MICI2400 Syllabus

Department of Microbiology & Immunology

CRN 21946 (and 21947 OR 21948) Winter 2025

Dalhousie University acknowledges that we are in Mi'kma'ki, the ancestral and unceded territory of the Mi'kmaq People and pays respect to the Indigenous knowledges held by the Mi'kmaq People, and to the wisdom of their Elders past and present. The Mi'kmaq People signed Peace and Friendship Treaties with the Crown, and section 35 of the Constitution Act, 1982 recognizes and affirms Aboriginal and Treaty rights. We are all Treaty people.

Dalhousie University also acknowledges the histories, contributions, and legacies of African Nova Scotians, who have been here for over 400 years.

Course Instructor(s)

Name	Email	Office Hours
Dr Lois Murray	LMurray@dal.ca	By Appointment

Course Description

An introduction to techniques in Microbiology and Immunology through a rigorous wet laboratory experience that includes training in how to explore safely and effectively the properties of viruses, bacteria and immune cells. This course is directed to students in Microbiology and Immunology, Biochemistry & Molecular Biology, and Biology programs.
FORMAT: Lab
CREDIT HOURS: 3

Course Prerequisites

Grade of B- or better in MICI2100 or instructor's consent.
COREQUISITES: BIOL2020.03 and BIOL2030.03

Course Exclusions

N/A

Student Resources

Dr. Murray offers Office Hours on Teams or in person by appointment.

Course Structure

Course Delivery

Weekly in-person synchronous laboratory sessions that will not be recorded. Required reading prior to laboratory sessions to facilitate experimental planning. Students must prepare a weekly workflow document and use it in the lab session for time management.

Lectures

Asynchronous online lectures as scheduled.

Laboratories

(If applicable) Tuesdays or Thursdays, 2:35-5:35PM weekly, Sir Charles Tupper Medical Building, Room 12K.

Tutorials

None.

Course Materials

Any standard Microbiology Textbook can be used as a reference. I recommend OpenStax Microbiology (free, Open Access textbook) available here:

https://openstax.org/details/books/microbiology

Lab Manual and course-specific lab coat will be provided during the first lab session.

Assessment

Assignments /Practical Grades / Lab Reports

Grades will be allocated as described here:

10% Lab techniques, including but not limited to: Dilution streaking, performing dilution series, sample staining, use of microscopes, labeling of materials, isolation of bacteria and viruses, following protocols, Maintenance of workspace

4% Pre-lab planning: weekly workflow document

8% Assignments
- Dilution Series Calculations
- Bacterial Structures Work Sheet

36% Formal Lab reports

Written reports:
- Exp 3 Antibiosis
- Exp 8 Soil bacteria and antibiotics
- Exp 9 Bacteriophages Isolation

Oral report: scheduled during the Week 11 lab session
- Exp 7 Characterization of Unknown Bacteria

10% Practical Lab Test

This is an in-lab Practical Skills test, scheduled during the Week 10 lab session.

30% Final Exam

The final exam will be comprised of a combination of multiple choice and short answer questions. There will also be one experimental design question that will require a longer answer. The exam will be set up as stations in the lab, Room Tupper 12K. Students will have 2 minutes to sit at one station to answer a question; they will move to each subsequent station They will have 1.5 hours to complete the exam. The exam will be scheduled by the Registrar's Office. There may be an "early" and a "late" session during the same exam time slot if we cannot accommodate all students at once. Students are required to write the exam on that given day and time. Students with accommodations that enable them to have extra time or to write in a distraction-free environment must make arrangements to write immediately following the regularly-scheduled exam.

Other course requirements

To pass the course students must attend and participate in all lab sessions, complete all experiments, and submit all laboratory reports. If any of these components is not completed the student will be awarded a grade of F.

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

Classes missed due to illness or exceptional circumstances must be communicated to the instructor immediately. An alternative make-up will only be considered with a Declaration of Absence, (SDA), completed, signed, and uploaded to the folder on Brightspace within 24 hours of the missed class. A maximum of two SDA's can be submitted for this course. The Course Instructor will contact the student re: making up the class. No SDA's will be accepted for Lab Reports since students have 8 days to write or prepare the Report after completing the experimental work. Late Lab Reports will be penalized with a deduction of 20% of the grade per day that they are late.

Course Policies related to Academic Integrity

Students may collaborate on data collection. All lab reports and assignments are, however, to be individual efforts. The assignments and lab reports will be completed individually and must be the written work of the student. Plagiarism, generative AI or large language models such as ChatGPT must NOT be used when writing lab reports. If there is evidence that a student has submitted work that is not their own a case will be prepared and submitted to a Faculty of Science Academic Integrity Officer for adjudication.

Learning Objectives

Knowledge:

Describe best practices for safety when working with Level 2 Microorganisms.
Describe mechanisms of sterilization of liquid and solid media and of equipment
Distinguish between Gram-positive and Gram-negative cells in electron micrographs and Gram stains.
Identify bacteria through phenotypes observed when grown on selective and differential media.
Design a set of experiments to enable identification of unknown bacteria.
Draw and interpret diagrams that illustrate the life cycles of lysogenic and non-lysogenic viruses.
Describe the origin and formation of a plaque in a lawn of bacterial or tissue culture cells.
Calculate the number of viruses or bacteria present in a sample.

Describe the process of antigen-antibody recognition.
Document and report experimental protocols, results and conclusions.

Practical skills:

Demonstrate safe practices and use of aseptic technique in the laboratory.
Maintain a tidy and clean work space.
Properly prepare and view specimens for examination using microscopy.
Sample microbes from their environment.
Develop microscopy skills such that samples of stained bacteria and unstained microbes can be easily viewed.
Use a loop to inoculate liquid and agar media. Isolate single cells on agar media that can proliferate to form colonies.
Perform a dilution series such that defined numbers of organisms or viruses are realized.
Isolate clones of bacteria and viruses from specimens.

Course Content

Experiments to be performed include:

- Detection of Bacteria and Efficiency of Hand Washing
- Culture and Aseptic Techniques
- The Gram Stain
- Bacterial Structures
- Microbial Motility
- Identification of Unknown Bacteria
- Isolation of Antibiotic-producing Streptomyces
- Bacteriophage Isolation and Characterization
- Effects of Antibiotics
- Antigenic Structure and Hemagglutination

Optional, outside of class opportunities

- Electron Microscopy
- Flow Cytometry Demonstration
- Microscopy Demonstration

Course Schedule is included here:

MICI 2400 - Winter 2025 - Tues or Thurs - 14:35 -17:25 - Tupper Room 12K as of 2024.12.17						
	1	**2**	**3**	**4**	**5**	**6**
Class Time	Jan 7 & 9	Jan 14 & 16	Jan 21 & 23	Jan 28 & 31	Feb 4 & 6	Feb 11 & 13
00:00 - 00:15	Introduction	Introduction	Introduction	Introduction	Introduction	Introduction
00:15 - 00:30	Safety Review	Exp 1B - Count CFUs for handwashing Exp; view nasal bacteria	Exp 3B - Environmental bacteria / antibiosis	Exp 3C - Environmental unknown: Gram stain and dilution streaking.	Exp 3D - PCR amplification	Exp 3E - Electrophoresis and viewing gels
00:30 - 00:45	Exp 1A - Detection of Bacteria - swab and plate					
00:45 - 01:00		Exp 2B - Examination and quantitation of cultures incl. hemolysis				Exp 8E.1 - Soil-Bacteria - Inoculate antibiosis exp.
01:00 - 01:15	Use of: micropipettors, pipettes and loops		Exp 8B - Soil-Bacteria - inoculate SCM plates for *Streptomyces* isolation		Exp 8D.1 - Soil-Bacteria - Set up antibiosis exp.	
01:15 - 01:30		Exp 4A - The Gram stain		Exp 8C - Soil-Bacteria - View and isolate Streptomycetes on SCM		Exp 8E.2 - Soil-Bacteria - staining and visualization
01:30 - 01:45	Exp 2A - Aseptic Technique - inoculating broth cultures, dilution streaking and plating		Exp 4B -Acid fast stain		Exp 8D.2 - Soil-Bacteria - inoculate Streptomycetes on slides / agar	
01:45 - 02:00						
02:00 - 02:15			Exp 4C - Capsule stain	Exp 5 -Viewing live microbes: *S. cerevisiae* and motile bacteria		
02:15 - 02:30		Exp 3A and 8A - How to collect samples			Exp 6 Motility Demos	Exp 14 - Hemagglutination
02:30 - 02:45			Exp 4D - Demos			
02:45 - 03:00	Clean Up	Clean Up	Clean Up	Clean Up	Clean Up	Clean Up
Before Lab:	Complete Prelab Work / workflow chart	Complete Prelab Work / workflow chart	Complete Prelab Work / workflow chart	Complete Prelab Work / workflow chart	Complete Prelab Work / workflow chart	Complete Prelab Work / workflow chart
Homework Due		Lab Safety Exp 3A - Collect Swabbed Sample Exp 8A - Collect Soil	Exp 2 - Dilution Assignment		Exp 3 Antibiosis Lab Report: Intro, M&Ms, One Figure Result	Bacterial Structures. Exp 4, 5, 6, 8E.2 Assignment

No Class week of Feb 17 - 21	**WEEK**					
	7	**8**	**9**	**10**	**11**	**12**
Class Time	Feb 25 & 27	Mar 5 & 7	Mar 12 & 14	Mar 19 & 21	Mar 26 & 28	Apr 1 & 3
00:00 - 00:15	Introduction	Introduction	Introduction	Introduction	Introduction	
00:15 - 00:30	Exp 8F - Soil-Bacteria - quantitate antibiosis	Exp9B - Bacteriophage - Pick plaque clones, dilute, spot test	Exp 9C - Bacteriophage - Plate to clone viruses	Practical Lab Exam	Exp 7 Identification of lab unknowns: Oral Lab Report	Storm day make-up session, if needed
00:30 - 00:45						
00:45 - 01:00	Exp 9A - Bacteriophage isolation: dilute and plate					
01:00 - 01:15				Exp 9D- Bacteriophage - View single plaques		
01:15 - 01:30						
01:30 - 01:45		Exp 7B Identification of lab unknowns; incl Gram stain	Exp 7C Identification of lab unknowns	Exp 7D Identification of lab unknowns		
01:45 - 02:00	Exp7A Identification of lab unknowns					
02:00 - 02:15						
02:15 - 02:30			Exp 11A -Antibiotic sensitivity of bacteria	Exp 11B - Review effects of antibiotics		
02:30 - 02:45						
02:45 - 03:00	Clean Up	Clean Up	Clean Up	Clean Up	Clean Up	Clean Up
Before Lab:	Complete Prelab Work / workflow chart	Complete Prelab Work / workflow chart	Complete Prelab Work / workflow chart	Complete Prelab Work / workflow chart		
Homework Due	Exp 3 - Antibiosis Lab Report	Exp 8 - Streptomyces Lab Report			Exp 9 - Bacteriophage Lab Report	

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 the Indigenous Student Centre can be found at: https://www.dal.ca/campus_life/communities/indigenous.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-dal/internationalization.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/about-dal/agricultural-campus/student-success-centre.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: http://www.dal.ca/cultureofrespect.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/dept/university_secretariat/policies/student-life/code-of-student-conduct.html

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/dept/university_secretariat/policies/academic/fair-dealing-policy-.html

Originality Checking Software

The course instructor may use Dalhousie's approved originality checking software and Google to check the originality of any work submitted for credit, in accordance with the Student Submission of Assignments and Use of Originality Checking Software Policy. Students are free, without penalty of grade, to choose an alternative method of attesting to the authenticity of their work and must inform the instructor no later than the last day to add/drop classes of their intent to choose an alternate method. Additional information regarding Originality Checking Software can be found at: https://www.dal.ca/about/leadership-governance/academic-integrity/faculty-resources/ouriginal-plagiarism-detection.html

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.