

CSCI 4174 Network Security

CSCI 6708 Advanced Topics in Network Security Winter 2019

Course Description

Welcome to Network Security/Advanced Topics in Network Security course. The fourth year undergraduate course CSCI 4174 is co-listed (and co-taught) with the graduate level course CSCI 6708. The grading schemes for the two courses are, however, different. Network Security stands out as a critical issue in the design, deployment and management of internetworks. The primary objective of this course is to provide a comprehensive coverage of the theory, concepts, design principles and technologies for network security. Industry-driven issues and problems in cyber security and emerging trends in security will also be discussed.

Lecture Times

Lectures will be held on TRF 1.35 PM to 2.25 PM

Intended Audience

CSCI 4174 is intended for fourth year undergraduate students and CSCI 6708 is intended for graduate students with an interest in cyber security. Students must have completed an undergraduate course in networking (CSCI 3171 or equivalent).

Hardware/Software

Programming language: Typically Java, C or C++
Students will also get exposure to other simulators and networking tools.

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Office: 319 Goldberg Computer Science
Building, 6050 University Avenue

Office Hours: "Open-door, Walk-in" policy. In addition, Tuesdays and Fridays 10.30-12.30.

Evaluation Scheme (4174)

Test 1 (January 31):	15%
Test 2 (March 7):	20%
Final Exam (April 10-26):	30%
Assignments:	20%
Group Case Study Debate:	10%
Class Participation and Pop Quizzes:	5%

Evaluation Scheme (6708)

Test 1 (January 31):	15%
Test 2 (March 7):	20%
Final Exam (April 10-26):	30%
Assignments :	12%
Research Paper:	8%
Group Case Study Debate:	10%
Class Participation and Pop Quizzes:	5%

Assignment Requirements

- There will be a number of short assignments (approximately 10) spaced through the term. The intent of the assignments is to hone in the concepts taught in the lectures.
- Assignments must be submitted on Brightspace.
- No collaboration is permitted on the assignments.
- Late assignments will be subject to a penalty of 10% per day.

Important Dates

Test 1: Thursday, January 31, 2019, 6.30-8.30 PM

Test 2: Thursday, March 7, 2019, 6.30-8.30 PM

Final Exam: Will be held between April 10 and April 26. Date will be scheduled by the Registrar's office.

Assignments will be spaced evenly throughout the term. The turnaround time per assignment is approximately 2 weeks.

Case study debates will be held at the end of the term.

The research paper (for 6708) will be due at the end of the term.

Last date to drop course without financial implications:

January 18

Last date to drop course without a "W": **February 4**

Last date to change from credit to audit: **February 4**

Last date to drop course with a "W": **March 11**

Winter Study Break: **February 18-22**

Munro Day Holiday: **February 1**

Test and Final Exam Requirements

- The tests and final exam will be closed book.
- Please bring a photo ID
- No electronic aids are permitted unless otherwise specified.

Note:

The grade conversion scale specified under Dalhousie's Grade Scale and Definitions

(https://www.dal.ca/campus_life/academic-support/grades-and-student-records/grade-scale-and-definitions.html) will be used.

For CSCI 6708, the minimum passing grade is a B- or 70%.

Course Homepage:

All important course information will be posted on:

<https://web.cs.dal.ca/~srini/security>

All assignment submissions will be on the Dalhousie Brightspace Portal:

<http://dal.ca/brightspace>

Prerequisites

CSCI 4174: Intended for fourth year CS students;

Prerequisite is CSCI 3171 or equivalent.

CSCI 6708: Intended for graduate students. All students must have completed an undergraduate course in networking.

Class Format and Course Communication

- Content will be delivered via a combination of lectures and interactive group exercises.
- Students must ask the instructor permission before recording class lectures.
- Course announcements will be posted on the course website and Brightspace. Some announcements will be sent to the course mail list, which comprises the instructor's and students' Dal emails. It is the student's responsibility to check the websites and their Dal e-mail on a daily basis.

BROAD OVERVIEW OF TOPICS

1. **Review of Networking Concepts:** Quick review of network topologies, TCP/IP, Internet structure.
2. **Introduction:** Classification of attack and hacker types, Techniques and Tools used by the Hacker, Security goals, special focus on denial of service attacks and viruses & other malware
3. **Securing the Network – Firewalls:** Access Control Lists, Gateway Firewalls, Network Address Translation, Emerging trends in firewall design.
4. **Securing the Transaction - Introduction to Cryptography:** Private key encryption, Block ciphers, DES, 3DES, AES; Stream ciphers, public key encryption, RSA, Elliptic curve
5. **Securing the Data Transaction -Digital Signatures:** Authentication and Integrity, Digital Signatures, Secure Hash and Message Digests, Key exchange, Certification
6. **Security Protocols:** IPSec, SSH, SSL, PGP and other security standards.
7. **Virtual Private Networks:** VPN Components and design issues, tunneling mechanisms, VPN Design issues
8. **Wireless Network Security:** Overview of wireless technologies, Security in 802.11 Networks, WEP and its shortcomings, WPA1 and WPA2, Security in Cellular Networks, IPSec-based wireless VPNs
9. **Emerging Areas:** Emerging cyber threats, Biometric Identification, IoT Security, Ransomware
10. **Industry Angle:** Establishing an organization-wide security plan, risk management, cyber ethics, Security operations, Security testing, Asset Security, Identity and Access management, Software Development Security

Note: The above listing is a broad outline of the topics intended to be covered in the course. Topics within each module will be outlined in detail as the course progresses.

LEARNING OUTCOMES

- ◆ Learn the principles and concepts of network security.
- ◆ Discover the principles of securing a network from a systems perspective.
- ◆ Get an insight into attack types, tools and techniques.
- ◆ Understand the principles of the security protocols and standards
- ◆ Discover emerging areas in cyber security.
- ◆ Know the industry-driven aspects of cyber security.

Responsible Computing Policy

Usage of all computing resources in the Faculty of Computer Science must be within the Dalhousie Acceptable Use Policies (<http://its.dal.ca/policies/>) and the Faculty of Computer Science Responsible Computing Policy. For more information please see https://www.cs.dal.ca/downloads/fcs_policy_local.pdf

Use of Plagiarism Detection Software

All submitted code may be passed through a plagiarism detection software, such as the plagiarism detector embedded in Codio, the Moss (<https://theory.stanford.edu/~aiken/moss/>) Software Similarity Detection System, or similar systems. If a student does not wish to have their assignments passed through plagiarism detection software, they should contact the instructor for an alternative. Please note, that code not passed through plagiarism detection software will necessarily receive closer scrutiny. https://cdn.dal.ca/content/dam/dalhousie/pdf/dept/university_secretariat/policy-repository/OriginalitySoftwarePolicy.pdf

Culture of Respect¹

Every person has a right to respect and safety. We believe inclusiveness is fundamental to education and learning. Misogyny and other disrespectful behaviour in our classrooms, on our campus, on social media, and in our community is unacceptable. As a community, we must stand for equality and hold ourselves to a higher standard.

What we all need to do:

1. **Be Ready to Act:** This starts with promising yourself to speak up to help prevent it from happening again. Whatever it takes, summon your courage to address the issue. Try to approach the issue with open-ended questions like “Why did you say that?” or “How did you develop that belief?”
2. **Identify the Behaviour:** Use reflective listening and avoid labeling, name-calling, or assigning blame to the person. Focus the conversation on the behaviour, not on the person. For example, “The comment you just made sounded racist, is that what you intended?” is a better approach than “You’re a racist if you make comments like that.”
3. **Appeal to Principles:** This can work well if the person is known to you, like a friend, sibling, or co-worker. For example, “I have always thought of you as a fair-minded person, so it shocks me when I hear you say something like that.”
4. **Set Limits:** You cannot control another person’s actions, but you can control what happens in your space. Do not be afraid to ask someone “Please do not tell racist jokes in my presence anymore” or state “This classroom is not a place where I allow homophobia to occur.” After you have set that expectation, make sure you consistently maintain it.
5. **Find or be an Ally:** Seek out like-minded people that support your views, and help support others in their challenges. Leading by example can be a powerful way to inspire others to do the same.
6. **Be Vigilant:** Change can happen slowly, but do not let this deter you. Stay prepared, keep speaking up, and do not let yourself be silenced.

¹ Source: Speak Up! © 2005 Southern Poverty Law Center. First Printing. This publication was produced by Teaching Tolerance, a project of the Southern Poverty Law Center. Full “Speak Up” document found at: <http://www.dal.ca/dept/dalrespect.html>. Revised by Susan Holmes from a document provided April 2015 by Lyndsay Anderson, Manager, Student Dispute Resolution, Dalhousie University, 902.494.4140, lyndsay.anderson@dal.ca www.dal.ca/think.

University Statements

This course is governed by the academic rules and regulations set forth in the University Calendar and the Senate.

<https://academiccalendar.dal.ca/Catalog/ViewCatalog.aspx?pageid=viewcatalog&catalogid=69&chapterid=3457&loaduseredits=False>

Academic Integrity

At Dalhousie University, we are guided in all of our work by the values of academic integrity: honesty, trust, fairness, responsibility and respect (The Center for Academic Integrity, Duke University, 1999). As a student, you are required to demonstrate these values in all of the work you do. The University provides policies and procedures that every member of the university community is required to follow to ensure academic integrity. http://www.dal.ca/dept/university_secretariat/academic-integrity.html

Accessibility

The Advising and Access Services Centre is Dalhousie's centre of expertise for student accessibility and accommodation. The advising team works with students who request accommodation as a result of: a disability, religious obligation, or any barrier related to any other characteristic protected under Human Rights legislation (NS, NB, PEI, NFLD). http://www.dal.ca/campus_life/student_services/academic-support/accessibility.html

Student Code of Conduct

Everyone at Dalhousie is expected to treat others with dignity and respect. The Code of Student Conduct allows Dalhousie to take disciplinary action if students don't follow this community expectation. When appropriate, violations of the code can be resolved in a reasonable and informal manner perhaps through a restorative justice process. If an informal resolution can't be reached, or would be inappropriate, procedures exist for formal dispute resolution.

https://www.dal.ca/campus_life/safety-respect/student-rights-and-responsibilities/student-life-policies/code-of-student-conduct.html

Diversity and Inclusion – Culture of Respect

Every person at Dalhousie has a right to be respected and safe. We believe inclusiveness is fundamental to education. We stand for equality. Dalhousie is strengthened in our diversity. We are a respectful and inclusive community. We are committed to being a place where everyone feels welcome and supported, which is why our Strategic Direction prioritizes fostering a culture of diversity and inclusiveness (Strategic Priority 5.2). <http://www.dal.ca/cultureofrespect.html>

Recognition of Mi'kmaq Territory

Dalhousie University would like to acknowledge that the University is on Traditional Mi'kmaq Territory. The Elders in Residence program provides students with access to First Nations elders for guidance, counsel and support. Visit the office in the McCain Building (room 3037) or contact the programs at elders@dal.ca or 902-494-6803 (leave a message).

Learning and Support Resources

- General Academic Support — Advising http://www.dal.ca/campus_life/student_services/academic-support/advising.html
- Fair Dealing Guidelines <https://libraries.dal.ca/services/copyright-office/guidelines/fair-dealing-guidelines.html>
- Dalhousie University Library <http://libraries.dal.ca/>