

Host-Pathogen Interactions Syllabus

Department of Microbiology and Immunology

MICI4119 Fall 2025

Dalhousie University operates in the unceded territories of the Mi'kmaw, Wolastoqey, and Peskotomuhkati Peoples. These sovereign nations hold inherent rights as the original peoples of these lands, and we each carry collective obligations under the Peace and Friendship Treaties. Section 35 of the Constitution Act, 1982, recognizes and affirms Aboriginal and Treaty rights in Canada.

We recognize that African Nova Scotians are a distinct people whose histories, legacies, and contributions have enriched the part of Mi'kma'ki known as Nova Scotia for over 400 years.

Course Instructor(s)

Name	Email	Office Hours
Zhenyu Cheng	zhenyu.cheng@dal.ca	Contact by email

Course Description

This is an advanced undergraduate course that will focus on how pathogens modify, disrupt or utilize cellular functions for their own purposes and the significance of these interactions in terms of both pathogenesis and host cell biology. This capstone undergraduate course provides the students with an opportunity to have a comprehensive understanding of the host immune response and pathogen as an integrated system. This course helps students to learn how to critically evaluate the scientific literature, develop hypotheses and design experiments to test these hypotheses in the field of Microbiology and Immunology. Students will also gain a working knowledge of many of the techniques currently being used to study host-pathogen interactions.

Course Prerequisites

Students must have taken two out of 3 of the following: MICI 3114, MICI 3115, MICI 3119, or receive permission from the instructor. (a B average in these classes with a minimum B- in any one).

Course Exclusions

None.

Student Resources

See the end of this document.

Course Structure

Course Delivery

In-person in Dentistry 2537

In-person lectures will NOT be recorded

Lectures

Monday, Wednesday, and Friday/9:35 to 10:25am

Laboratories

None.

Tutorials

None.

Course Materials

Not applicable.

Assessment

Assessment	Weight (% of final grade)	Date
Two in-class exams	50% (20% mid-term; 30% final)	Decided and updated in class
Two summaries	10% (5% each)	Decided and updated in class
Two oral presentations	30% (15% each)	Decided and updated in class
Participation	10%	Sent with final marks
<i>Other course requirements</i>		
<i>N/A.</i>		

Conversion of numerical grades to final letter grades follows the

[Dalhousie Grade Scale](#)

A+ (90-100)	B+ (77-79)	C+ (65-69)	D (50-54)
A (85-89)	B (73-76)	C (60-64)	F (0-49)
A- (80-84)	B- (70-72)	C- (55-59)	

Course Policies on Missed or Late Academic Requirements

- *Arrange with the coordinator for a make up assignments.*
- *Students are expected to use the Student Declaration of Absence form for late or missed requirements during the term. They may use the form for a maximum of 2 times in this course.*

Course Policies related to Academic Integrity

Students are expected to work on their assignments individually and independently.

No plagiarism software will be used in course. It is strongly recommended that you include a statement about your expectations around generative AI and large language models (e.g., ChatGPT).

Learning Objectives

Lecturers provide overview presentations that will cover foundational concepts of host immune responses and clinical implications. Subsequent sessions involve oral presentations by students covering different aspects of individual research articles in the field of Infection and Immunity. Students will learn how to critically evaluate the scientific literature, develop hypotheses and design experiments to test these hypotheses. Students will also gain a working knowledge of many of the techniques currently being used to study host-pathogen interactions. Specific learning outcomes include:

- *Understand the concept of host-pathogen interactions*
- *Understand the definition of a pathogen and know Koch's Postulates and Falkow's "Molecular Koch's Postulates"*
- *Understand the environmental cues that pathogens use to regulate virulence gene expression.*
- *Know standard methodology for the identification and study of virulence factors and host immunity.*
- *Describe the role of the human microbiome in health and disease and understand the basic principles of how microbiomes are studied.*
- *Discuss emerging pathogens and how human activity creates and destroys niches for pathogens.*
- *Explain the mechanisms behind adaptive response to selected environmental challenges faced by pathogens.*

Course Content

(to be fit into timetable of available dates and may be subject to changes).

There are two parts in this course. Ten lectures will be given by the instructor and provide overview presentations that will cover foundational concepts, while of host immune responses and clinical implications. Subsequent sessions involve oral presentations by students covering different aspects of individual research articles supplied by the faculty and of their own selections.

Each student will complete two oral presentations. Each oral presentations will be 25 minutes, and worth 15% of the final grade (2 presentations total, 15% each). Oral presenters will be evaluated by a variety of criteria, including understanding, communication and thoughtful critical analysis. Sample presentation will be given by the instructor.

To encourage students to carefully read the papers, and to allow students an opportunity to improve their concise scientific writing skills, students hand in two summaries of the paper to be selected from the presented paper from other presenters (two-page maximum, double-spaced). The summaries are due in class before the papers, based on which the summaries will be written, are presented. One summary is due before mid-term and the other is due before last presentation. These paper summaries will be marked by the instructor, and comprise 10% of their final grade (2 summaries total, 5% per summary).

Guidelines for oral presentations, chalk talks, and written exercises will be provided.

To encourage class discussion and audience participation, 10% of the final grade is awarded for participation.

There will be two in-class exams: one mid-term and one final. The mid-term exam will test the student's basic knowledge of host-microbe interaction that will be covered by the contents of the ten lectures given by the instructor. The final exam will test key concepts of infection and immunity that will be discussed during the presentations given by the students. In addition, experimental design questions to study specific topics in host microbe interaction will be included for the students to develop problem solving abilities.

Part I. Ten lectures on key Microbiology and Immunology concepts

1. *Course overview. Molecular pathogenesis, what is it? What is a pathogen? Koch's Postulate's and Falkow's Molecular Postulates example presentation. Genomes in conflict, mutation and adaptation: Red Queen hypothesis.*
2. *Host-pathogen interactions: break the chain of infections*
3. *Bacterial virulence mechanisms Pseudomonas aeruginosa*
4. *Bacterial virulence mechanisms Pseudomonas aeruginosa*
5. *Bacterial pathogenesis: Gram positive bacteria*
6. *Bacterial pathogenesis: Intracellular bacteria*
7. *Viral pathogenesis: Influenza A virus and HIV*
8. *Immune cells and inflammatory response*
9. *Dysbiosis and microbiomes in disease and health*
10. *Pattern triggered immunity and immune signaling network*

Part II. Two rounds of student presentations

1. *Each student will complete a first round of powerpoint presentations on pre-selected research articles from journals in the field of host microbe interactions (i.e. Cell Host & Microbe, PLoS Pathogens, or Nature Microbiology).*

The list of selected papers will be given out at the beginning of the course. The papers pre-selected by the instructor will ensure the quality of the publication, the appropriate fit to the scope of the course, the sufficient coverage of diverse topics in the field.

Each presentation will be 25-minute long. Feedback will be provided to the students after the presentation.

2. *Each student will complete a second round of chalk talk presentations on student-selected papers. A different format of presentation will be used in this round. Chalk talk presentations will enhance the students' ability to think on their feet and to clearly delivery key information covering background, method, results, and discussion in a brief and organized manner.*

Each presentation will be 25-minute long. Sample presentation will be given at the beginning of the round. Feedback will be provided to the students after the presentation.

Each student will select their paper to present and get approval by the instructor. The instructor will compile the list of papers to be presented in the chalk talks and send out the list at the beginning of this round of presentation.

#	Dates	Lectures	Lecturers/summary
1	W, Sept 3	Course Introduction Course objective and overview of the host-pathogen interactions	Cheng
2	F, Sept 5	Lecture 1. Host-Pathogen Interactions	Cheng
3	M, Sept 8	Lecture 2. Host-Pathogen Interactions	Cheng
4	W, Sept 10	Lecture 3. <i>Pseudomonas aeruginosa</i>	Cheng
5	F, Sept 12	Lecture 4. <i>Pseudomonas aeruginosa</i>	Cheng
6	M, Sept 15	Lecture 5. Gram-positive pathogens	Cheng
7	W, Sept 17	Lecture 6. Immunology overview	Cheng
8	F, Sept 19	Lecture 7. Virology	Khaperskyy
9	M, Sept 22	Lecture 8. Microbiome	Langille
10	W, Sept 24	Review Q&A for mid-term, scholarship introduction	Cheng
11	F, Sept 26	Sample powerpoint presentation	Cheng
12	M, Sept 29	Mid-term	
13	W, Oct 1	Powerpoint presentation 1	
14	F, Oct 3	Powerpoint presentation 2	
	M, Oct 6	Powerpoint presentation 3	
15	W, Oct 8	Powerpoint presentation 4	
16	F, Oct 10	Powerpoint presentation 5	
17	M, Oct 13	No class, Thanksgiving Holiday	
18	W, Oct 15	Powerpoint presentation 6	
19	F, Oct 17	Powerpoint presentation 7	
20	M, Oct 20	Powerpoint presentation 8	
21	W, Oct 22	Review 1 st round of presentations	Class
22	F, Oct 24	Sample chalk talk presentation	Cheng
23	M, Oct 27	Review, scholarship, career development	Cheng
24	W, Oct 29	chalk talk 1	
25	F, Oct 31	Chalk talk 2	
26	M, Nov 3	Chalk talk 3	
27	W, Nov 5	Chalk talk 4	
28	F, Nov 7	Chalk talk 5	
29	M, Nov 10	Study break	
30	M, Nov 17	Chalk talk 6	
31	W, Nov 19	Chalk talk 7	
32	F, Nov 21	Chalk talk 8	
33	M, Nov 24	Review	Cheng
34	W, Nov 26	Review	Cheng
35	F, Nov 28	Review	Cheng
36	M, Dec 1	Q&A	Cheng
37	W, Dec 3	Final Exam	Class

University Policies and Statements

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 or e-mail the Indigenous Student Centre at 1321 Edward St or elders@dal.ca. Additional information regarding Mi'kmaq and Indigenous Relations (including the Elders in Residence program, Land Acknowledgements, Understanding Our Roots, and much more) can be found at: <https://www.dal.ca/about/mission-vision-values/mikmaq-indigenous-relations.html>

Internationalization

At Dalhousie, 'thinking and acting globally' enhances the quality and impact of education, supporting learning that is "interdisciplinary, cross-cultural, global in reach, and orientated toward solving problems that extend across national borders." Additional internationalization information can be found at: <https://www.dal.ca/about/mission-vision-values/global-relations.html>

Academic Integrity

At Dalhousie University, we are guided in all our work by the values of academic integrity: honesty, trust, fairness, responsibility, and respect. As a student, you are required to demonstrate these values in all 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. Additional academic integrity information can be found at: https://www.dal.ca/dept/university_secretariat/academic-integrity.html

Accessibility

The Student Accessibility Centre is Dalhousie's centre of expertise for matters related to student accessibility and accommodation. If there are aspects of the design, instruction, and/or experiences within this course (online or in-person) that result in barriers to your inclusion, please contact the Student Accessibility Centre (https://www.dal.ca/campus_life/academic-support/accessibility.html) for all courses offered by Dalhousie with the exception of Truro. For courses offered by the Faculty of Agriculture, please contact the Student Success Centre in Truro (https://www.dal.ca/campus_life/ssc.html).

Conduct in the Classroom – Culture of Respect

Substantial and constructive dialogue on challenging issues is an important part of academic inquiry and exchange. It requires willingness to listen and tolerance of opposing points of view. Consideration of individual differences and alternative viewpoints is required of all class members, towards each other, towards instructors, and towards guest speakers. While expressions of differing perspectives are welcome and encouraged, the words and language used should remain within acceptable bounds of civility and respect.

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). Additional diversity and inclusion information can be found at: <https://www.dal.ca/about/mission-vision-values/equity-diversity-inclusion-and-accessibility/about-office-equity-inclusion.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. The full Code of Student Conduct can be found at:

<https://www.dal.ca/content/dam/www/about/leadership-and-governance/governing-bodies/code-student-conduct.pdf>

Fair Dealing Policy

The Dalhousie University Fair Dealing Policy provides guidance for the limited use of copyright protected material without the risk of infringement and without having to seek the permission of copyright owners. It is intended to provide a balance between the rights of creators and the rights of users at Dalhousie. Additional information regarding the Fair Dealing Policy can be found at: <https://www.dal.ca/content/dam/www/about/leadership-and-governance/university-policies/fair-dealing-policy.pdf>

Student Use of Course Materials

Course materials are designed for use as part of this course at Dalhousie University and are the property of the instructor unless otherwise stated. Third party copyrighted materials (such as books, journal articles, music, videos, etc.) have either been licensed for use in this course or fall under an exception or limitation in Canadian Copyright law. Copying this course material for distribution (e.g. uploading to a commercial third-party website) may lead to a violation of Copyright law.

Faculty of Science

Student Resources and Support

University Policies and Programs

Important Dates in the Academic Year (including add/drop dates):

http://www.dal.ca/academics/important_dates.html

Classroom Recording Protocol: <https://www.dal.ca/content/dam/www/about/leadership-and-governance/university-policies/class-recording-protocol.pdf>

Dalhousie Grading Practices Policies:

<https://www.dal.ca/content/dam/www/about/leadership-and-governance/university-policies/grading-practices-policy.pdf>

Grade Appeal Process: https://www.dal.ca/campus_life/academic-support/grades-and-student-records/appealing-a-grade.html

Sexualized Violence Policy: <https://www.dal.ca/content/dam/www/about/leadership-and-governance/university-policies/sexualized-violence-policy.pdf>

Scent-Free Program: <https://www.dal.ca/dept/safety/programs-services/occupational-safety/scent-free.html>

Learning and Support Resources

General Academic Support – Advising (Halifax): https://www.dal.ca/campus_life/academic-support/advising.html

General Academic Support – Advising (Truro): https://www.dal.ca/campus_life/ssc.html

Student Health & Wellness Centre: https://www.dal.ca/campus_life/health-and-wellness.html

On Track (helps you transition into university, and supports you through your first year at Dalhousie and beyond): https://www.dal.ca/campus_life/academic-support/On-track.html

Indigenous Student Centre: https://www.dal.ca/campus_life/communities/indigenous.html

Mi'kmaq and Indigenous Relations: <https://www.dal.ca/about/mission-vision-values/mikmaq-indigenous-relations.html>

Elders-in-Residence (The Elders in Residence program provides students with access to First Nations elders for guidance, counsel, and support. Visit the office in the Indigenous Student Centre or contact the program at elders@dal.ca or 902-494-6803: <https://www.dal.ca/about/mission-vision-values/mikmaq-indigenous-relations/elders-in-residence-and-traditional-knowledge-keepers.html>

Black Student Advising Centre: https://www.dal.ca/campus_life/communities/black-student-advising.html

International Centre: https://www.dal.ca/campus_life/international-centre.html

LGBTQ2SIA+ Collaborative: <https://www.dal.ca/about/mission-vision-values/equity-diversity-inclusion-and-accessibility/about-office-equity-inclusion/community-specific-groups/lgbtq2sia-collaborative.html>

Dalhousie Libraries: <http://libraries.dal.ca/>

Copyright Office: <https://libraries.dal.ca/services/copyright-office.html>

Dalhousie Student Advocacy Services: <https://www.dsu.ca/dsas?rq=student%20advocacy>

Dalhousie Ombudsperson: https://www.dal.ca/campus_life/safety-respect/ombudsperson.html

Human Rights and Equity Services: <https://www.dal.ca/about/mission-vision-values/equity-diversity-inclusion-and-accessibility/about-office-equity-inclusion/human-rights-and-equity-services.html>

Writing Centre: https://www.dal.ca/campus_life/academic-support/writing-and-study-skills.html

Study Skills/Tutoring: http://www.dal.ca/campus_life/academic-support/study-skills-and-tutoring.html

Faculty of Science Advising Support: <https://www.dal.ca/faculty/science/current-students/undergrad-students/degree-planning.html>

Safety

Biosafety: <http://www.dal.ca/dept/safety/programs-services/biosafety.html>

Chemical Safety: <https://www.dal.ca/dept/safety/programs-services/chemical-safety.html>

Radiation Safety: <http://www.dal.ca/dept/safety/programs-services/radiation-safety.html>

Laser Safety: <https://www.dal.ca/dept/safety/programs-services/radiation-safety/laser-safety.html>