, and know how to detect them.
9. Be able to construct controls against program threats.
10. Be able to construct various types of protections in operating systems including memory protection, address protection, object access, file protection, and user authentication.
11. Be able to use models of security in designing a trusted operating system.
12. Know the security requirements of database systems.
13. Be able to design a database that ensures the reliability and integrity of the data.
14. Know how to cope with sensitive data in a database.
15. Understand the sources of security threats to networks.
16. Be able to design simple network security controls using encryption and authentication.
17. Understand the concepts behind firewalls and be able to describe the limitations of firewalls.
18. Know how to design a secure email system.
19. Be able to administer security plans for computer systems.
20. Understand and be able to describe the legal, ethical, and privacy issues in computer security.

**Student outcomes addressed by the course:**Partial fulfillment of Criterion 3 objectives A, C, E, F, G, H, I, J, and K

**Brief list of topics to be covered**

 Security Issues in Computing

 Elementary Cryptography

 Program Security

 Security in Operating Systems, Trusted Operating Systems

 Database Security

 Network Security

 Administering Security; Legal, Ethical, and Privacy Issues