ECE519C: Selected Topics in Secure Communications: Firewalls and Intrusion Prevention Systems

Territory Acknowledgement

We acknowledge and respect the Ləkʷəŋən (Songhees and Esquimalt) Peoples on whose territory the university stands, and the Ləkʷəŋən and W̱SÁNEĆ Peoples whose historical relationships with the land continue to this day.

Course Dates

CRN(s):	Section A01 CRN: 14086
	Section A02 CRN: 14087
Term:	2024
Course Start:	2024-09-04
Course End:	2024-12-20
Withdrawal with 100% reduction of tuition fees:	2024-09-17
Withdrawal with 50% reduction of tuition fees:	2024-10-08
Last day for withdrawal (no fees returned):	2024-10-31

Scheduled Meeting Times (M=Mon, T=Tue, W=Wed, R=Thu, F=Fri)

Section:	Location:	Classes Start:	Classes End:	Days of week:	Hours of day:	Instructor:
A01	FIA 103	2024-09-04	2024-12-04	TR	14:30-15:50	Ismail Afia
A02	FIA 103	2024-09-04	2024-12-04	TR	14:30-15:50	Ismail Afia

Instructor(s)

Name: **Ismail Afia**
Office:
Phone:
Email: iafia at uvic dot ca
Office Hours: **TBD**

Course Objectives

The Network Security course focusing on Firewalls and Intrusion Prevention Systems (IPS) is designed to equip students with the essential knowledge and hands-on skills to protect modern networks from cyber threats. With a strong emphasis on firewall technologies and IPS solutions, students will learn how to design, implement, and manage secure network infrastructures that safeguard against unauthorized access, malicious attacks, and data breaches.

Learning Outcomes

By the end of this course, students will:

- Understand the fundamentals of network security, including common threats and vulnerabilities.
- Master the concepts and functionalities of firewalls as critical network security components.
- Gain a comprehensive understanding of Intrusion Prevention Systems (IPS) and their role in proactive threat prevention.
- Develop practical skills in configuring, monitoring, and maintaining firewalls and IPS devices.
- Learn advanced firewall techniques for securing application-layer protocols and managing access control policies.
- Analyze network traffic to detect and respond to potential security breaches using IPS solutions.

- Understand the importance of security policies, incident response, and log analysis in network security.
- Explore real-world case studies and best practices in designing secure network architectures.

Syllabus

The following topics will be covered in the order below.

- Introduction to Network Security
  - Network security basics: Threats, vulnerabilities, and defense mechanisms.
  - The role of firewalls and IPS in network protection.
- Firewall Fundamentals
  - Types of firewalls: Packet filtering, stateful inspection, application-layer, and next-generation firewalls.
  - Firewall architecture and deployment scenarios.
- Configuring and Managing Firewalls
  - Firewall rule sets and access control lists (ACLs).
  - Network Address Translation (NAT) and Port Address Translation (PAT).
  - VPN (Virtual Private Network) implementation and secure remote access.
- Application-Layer Firewalls
  - Deep packet inspection and content filtering.
  - Securing web applications and managing HTTP/HTTPS traffic.
- Intrusion Prevention Systems (IPS)
  - Understanding IPS technologies and functionalities.
  - Signature-based vs. behavior-based IPS solutions.
- Implementing IPS for Network Security
  - Configuring IPS policies and profiles.
  - Tuning IPS to reduce false positives and negatives.
- Monitoring and Responding to Network Attacks
  - Real-time monitoring of network traffic for suspicious behavior.
  - Incident response and mitigation strategies.
- Network Security Best Practices
  - Designing secure network architectures and defense-in-depth strategies.
  - Integrating firewalls and IPS with other security technologies (e.g., SIEM).

Textbook & Course Materials

Optional Text	
Title:	Network Security, Firewalls, and VPNs, 3rd Edition
Author:	J. Michael Stewart and Denise Kinsey
Publisher/Year:	Jones & Bartlett/2021

Lecture notes:

Students are responsible for attending the lectures and taking notes.

Assessment

Assessment Tool	Weight	Date
Two quizzes	30%	October 15 and December 3
Three Assignments	30%	September 15, October 5, and November 10
Project	40%	December 20

Notes

All due dates are tentative depending on how much material is covered through the course. Exact dates may vary slightly and will be agreed upon in class and communicated through Brightspace announcements and emails.

The project is individual and requires a Windows laptop equipped with at least 16GB of RAM. Group work is not permitted; each participant must complete the project independently.

Plagiarism detecting, code analysis, and ChatGPT (AI) detecting tools will be used during marking assessments and project.

Late policy for assignments and project:

Cumulative of 10% times the number of days late

- 1 day late: lose 10%
- 2 days late: lose 30% (10% + 20%)
- 3 days late: lose 60% (30% + 30%)
- Greater than 4 days late is not accepted.

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.

Coursework Mark Appeals: All marks must be appealed within 7 days of the mark being posted.

General Information

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.

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.

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 Centre for Accessible Learning. 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.

Academic Integrity requires commitment to the values of honesty, trust, fairness, respect, and responsibility. It is expected that students, faculty members and staff at the University of Victoria, as members of an intellectual community, will adhere to these ethical values in all activities related to learning, teaching, research and service. Any action that contravenes this standard, including misrepresentation, falsification or deception, undermines the intention and worth of scholarly work and violates the fundamental academic rights of members of our community. This policy is designed to ensure that the university's standards are upheld in a fair and transparent fashion.

Attendance: Students are expected to attend all classes in which they are enrolled. An academic unit may require a student to withdraw from a course if the student is registered in another course that occurs at the same time.

An Instructor may refuse a student admission to a lecture, laboratory, online course discussion or learning activity, tutorial or other learning activity set out in the course outline because of lateness, misconduct, inattention or failure to meet the responsibilities of the course set out in the course outline. Students who neglect their academic work may be assigned a final grade of N or debarred from final examinations.

Students who do not attend classes must not assume that they have been dropped from the course by an academic unit or an instructor. Courses that are not formally dropped will be given a failing grade, students may be required to withdraw and will be required to pay the tution fee for the course.

Resources for Students:

- UVic Learn Anywhere
- Library resources
- Indigenous Student Services (ISS)
- Centre for Academic Communication (CAC)
- Math & Stats Assistance Centre
- Learning Assistance Program (LSP)
- Community-Engaged Learning (CEL)
- Academic Concessions
- Academic Concessions & Accomodations
- Centre for Accessible Learning (CAL)
- Academic Accommodation & Access for students with disabilities - Policy AC1205

- [Student Groups & Resources](#)
- [Student Wellness](#)
- [Office of the Ombudsperson](#)

University Statements & Policies

- [Information for all students](#)
- [Attendance](#)
- [Creating a respectful, inclusive and productive learning environment (general policies)](#)
- [Accommodation of Religious Observance](#)
- [Student Conduct](#)
- [Academic Integrity](#)
- [Non-academic Student Misconduct](#)
- [Standards of Professional Behaviour (Faculty of Engineering and Computer Science)](#)
- [Academic Accommodations and Accessibility](#)
- [Accessibility](#)
- [Diversity & Inclusion Supports (Faculty of Engineering and Computer Science)](#)
- [Diversity / EDI (VPAC's Commitment](#)
- [Equity statement](#)
- [Sexualized Violence Prevention and Response](#)
- [Discrimination and Harassment Policy](#)
- [Graduate Supervision Policy](#)