ECE 567 – Advanced Network Security

Term – SPRING 2019 (201901)

Instructor

Dr. Issa Traore
Phone: 250 721 8697
E-mail: itraore@ece.uvic.ca

Office Hours

Days: Monday, Thursday
Time: 10:00am-12:00
Location: EOW 415

Course Objectives

The purpose of the course is to introduce fundamental concepts and techniques underlying the science and art of network security, with a primary focus on network security vulnerability assessment and penetration testing, secure network architecture design, and network security services and mechanisms. Examples of attack techniques and tools are introduced, as well as adequate countermeasures against these attacks.

Learning Outcomes

By the end of this course, students should have a good grasp of network vulnerability assessment techniques, as well as secure architecture design and countermeasure. They should be able to identify for a target network the security requirements, extract adequate security policy, and design and implement appropriate protection strategies and countermeasures. They should become proficient in how to conduct penetration testing for an existing enterprise network and develop and implement adequate remediation plan.

Syllabus

Unit 1: Network Security Overview
- Ethical issues
- Introduction of fundamental security principles and concepts
- Basic Network Protocols and Addressing Schemes

Unit 2: Network Attacks and Penetration Testing
- Review of attack methods and tools
- Generic penetration testing methodology
- Authentication Systems and Protocols
- Port scanning, denial of service, attack on authentication system, and input validation attacks, etc.

Unit 3: Web Applications Attacks
Web application vulnerabilities and attacks; the following attack methods will be covered:
- Code injection
- SQL injection
- Cross-Site Scripting
- Directory traversal

Unit 4: Malicious Software
- Trojan horses
- Rootkits
- Viruses
- Worms
- Botnets
- Exploit Kits (EKs)
- Ransomware

Unit 5: Security Policies
- Notions and examples of security policies and models: Bell-LaPadulla, Biba, Chinese Wall etc.
- Basic access control model, reference monitor concept, security kernel.
- Role-based access control model.

Unit 6: Firewall Systems
- Classes of firewall
- Firewall configurations and architectures
- Network Address Translation (NAT)
- Linux IP Tables

Unit 7: Intrusion Detection Systems (IDS)
- IDS models, architectures, and tools
- Intrusion Prevention Systems (IPS)
- IDS/IPS performance metrics and evaluation

Unit 8: Virtual Private Network (VPN)
- Network Layer Security
- IPSec protocol
- VPN Technology
- Secure Network Architecture

Unit 9: Biometrics Systems
- Biometric system components
- Biometric performance metrics and evaluation techniques
- Technologies overview: fingerprint, face, gait, keystroke dynamic, etc.

A-Section(s):   A01 / CRN 20932   B01   N/A   TA (email)   N/A
                      A02 / CRN 20933

Days: Monday, Thursday

Time: 8:30-9:50 am
Location: ECS 104

Required Text

Title: "The Basics of Hacking and Penetration Testing - Ethical Hacking and Penetration Testing Made Easy"
Author: Patrick Engebretson
Publisher: Syngress
Date: August 2013
Edition: 2nd
eBook ISBN: 9780124116412
Paperback ISBN: 9780124116443

Optional Text (available as E-book in Uvic Library Online)

Title: Computer Network Security
Author: Jie Wang
Publisher: Springer
Year: 2009

References:

1. "Computer Security – Art and Sciences". Matt Bishop, 2nd edition, Pearson, 2019
2. "Network Security, Firewalls, and VPNs". J. Michael Stewart. Jones & Bartlett Learning; 2nd edition, 2014.
3. Lectures Notes available on Course Space

Assessment:

Assignments #1:	10%	Due Dates:	February 4, 2019
Assignment #2:	5%		February 18, 2019
Project – Part 1:	25%		March 4, 2019
Project – Part2:	20%		April 4, 2019
Mid-term	35%		March 21, 2019

Attendance and Participation: 5%
Final Exam: N/A

<u>Note</u>:

The final grade obtained from the above marking scheme for the purpose of GPA calculation will be based on the percentage-to-grade point conversion table as listed in the current Graduate Calendar. https://web.uvic.ca/calendar2019-01/grad/academic-regulations/grading.html

Note to Students: Students who have issues with the conduct of the course should discuss them with the instructor first. If these discussions do not resolve the issue, then students should feel free to contact the Chair of the Department by email or the Chair's Assistant to set up an appointment.

Accommodation of Religious Observance:
 https://web.uvic.ca/calendar2019-01/grad/registration/Registration.1.17.html#

Updated November 20, 2018

Policy on Inclusivity and Diversity:
https://web.uvic.ca/calendar2019-01/general/policies.html

Standards of Professional Behaviour: You are advised to read the Faculty of Engineering document Standards for Professional Behaviour, which contains important information regarding conduct in courses, labs, and in the general use of facilities.
https://www.uvic.ca/engineering/assets/docs/professional-behaviour.pdf

Cheating, plagiarism and other forms of academic fraud are taken very seriously by both the University and the Department. You should consult the entry in the current Graduate Calendar for the UVic policy on academic integrity.
https://web.uvic.ca/calendar2019-01/grad/academic-regulations/academic-integrity.html

Equality: This course aims to provide equal opportunities and access for all students to enjoy the benefits and privileges of the class and its curriculum and to meet the syllabus requirements. Reasonable and appropriate accommodation will be made available to students with documented disabilities (physical, mental, learning) in order to give them the opportunity to successfully meet the essential requirements of the course. The accommodation will not alter academic standards or learning outcomes, although the student may be allowed to demonstrate knowledge and skills in a different way. It is not necessary for you to reveal your disability and/or confidential medical information to the course instructor. If you believe that you may require accommodation, the course instructor can provide you with information about confidential resources on campus that can assist you in arranging for appropriate accommodation. Alternatively, you may want to contact the Resource Centre for Students with a Disability located in the Campus Services Building.

The University of Victoria is committed to promoting, providing, and protecting a positive, and supportive and safe learning and working environment for all its members.

Course Lecture Notes
Unless otherwise noted, all course materials supplied to students in this course have been prepared by the instructor and are intended for use in this course only. These materials are NOT to be re-circulated digitally, whether by email or by uploading or copying to websites, or to others not enrolled in this course. Violation of this policy may in some cases constitute a breach of academic integrity as defined in the UVic Calendar.

Sexualized Violence Prevention and Response at UVic
UVic takes sexualized violence seriously, and has raised the bar for what is considered acceptable behaviour. We encourage students to learn more about how the university defines sexualized violence and its overall approach by visiting www.uvic.ca/svp. If you or someone you know has been impacted by sexualized violence and needs information, advice, and/or support please contact the sexualized violence resource office in Equity and Human Rights (EQHR). Whether or not you have been directly impacted, if you want to take part in the important prevention work taking place on campus, you can also reach out:

> **Where:** Sexualized violence resource office in EQHR; Sedgewick C119
> **Phone:** 250.721.8021
> **Email:** svpcoordinator@uvic.ca
> **Web:** www.uvic.ca/svp