

## CS 4458B/CS 9636B: Network Security Course Outline

### 1. Course Information

#### Course Information

CS 4458B/9636B: Network Security (Winter 2026)

Lectures: Wednesday, 3:30 PM – 6:30 PM

#### List of Prerequisites

(Computer Science 3305A/B or Software Engineering 3313A/B) and (Computer Science 3357A/B or Electrical and Computer Engineering 4436A/B)

#### List of Antirequisites

2020-2021: CS 4457A/CS 9657A, 2021-2022: CS 4434A/B

Unless you have either the prerequisites for this course or written special permission from the Department of Computer Science to enroll in it, you may be removed and withdrawn from this course in accordance with university policy. This may be done after the add/drop deadline of the academic term, and the course will be marked as withdrawn (WDN) on your academic record. This decision may not be appealed.

### 2. Instructor Information

**Name:** Muhammad Haris Rafique Zakar

**Email:** mzakar@uwo.ca

Students must use their Western ([@uwo.ca](mailto:@uwo.ca)) email addresses when contacting their instructors and TAs.

#### Office Hours

- **Instructor:** Thursday, 9:00 AM – 11:00 AM (Zoom, link will be announced on OWL)
- **Teaching Assistants (TAs):** TBD, will be announced on OWL

### 3. Course Syllabus, Schedule, Delivery Mode

This course will aim to provide a comprehensive understanding of various security issues in today's advanced communication networks. The list of these topics includes message/user authentication, cryptographic key management, web security, TLS, wireless/5G security, e-mail security, DNS security, IPSec, VPN security, Malware, Firewall, network intrusion detection/prediction/prevention, DoS/DDoS, Cloud and IoT Security.

**Course Schedule:** A detailed course schedule is provided below in Table 1.

**Table 1: CS4458/CS9636 Winter 2026 Course Schedule**

Lec. #	Date	Topics	Notes
1	Jan. 7	Course Introduction Overview of ISP Network Architecture - I	
2	Jan. 14	Overview of ISP Network Architecture – II	
	Jan. 14	Assignment #1 Available [4%] (ISP and Network Security)	
	Jan. 14	QUIZ #1 [1.25%] OWL: Starts Jan. 14, 7 PM – Ends Jan. 20, 11:55 PM	Lectures 1 & 2
3	Jan. 21	Intro to Information and Network Security	
	Jan. 21	QUIZ #2 [1.25%] OWL: Starts Jan. 21, 7 PM – Ends Jan. 27, 11:55 PM	Lecture 3
	Jan. 21	Assignment #2 Available [8%] (Authentication / Digital Signatures / Certificates)	
4	Jan. 28	Cryptography, Authentication, Digital Signature, & Certificate – I	
	Jan. 28	QUIZ #3 [1.25%] OWL: Starts Jan. 28, 7 PM – Ends Feb. 3, 11:55 PM	Lecture 4
	Jan. 30	Assignment #1 Due Submission Deadline: Jan. 30, 11:55 PM	
5	Feb. 4	Cryptography, Authentication, Digital Signature, & Certificate – II	
	Feb. 4	QUIZ #4 [1.25%] OWL: Starts Feb. 4, 7 PM – Ends Feb. 10, 11:55 PM	Lecture 5
	Feb. 4	Assignment #3 Available [6%] (Authentication / Digital Signatures / Certificates)	
	Feb. 11	<b>MIDTERM [UG only, 15%, Room: TBA]</b> In-person Exam (1.5 hours)	Lectures 1-5
	Feb. 18	<b>READING WEEK – NO CLASSES</b>	
	Feb. 23	Grad Research Project Proposal Report Due [10%] Submission Deadline: Feb. 23, 11:55 PM	

<b>6</b>	Feb. 25	Web Security, TLS, Wireless security – I	
	Feb. 25	QUIZ #5 [1.25%] OWL: Starts Feb. 25, 7 PM – Ends Mar. 3, 11:55 PM	Lecture 6
	Feb. 25	Assignment #4 Available [5%] (Network Traffic Anomalies)	
	Feb. 27	Assignment #2 Due Submission Deadline: Feb. 27, 11:55 PM	
<b>7</b>	Mar. 4	Web Security, TLS, Wireless security – II	
	Mar. 4	QUIZ #6 [1.25%] OWL: Starts Mar. 4, 7 PM – Ends Mar. 10, 11:55 PM	Lecture 7
	Mar. 6	Assignment #3 Due Submission Deadline: Mar. 6, 11:55 PM	
<b>8</b>	Mar. 11	E-mail Security, DNS, IPSec, VPN	
	Mar. 11	QUIZ #7 [1.25%] OWL: Starts Mar. 11, 7 PM – Ends Mar. 17, 11:55 PM	Lecture 8
	Mar. 11	Assignment #5 Available [7%] (Network Security Architecture and Design Principles)	
<b>9</b>	Mar. 18	Malware, Firewall, NIDS, DoS/DDoS	
	Mar. 18	QUIZ #8 [1.25%] OWL: Starts Mar. 18, 7 PM – Ends Mar. 24, 11:55 PM	Lecture 9
	Mar. 20	Assignment #4 Due Submission Deadline: Mar. 20, 11:55 PM	
<b>10</b>	Mar. 25	Cloud Security	
	Mar. 25	QUIZ #9 [1.25%] OWL: Starts Mar. 25, 7 PM – Ends Mar. 31, 11:55 PM	Lecture 10
<b>11</b>	Apr. 1	IoT Security	
	Apr. 1	QUIZ #10 [1.25%] OWL: Starts Apr. 1, 7 PM – Ends Apr. 7, 11:55 PM	Lecture 11
	Apr. 2	Assignment #5 Due Submission Deadline: Apr. 2, 11:55 PM	
<b>12</b>	Apr. 8	Content Review (Q&A)	
	TBA	<b>UG FINAL EXAM [45%]</b> In-person Exam (3 hours)	Lectures 1-11
	Apr. 16	Final Research Paper (Grad Students) Due [45%] Submission Deadline: Apr. 16, 11:55 PM	
	Apr. 17	Grad Research Project Presentations [5%] (Presented Online using Zoom)	

**Course Delivery Mode:** The delivery mode of this course will be in-person. Lecture materials/slides will be made available on OWL Brightspace prior to each lecture. The instructor's and TA office hours will be offered over Zoom. Quizzes will be conducted via OWL's Test and Quizzes. Midterm and Final exams will be in-person. Assignments submissions will be via OWL's Assignments.

**Key Sessional Dates:**

- Classes Begin: Jan. 5, 2026
- Spring Reading Week: Feb. 14 – 22, 2026
- Classes End: Apr. 9, 2026
- Exam Period: Apr. 12 – 30, 2026

**Contingency Plan:** Although the intent is for this course to be delivered in person, should any university-declared emergency require some or all of the course to be delivered online, either synchronously or asynchronously, the course will adapt accordingly. The grading scheme will not change. Any assessments affected will be conducted online as determined by the course instructor.

## 4. Course Materials

**Suggested Textbook:** The following book is recommended for this course.

- William Stallings, "Cryptography and Network Security: Principles and Practice", 8th edition, Pearson, 2020, Print ISBN: 9780135764039, 0135764033

**Costs of Textbooks and Other Learning Materials/Activities**

- Suggested Textbook: \$128.34 on Amazon

**Lecture Notes:**

- Will be made available on OWL Brightspace prior to each class.

All course material will be posted to OWL: <https://westernu.brightspace.com/>.

Students are responsible for checking the course OWL site (<https://westernu.brightspace.com/>) regularly for news and updates. This is the primary method by which information will be disseminated to all students in the class.

If students need assistance with the course OWL site, they can seek support on the [OWL Brightspace Help](#) page. Alternatively, they can contact the Western Technology Services Helpdesk. They can be contacted by phone at 519-661-3800 or ext. 83800.

## 5. Methods of Evaluation

### Undergraduate Students

There are four components (assignments, quizzes, midterm, and final exam) that will be used to determine the grade of undergraduate students in the course:

- 5 Assignments (worth a total of **30%** of the overall grade)
  - Assignment #1 [**4%**]: Jan. 30, 2026
  - Assignment #2 [**8%**]: Feb. 27, 2026
  - Assignment #3 [**6%**]: Mar. 6, 2026
  - Assignment #4 [**5%**]: Mar. 20, 2026
  - Assignment #5 [**7%**]: Apr. 2, 2026
- 10 Quizzes (worth a total of **10%** of the overall grade; the best **8** out of **10** quizzes will be considered)
  - Each quiz will be worth **1.25%** of the overall grade.
- Midterm Exam (worth **15%** of the overall grade)
  - Feb. 11, 2026 (1.5 hours)
- Final Exam (worth **45%** of the overall grade)
  - During April examination period, date TBA (3 hours)

### Graduate Students

There are three components (assignments, quizzes, and research project) that will be used to determine the grade of graduate students in the course:

- 5 Assignments (worth a total of **30%** of the overall grade)
  - Assignment #1 [**4%**]: Jan. 30, 2026
  - Assignment #2 [**8%**]: Feb. 27, 2026
  - Assignment #3 [**6%**]: Mar. 6, 2026
  - Assignment #4 [**5%**]: Mar. 20, 2026
  - Assignment #5 [**7%**]: Apr. 2, 2026
- 10 Quizzes (worth a total of **10%** of the overall grade; the best **8** out of **10** quizzes will be considered)
  - Each quiz will be worth **1.25%** of the overall grade.
- Final Research Project (worth a total of **60%** of the overall grade)
  - Project Proposal [**10%**]: Feb. 23, 2026
  - Research Paper [**45%**]: Apr. 16, 2026
  - Project Presentation [**5%**]: Apr. 17, 2026

\* For the list of topics covered in each test, examination, and assignment, refer to Table 1. Table 2 provides a summary of the individual course components for both undergraduate and graduate students.

**Table 2: Summary of Course Components and Grade Weighting**

Course Component	Student Group	Description	Grade Weight
Assignments	UG & Graduate	A total of five assignments; two written and three programming.	30%
Quizzes	UG & Graduate	A total of ten quizzes of true/false and multiple-choice questions.	10%
Midterm	UG	Mixed Format	15%
Final Exam	UG	Mixed Format (to be administered by the Registrar's office)	45%
Research Project Proposal	Graduate	2-3 page research project proposal. Group effort.	10%
Research Paper	Graduate	10-15 page research paper. Group effort.	45%
Project Presentation	Graduate	20-minute research presentation. Group effort.	5%

**Notes:**

- Assignments:** Must be submitted through OWL by the deadline specified. Late assignments may be handed in but will be accepted for up to two days after the due date, with a penalty of 20% a day. Weekends will be counted as a single day. Late coupons can also be used as outlined below. Every effort will be made to have assignments marked and handed back within ten business days of the due date, preferably sooner.
- Grad Research Project Proposal:** Graduate students are expected to write a research proposal to outline their final research papers. This proposal paper could be a 2 to 3 page that includes (a) the specific research problem that students are planning to explore and why this is an important area to explore; (b) related work (other research works in this area); (c) proposed research plan (an outline of the solution to address the research problem). Students are required to work in a group (with other graduate students) for their projects. A sample research proposal will be provided to students.
- Grad Final Research Project Paper:** Based on the research proposal submitted by the graduate students, they are expected to work on a full-fledged research paper of 10 to 15 pages in length (11 pt, Times New Roman font, single spaced). This research paper should include: (a) the problem statement; (b) relevant/related work, (c) a detailed description of the proposed idea/solution/framework; (e) validation of the proposed solution through experimental results and analysis; and (f) Conclusion, limitations, and future works.

Guidelines on research proposals, final projects, and presentations will be discussed in class, and the necessary information will be available on OWL. Graduate students will be allowed to submit their final research paper by April 16, 2026.

## Use of Generative AI Tools

In this course, the use of generative AI tools (e.g., ChatGPT, Copilot, and Gemini) is permitted only for brainstorming. They may not be used to produce or revise any final written assignments. If students choose to use AI tools during the brainstorming stage, they must include a brief written summary explaining how the tools were used and to what extent. For all programming assignments, the use of generative AI tools is strictly prohibited.

## General information about missed coursework

Students must familiarize themselves with the *University Policy on Academic Consideration – Undergraduate Students in First Entry Programs*, posted on the Academic Calendar: [https://www.uwo.ca/univsec/pdf/academic\\_policies/appeals/academic\\_consideration\\_Sep24.pdf](https://www.uwo.ca/univsec/pdf/academic_policies/appeals/academic_consideration_Sep24.pdf).

This policy does not apply to requests for Academic Consideration submitted for **attempted or completed work**, whether online or in person.

The policy also does not apply to students experiencing longer-term impacts on their academic responsibilities. These students should consult [Accessible Education](#).

For procedures on how to submit Academic Consideration requests, please see the information posted on the Office of the Registrar's webpage:

[https://registrar.uwo.ca/academics/academic\\_considerations/](https://registrar.uwo.ca/academics/academic_considerations/)

All requests for Academic Consideration must be made within 48 hours after the assessment date or submission deadline.

All Academic Consideration requests must include supporting documentation; however, recognizing that formal documentation may not be available in some extenuating circumstances, the policy allows students to make one Academic Consideration request **without supporting documentation** in this course. However, the following assessments are excluded from this, and therefore always require formal supporting documentation:

- Examinations scheduled during official examination periods (Defined by policy)
- Midterm Exam (Designated by the instructor as the one assessment that always requires documentation when requesting Academic Consideration)

When a student mistakenly submits their one allowed Academic Consideration request **without supporting documentation** for the assessments listed above or those in the **Coursework with Assessment Flexibility** section below, the request cannot be recalled and reapplied. This privilege is forfeited.

## Evaluation Scheme for Missed Assessments

There will be no makeup for the Quizzes or the Midterm Exam. If you miss a Quiz or the Midterm Exam, follow the procedure for Academic Consideration detailed above.

- Note that a student may miss up to two quizzes without any grade penalty since the best 8 out of 10 are considered. For subsequent missed quizzes with approved absence, the grade will be calculated based on the average of the other completed quizzes.
- For students with approved absence for missing the Midterm, the weight of the Midterm (i.e., 15%) will be added to the weight of the Final Exam (i.e.,  $45\% + 15\% = 60\%$ ).

Assignments allow for built-in flexibility as outlined below. Assignments can be submitted up two days after the submission deadline with a penalty of 20% per day, with weekends counting as one day. Late

coupons (described in more detail below) can be used by students as a one-day extension for the assignment without penalty.

When a student misses the Final Exam and their Academic Consideration has been granted, they will be allowed to write the Special Examination (the name given by the University to a makeup Final Exam). See the Academic Calendar for details (under [Special Examinations](#)), especially for those who miss multiple final exams within one examination period.

### **Essential Learning Requirements**

Even when Academic Considerations are granted for missed coursework, the following are deemed essential to earn a passing grade.

These rules ensure that students demonstrate sufficient mastery of the learning outcomes.

### **Undergraduate Students**

- To be eligible to pass the course, a student must receive **at least 40%** in the exam components (i.e., 40% of 70) and **at least 40%** in the assignments (i.e., 40% of 30).
- To be eligible to receive an overall grade of **60% or higher** in the course, a student must receive **at least 50%** in the exam components (i.e., 50% of 70) and **at least 50%** in the assignments (i.e., 50% of 30).

### **Graduate Students**

- To be eligible to pass the course, a student must receive **at least 40%** in the exam (i.e., quizzes) components (i.e., 40% of 10), **at least a 40%** in the assignments (i.e., 40% of 30), and **at least 40%** in the research project components (i.e., 40% of 60).
- To be eligible to receive an overall **grade of 60%** or higher in the course, a student must receive **at least 50%** in the exam (i.e., quizzes) component (i.e., 50% of 10), **at least 50%** in the assignments (i.e., 50% of 30), and **at least 50%** in the research project component (i.e., 50% of 60).

### **Coursework with Assessment Flexibility**

By policy, instructors may deny Academic Consideration requests for the following assessments with built-in flexibility:

- **Quizzes:** This course has 10 quizzes, and the 8 quizzes with the highest marks are counted towards your final grade. Should extenuating circumstances arise, students do not need to request Academic Consideration for the first 2 missed quizzes. Academic Consideration requests will be denied for the first 2 missed quizzes. If you miss more than two quizzes due to illness or other serious circumstances, you must request academic consideration using the Student Absence Portal (SAP) with valid medical or supporting documentation as soon as possible. All requests for academic consideration must be made within 48 hours after the assessment date or submission deadline. If the request for academic consideration is approved, your missed quiz mark will be calculated based on the average mark of the rest of the quizzes.
- **Assignments:** For Assignments, late assignments may be handed in, but they will be accepted for up to two days after the due date, with a penalty of 20% a day. Weekend will be counted as a single day. In addition, you have 2 late coupons that will automatically give leniency with due dates. If

you require additional time with assignments (after your late coupons run out) due to illness or other serious circumstances, you must request academic consideration using the Student Absence Portal (SAP) with valid medical or supporting documentation as soon as possible. All requests for academic consideration must be made within 48 hours after the assessment date or submission deadline.

- **Late Coupons:** Each student is given 2 “late coupons”. Each coupon can be thought of as a potential one-day assignment extension. It is entirely up to you to decide when to use your coupons; more than one coupon may be used per assignment. You will hand in the coupon(s) together with the assignment (you must mention this on OWL when you submit your assignment), and the number of coupons you use will be recorded. The rules for late coupons are the following:
  - Coupons are not transferable to another student.
  - Once a coupon has been used, you cannot “take it back” to use for another assignment instead.
  - Coupons cannot be redeemed retroactively. (If an assignment has been marked, a coupon cannot later be used to reduce the late penalty.)
  - Unused coupons are not redeemable for extra marks.
  - Using a late coupon does not change the final date on which an assignment will be accepted. Whether or not coupons are used, the assignment must be handed in within 2 days of the original due date.

## 6. Additional Statements

### 6.1 Religious Accommodation

When conflicts arise with a religious holiday that requires an absence from the University or prohibits certain activities, students should request an accommodation for their absence in writing to the course instructor and/or the Academic Advising office of their Faculty of Registration. This notice should be made as early as possible, but not later than two weeks prior to the writing of the examination (or one week prior to the writing of the test).

Please visit the Diversity Calendars posted on our university’s EDID website for the recognized religious holidays - <https://www.edi.uwo.ca>

### 6.2 Academic Accommodation Policies

Students with disabilities are encouraged to contact Accessible Education, which provides recommendations for accommodation based on medical documentation or psychological and cognitive testing. The policy on Academic Accommodation for Students with Disabilities can be found at:

[https://www.uwo.ca/univsec/pdf/academic\\_policies/appeals/Academic\\_Accommodation\\_disabilities.pdf](https://www.uwo.ca/univsec/pdf/academic_policies/appeals/Academic_Accommodation_disabilities.pdf).

### 6.3 General Academic Policies

The website for Registrar Services is <https://www.registrar.uwo.ca/>.

**Use of @uwo.ca email:** In accordance with policy,

[https://www.uwo.ca/univsec/pdf/policies\\_procedures/section1/mapp113.pdf](https://www.uwo.ca/univsec/pdf/policies_procedures/section1/mapp113.pdf), the centrally administered e-mail account provided to students will be considered the individual’s official university email address.

It is the responsibility of the account holder to ensure that emails received from the University at their official university address are attended to in a timely manner.

### **Requests for Relief** (formally known as “appeals”)

Policy on Request for Relief from Academic Decision:

[https://uwo.ca/univsec//pdf/academic\\_policies/appeals/requests\\_for\\_relief\\_from\\_academic\\_decisions.pdf](https://uwo.ca/univsec//pdf/academic_policies/appeals/requests_for_relief_from_academic_decisions.pdf)

Procedures on Request for Relief from Academic Decision (Undergraduate):

[https://uwo.ca/univsec//pdf/academic\\_policies/appeals/undergrad\\_requests\\_for\\_relief\\_procedure.pdf](https://uwo.ca/univsec//pdf/academic_policies/appeals/undergrad_requests_for_relief_procedure.pdf)

Procedures on Request for Relief from Academic Decision (Graduate):

[https://uwo.ca/univsec//pdf/academic\\_policies/appeals/graduate\\_requests\\_for\\_relief\\_procedure.pdf](https://uwo.ca/univsec//pdf/academic_policies/appeals/graduate_requests_for_relief_procedure.pdf)

### **6.4 Scholastic Offences**

Policy on Scholastic Offences:

[https://uwo.ca/univsec//pdf/academic\\_policies/appeals/scholastic\\_offences.pdf](https://uwo.ca/univsec//pdf/academic_policies/appeals/scholastic_offences.pdf)

Procedures on Scholastic Offences (Undergraduate):

[https://uwo.ca/univsec//pdf/academic\\_policies/appeals/undergrad\\_scholastic\\_offence\\_procedure.pdf](https://uwo.ca/univsec//pdf/academic_policies/appeals/undergrad_scholastic_offence_procedure.pdf)

Procedures on Scholastic Offences (Graduate):

[https://uwo.ca/univsec//pdf/academic\\_policies/appeals/graduate\\_scholastic\\_offence\\_procedure.pdf](https://uwo.ca/univsec//pdf/academic_policies/appeals/graduate_scholastic_offence_procedure.pdf)

### **Use of Electronic Devices During Assessments**

In courses offered by the Faculty of Science, the possession of unauthorized electronic devices during any in-person assessment (such as tests, midterms, and final examinations) is strictly prohibited. This includes, but is not limited to: mobile phones, smart watches, smart glasses, and wireless earbuds or headphones.

Unless explicitly stated otherwise in advance by the instructor, the presence of any such device at your desk, on your person, or within reach during an assessment will be treated as a *scholastic offence*, even if the device is not in use.

Only devices expressly permitted by the instructor (e.g., non-programmable calculators) may be brought into the assessment room. It is your responsibility to review and comply with these expectations.

### **Use of Generative AI Tools**

Unless otherwise stated, the use of generative AI tools (e.g., ChatGPT, Microsoft Copilot, Google Gemini, or similar platforms) is **not permitted** in the completion of any course assessments, including but not limited to: assignments, lab reports, presentations, tests, and final examinations.

Using such tools for content generation, code writing, problem solving, translation, or summarization—when not explicitly allowed—will be treated as a **scholastic offence**.

If the use of generative AI is permitted for a particular assessment, the conditions of use will be specified by the instructor in advance. If no such permission is granted, students must assume that use is prohibited. It is your responsibility to seek clarification before using any AI tools in academic work.

All required papers may be subject to submission for textual similarity review to the commercial plagiarism detection software under license to the University for the detection of plagiarism. All papers submitted for such checking will be included as source documents in the reference database for the

purpose of detecting plagiarism of papers subsequently submitted to the system. Use of the service is subject to the licensing agreement, currently between The University of Western Ontario and Turnitin.com (<http://www.turnitin.com>).

Computer-marked multiple-choice tests and exams may be subject to submission for similarity review by software that will check for unusual coincidences in answer patterns that may indicate cheating.

## **6.5 Support Services**

Please visit the Science & Basic Medical Sciences Academic Advising webpage for information on adding/dropping courses, academic considerations for absences, requests for relief, exam conflicts, and many other academic-related matters: <https://www.uwo.ca/sci/counselling/>.

Students who are in emotional/mental distress should refer to Mental Health@Western (<https://uwo.ca/health/>) for a complete list of options about how to obtain help.

Western is committed to reducing incidents of gender-based and sexual violence and providing compassionate support to anyone who has gone through these traumatic events. If you have experienced sexual or gender-based violence (either recently or in the past), you will find information about support services for survivors, including emergency contacts at

[https://www.uwo.ca/health/student\\_support/survivor\\_support/get-help.html](https://www.uwo.ca/health/student_support/survivor_support/get-help.html).

To connect with a case manager or set up an appointment, please contact [support@uwo.ca](mailto:support@uwo.ca).

Please contact the course instructor if you require lecture or printed material in an alternate format or if any other arrangements can make this course more accessible to you. If you have any questions regarding accommodations, you may also wish to contact Accessible Education at

[http://academicsupport.uwo.ca/accessible\\_education/index.html](http://academicsupport.uwo.ca/accessible_education/index.html)

Learning-skills counsellors at Learning Development and Success (<https://learning.uwo.ca>) are ready to help you improve your learning skills. They offer presentations on strategies for improving time management, multiple-choice exam preparation/writing, textbook reading, and more. Individual support is offered throughout the Fall/Winter terms in the drop-in Learning Help Centre, and year-round through individual counselling.

Western University is committed to a thriving campus as we deliver our courses in the mixed model of both virtual and face-to-face formats. We encourage you to check out the Digital Student Experience website to manage your academics and well-being: <https://www.uwo.ca/se/digital/>.

Additional student-run support services are offered by the USC, <https://westernusc.ca/services/>.