NORTHWESTERN POLYTECHNIC

DEPARTMENT Of Science

COURSE OUTLINE – Winter 2024

CS4995 (A3): Selected Topics in Computing Science – 3 (3-0-3)

Northwestern Polytechnic acknowledges that our campuses are located on Treaty 8 territory, the ancestral and present-day home to many diverse First Nations, Metis, and Inuit people. We are grateful to work, live and learn on the traditional territory of Duncan's First Nation, Horse Lake First Nation and Sturgeon Lake Cree Nation, who are the original caretakers of this land.

We acknowledge the history of this land, and we are thankful for the opportunity to walk together in friendship, where we will encourage and promote positive change for present and future generations.


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|---|---|---|---|
| INSTRUCTOR: | Dr. Mohamed Elgamal | PHONE: | 780-539-2976 |
| OFFICE: | C306 | E-MAIL: | melgamal@nwpolytech.ca |
| OFFICE HOURS: | WR 10:00-12:00 (by appointment) | | |


## CALENDAR DESCRIPTION:

This course provides a comprehensive coverage of the theory, concept, design principles and technologies for computer and network security. This course will deal with the architecture of secure systems with emphasis on secure networking and secure transfer of information.

## PREREQUISITE(S)/COREQUISITE:

Successful completion of Year 2

## REQUIRED TEXT/RESOURCE MATERIALS:

- Computer Security Principles and Practice, William Stallings and Lawrie Brown, 4th Ed., 2018.
- Network Security Essentials, William Stallings, 6th Edition, 2017.
- Other resources will also be available on BrightSpace.

NORTHWESTERN POLYTECHNIC

**DELIVERY MODE(S):** In-Person, On-Campus

This course includes 3-hours of lecture per week and a 3-hour lab per week.

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| **Lectures:** | G112 | TR | 8:30 – 9:50 |
| **Lab: L1** | G111 | W | 8:30 – 11:20 |

## LEARNING OUTCOMES:

Throughout the course, the students will:

1. Learn about the vulnerabilities of computer systems.
2. Learn about common tools used by the attackers.
3. Apply network security principles to protect information security.
4. Apply theoretical and practical knowledge in secure data transfer and authentication.
5. Describe future trends in the field of network security.

## TRANSFERABILITY:

Please consult the Alberta Transfer Guide for more information. You may check to ensure the transferability of this course at the Alberta Transfer Guide main page http://www.transferalberta.alberta.ca.

** Grade of D or D+ may not be acceptable for transfer to other post-secondary institutions. **Students are cautioned that it is their responsibility to contact the receiving institutions to ensure transferability.**

## EVALUATIONS:

Your final grade will be determined in the following manner:

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|---|---|
| Lab Assignments | 25% |
| Quizzes | 75% |
| Final Exam | No Final Exam |

NORTHWESTERN POLYTECHNIC

Please note that most universities will not accept your course for transfer credit **IF** your grade is **less than C-. Grading Chart:**

| Alpha Grade | 4-point Equivalent | Percentage Guidelines | | Alpha Grade | 4-point Equivalent | Percentage Guidelines |
|---|---|---|---|---|---|---|
| A+ | 4.0 | 95-100 | | C+ | 2.3 | 67-69 |
| A | 4.0 | 85-94 | | C | 2.0 | 63-66 |
| A- | 3.7 | 80-84 | | C- | 1.7 | 60-62 |
| B+ | 3.3 | 77-79 | | D+ | 1.3 | 55-59 |
| B | 3.0 | 73-76 | | D | 1.0 | 50-54 |
| B- | 2.7 | 70-72 | | F | 0.0 | 00-49 |

## COURSE SCHEDULE/TENTATIVE TIMELINE:

1. **Introduction to Network Security –** The basics of a network, Basic network utilities, The OSI model, assessing likely threats to the network, Classification of threats, Likely attacks, Choosing a network security approach.
2. **Types of Attacks –** Understanding denial of service attacks, Defending against buffer overflow attacks and Understanding various malware classes.
3. **Encryption Fundamentals –** The history of encryption, learning about modern encryption methods, identifying good encryption, Understanding digital signatures and certificates, Understanding and using decryption, Cracking passwords, Steganography, Steganalysis.
4. **Fundamentals of Firewalls –** What is a firewall, types of firewalls, selecting and using firewalls, using proxy servers.
5. **Intrusion Detection Systems (IDS) –** Understanding and implementing IDS and honey pots.
6. **Transport Level Security –** Understanding the Internet TLS protocol components and services.
7. **Electronic Mail Security –** Understanding MIME and S/MIME email security protocol and services.
8. **IP Security –** Understanding IPSec protocol to secure Internet traffic at packet level.
9. **Internet Authentication Protocols –** The structure of Kerberos authentication system.
10. **Defending Against Malware –** Definition and classification of malware, understanding virus attacks, virus scanners, antivirus policies and procedures, defending against Trojan horses, spyware and adware.
11. **Wireless Network Security –** Understanding the wireless network security challenges and mechanisms.
12. **Database Security –** Understanding the special requirements of database security.
13. **Digital Forensics**
14. **Techniques Used by Attackers –** Preparing to Hack, The attack phase.

NORTHWESTERN POLYTECHNIC

## STUDENT RESPONSIBILITIES:

Students are responsible for all lecture material, labs and readings. If the final is missed due to illness it will be deferred. A doctor's note or a phone message or email will be required in both cases.

It is the student's responsibility to adhere to ALL requirements of the assignments. Students are expected to arrive on time for both class and lab. If students are consistently late, they may be barred from attending future classes

Assignments MUST be submitted on their due date. Late assignments will NOT be accepted and will receive a grade of 0.

## STATEMENT ON ACADEMIC MISCONDUCT:

Academic Misconduct will not be tolerated. For a more precise definition of academic misconduct and its consequences, refer to the Student Rights and Responsibilities policy available at https://www.nwpolytech.ca/about/administration/policies/index.html.

**Note: all Academic and Administrative policies are available on the same page.

## Additional Information:

Some of the quizzes could be practical tasks to measure the students' skills and will be during the lab or class time.