

McGILL UNIVERSITY

**DEPARTMENT OF
MICROBIOLOGY & IMMUNOLOGY**



**MIMM 384
MOLECULAR MICROBIOLOGY LAB
COURSE OUTLINE**

Fall 2022

© Dr Benoit Cousineau, Dr Jasmin Chahal and Dr Antonis Koromilas

This course presents the student with a series of laboratory exercises in molecular biology. The general objective is to provide practical and theoretical introduction to technology used in bacteriology, microbiology and virology research.

Pre-requisites: MIMM 211 - Biology of Microorganisms, MIMM 212 - Laboratory In Microbiology
Co-requisites: MIMM 323 - Microbial Physiology and Genetics, MIMM 324 - Fundamental Virology

Class time and location:

Mondays, 2:30-3:30 pm: Pre-Laboratory Lectures
Lyman Duff Medical Building, Amphitheater

Wednesdays, 1:30-5:30 pm: Laboratory exercises
Laboratory Cubicles, 4th floor of the Lyman Duff Medical Building.

Fridays, 1:30-3:30 pm: Laboratory exercise follow-up periods (as required)
Laboratory Cubicles, 4th floor of the Lyman Duff Medical Building.

Fridays, 2:30-3:30 pm: Lectures (as required)
Lyman Duff Medical Building, Amphitheater

Course coordinators:

Labs 1-6: Dr Benoit Cousineau
Lyman Duff Medical Building, Room 617
benoit.cousineau@mcgill.ca

Labs 7-12: Dr Jasmin Chahal
Lyman Duff Medical Building, Room 408A
jasmin.chahal@mcgill.ca

Teaching Assistants:

David Firer	david.firer@mail.mcgill.ca
Zafir Kaiser	mohammad.kaiser@mail.mcgill.ca
Reese Ladak	reese.ladak@mail.mcgill.ca
Adeline Masse	adeline.masse@mail.mcgill.ca
Kayla Paulini	kayla.paulini@mail.mcgill.ca
Viktoria Plackoska	viktoria.plackoska@mail.mcgill.ca
Mina Sadeghi	mina.sadeghi@mail.mcgill.ca
Dania Shaban	dania.shaban@mail.mcgill.ca

TEAM Mentors:

Amy Qian	licheng.qian@mail.mcgill.ca
Wimmy Miller	willemien.miller@mail.mcgill.ca

Laboratory Staff:

Dr David Gagnon

david.gagnon3@mcgill.ca

Course content and instructional approaches

Similar to research labs, this course entails one overall question, which will be broken down into specific aims. Each aim will require students to perform various molecular biology techniques. Students are expected to follow the COVID-19 guidelines on campus, including mask wearing, handwashing, physical distancing and informing the course coordinators and TAs of any symptoms. As public health directives evolve, this course may have to move to remote delivery sometime during the term. We will announce any changes in class and post an announcement to myCourses as information becomes available.

Learning outcomes

By the end of this course, students will be able to:

1. Explain the theory behind each laboratory technique.
2. Perform laboratory techniques commonly used in research labs.
3. Design experiments with appropriate standards and controls.
4. Properly analyze data obtained in the lab.
5. Present research results in a clear and efficient manner.
6. Use a scientific approach to problem solving.
7. Analyze, interpret, summarize and clearly present scientific information.

Course Materials

The laboratory manual will be available on myCourses in early September.

Please bring the following essential materials to the laboratory classes:

- Lab coat
- Safety glasses/goggles
- Sharpie
- Hard cover lab book with lined pages (available at the McGill bookstore)

Evaluations

Laboratory reports	20%
Pre-lab quizzes	5%
Lab notebook assessment	5%
Midterm Exam (Labs 1-6)	35%
Final Exam (Labs 7-12)	35%

Laboratory Reports (20%):

Two lab reports, that include purpose, introduction, result and discussion sections will be due at 17h00 one week after the completion of the last laboratory exercise given by both course coordinators. Each report is worth 10% of the overall course grade. They should be submitted as PDF files by email directly to your TA. The rubric is provided on MyCourses.

Pre-Lab Quizzes (5%):

The quizzes will consist of short-answer type questions at the beginning of each laboratory exercise. There will be 11 quizzes and the quiz with the lowest grade will not count towards the total 5%. These quizzes will be held in-person before each lab session.

Lab notebook assessment (5%):

Lab notebook will be evaluated at the end of the course. TAs will assess clarity and detailed notes on protocol and results. The rubric is provided on MyCourses.

Midterm (Labs 1-6) (35%) and Final (Labs 7-12) (35%) Exams:

Two-hour written examinations that will test theory, application and experimental design. The midterm will be held during the semester and the final exam will be held during the final exam period. These assessments will be held in-person. More information regarding location, date and format will be provided during the semester.

Important notes

- 5% deduction will be applied for each day of late submission of the laboratory reports.
- A documented excuse (e.g. Doctor's note) for missing a lab session should be submitted to the course coordinator. The mark for a missed lab session or exam without a documented excuse is zero.

Note regarding missed laboratory exercise: As the material in all the laboratory exercises will be covered on the exams, it is mandatory that you obtain the data for any missed exercise from your TA and that you still write and submit the corresponding laboratory report. This will ensure that you understand the scientific principles, technical details and logical analysis of this exercise for the exams.

- The Department of Microbiology and Immunology is taking steps to assist students who need to miss a midterm examination due to medical or analogous reasons in order to limit the need to approach multiple professors for accommodations.

Students must complete the Missed Midterm Exam Form at

<https://www.mcgill.ca/microimm/undergraduate-programs/request-missing-mid-term-exam> within 1 week of the scheduled midterm, or else they will receive a grade of zero for the midterm. We will evaluate any non-medical situations and reserve the right to make final decisions regarding what accommodations are reasonable and appropriate in the circumstances. Please consult the Student Wellness Hub for sources of support (<https://www.mcgill.ca/wellness-hub/>)

COURSE CALENDAR - FALL 2022

Professors: Dr Benoit Cousineau (BC), Dr Antonis Koromilas (AK) and Dr Jasmin Chahal (JC)

DAY	DATE	TIME / ROOM / ACTIVITY
Wed	31 Aug.	2:00 p.m. to be determined Lecture: Introduction to MIMM 384 (BC)
Fri	2 Sept.	2:30 p.m. Lyman Duff Medical Building, Amphitheater Lecture: Protein assays (BC)
Mon	5 Sept.	LABOUR DAY
Wed	7 Sept.	1:30 p.m. Laboratory cubicles Laboratory: Protein quantification: the Bradford assay (BC)
Fri	9 Sept.	
Mon	12 Sept.	2:30 p.m. Lyman Duff Medical Building, Amphitheater Lecture: Endonuclease restriction analysis (BC)
Wed	14 Sept.	1:30 p.m. Laboratory cubicles Laboratory: Endonuclease restriction analysis of plasmid preparations (BC)
Fri	16 Sept.	
Mon	19 Sept.	2:30 p.m. Lyman Duff Medical Building, Amphitheater Lecture: PCR analysis (BC)
Wed	21 Sept.	1:30 p.m. Laboratory cubicles Laboratory: PCR to determine gene orientation in plasmids (BC)
Fri	23 Sept.	
Mon	26 Sept.	2:30 p.m. Lyman Duff Medical Building, Amphitheater Lecture: Transformation of bacterial cells (BC)
Wed	28 Sept.	1:30 p.m. Laboratory cubicles Laboratory: Transformation of <i>E. coli</i> with a plasmid (BC)
Fri	30 Sept.	1:30 p.m. Laboratory cubicles Follow up: Count transformed <i>E. coli</i> colonies (BC) and prepare SDS-Polyacrylamide gel for the following lab (AK)
Mon	3 Oct.	2:30 p.m. Amphitheatre Lyman-Duff Lecture: Purification, electrophoresis and transfer of GST fusion protein (AK)
Wed	5 Oct.	1:30 p.m. Laboratory cubicles Laboratory: Purification, electrophoresis and transfer of GST fusion protein (AK)
Fri	7 Oct.	
Mon	10 Oct.	THANKSGIVING
Wed	12 Oct.	FALL BREAK
Fri	14 Oct.	2:30 p.m. Amphitheatre Lyman-Duff Lecture: Immunodetection of GST fusion protein (AK)
Mon	17 Oct.	

Wed	19 Oct.	1:30 p.m. Laboratory cubicles Laboratory: Immunodetection of GST fusion protein (AK)
Fri	21 Oct.	
Mon	24 Oct.	2:30 p.m. Lyman Duff Medical Building, Amphitheater Lecture: Overview of Section 2 Lab, Plaque assays (JC)
Wed	26 Oct.	1:30 p.m. Laboratory cubicles: Laboratory: Titration of Bacteriophage 2972 (JC) Lab report #1 due at 17h00
Fri	28 Oct.	1:30 p.m. Laboratory cubicles Follow up: Calculate concentration of Bacteriophage 2972 (JC)
Mon	31 Oct.	2:30 p.m. Lyman Duff Medical Building, Amphitheater Lecture: CRISPR-Cas system and Bacteriophage-Insensitive Mutants (BIMs) (JC)
Tue	01 Nov.	19:00 p.m. to 22:00 p.m. Midterm Exam (tentative date)
Wed	2 Nov.	1:30 p.m. Laboratory cubicles: Laboratory: Generate Bacteriophage-Insensitive Mutants (BIMs)(JC)
Fri	4 Nov.	1:30 p.m. Laboratory cubicles Follow up: Count and grow BIMs (JC)
Mon	7 Nov.	2:30 p.m. Lyman Duff Medical Building, Amphitheater Lecture: CRISPR-Cas system sequences (JC)
Wed	9 Nov.	1:30 p.m. Laboratory cubicles: Laboratory: PCR of BIMs (JC)
Fri	11 Nov.	1:30 p.m. Laboratory cubicles Follow up: Run PCR products on agarose gel and send for sequencing (JC)
Mon	14 Nov.	2:30 p.m. Lyman Duff Medical Building, Amphitheater Lecture: Characterization of BIMs (JC)
Wed	16 Nov.	1:30 p.m. Laboratory cubicles: Laboratory: Quantify phage resistance of BIMs (JC)
Fri	18 Nov.	1:30 p.m. Laboratory cubicles Follow up: Count plaques and calculate EOP (JC)
Mon	21 Nov.	2:30 p.m. Lyman Duff Medical Building, Amphitheater Lecture: Bacteriophage mutations (JC)
Wed	23 Nov.	1:30 p.m. Laboratory cubicles: Laboratory: Perform plaque assays with BIMs (JC)
Fri	25 Nov.	1:30 p.m. Laboratory cubicles Follow up: Calculate resistance level (JC)
Mon	28 Nov.	2:30 p.m. Lyman Duff Medical Building, Amphitheater Lecture: Analysis of sequences and conclusion of lab (JC)
Wed	30 Nov.	1:30 p.m. Laboratory cubicles: Laboratory: Analyze BIM sequences (JC)
Fri	2 Dec.	Evaluate lab notebooks
Mon	5 Dec.	Lab report #2 due at 17h00

Class recording

The pre-lab lectures will be recorded to allow you to review material outside of scheduled class time. Class recordings do not replace a student's presence in a class; rather, they provide complementary pedagogical support for student learning. The recordings will be uploaded 24 hr after the lecture date on MyCourses.

Intellectual property considerations

"I ask for everyone's cooperation in ensuring that this [video] and associated material are not reproduced or placed in the public domain. This means that each of you can use it for your own purposes, but you cannot allow others to use it by posting it online or giving it or selling it to others who may copy it and make it available. Thank you very much for your help with this."

Inclusive Learning Environment

This course is designed to help you learn to communicate professionally both during your time at McGill and in your future workplaces. In keeping with McGill's policies on student rights and responsibilities, it is expected that during class discussions and small group interactions you will communicate constructively and respectfully. Sexist, racist, homophobic, ageist, and ableist expressions will not be tolerated in the classroom or during group meetings held outside of class.

McGill is committed to providing an inclusive and supportive learning environment. If you experience barriers to learning in this course, do not hesitate to discuss them with your instructor. If you have a special learning need or disability, you are encouraged to contact the Office for Students with Disabilities: <https://www.mcgill.ca/osd/>.

Health and Wellness

Student wellbeing is a priority for the University. To help students find the support they need as quickly as possible, all of McGill's health and wellness resources have been integrated into a single [Student Wellness Hub](#), a one-stop shop for everything related to physical and mental health. If you need access to services or would like more information, you are strongly encouraged to visit the Virtual Hub:

<https://www.mcgill.ca/wellness-hub/>. As the instructors of this course we endeavor to provide an inclusive learning environment. However, if you experience barriers to learning in this course, do not hesitate to discuss them with me and the [Office for Students with Disabilities](#), 514-398-6009.

McGill Writing Centre Tutorial Service

Writing well is key to both academic and professional success. The McGill Writing Centre (MWC) offers credit courses in academic and professional writing, and a tutorial service open to all McGill students: <https://www.mcgill.ca/mwc/tutorial-service>. The tutorial service offers one-to-one sessions with seasoned instructors and experienced tutors who will work with you at any stage of the writing process.

During the campus closure period, there will be no tutors on site and no administrative staff at the MWC to answer inquiries. Tutoring sessions will be conducted online via the Microsoft Teams platform. This application is available for free to all students through Office 365: <https://www.mcgill.ca/it/office365-software>. For information about how to book an appointment through Microsoft Teams, please go to <https://www.mcgill.ca/mwc/tutorial-service>.

McGill Library

Discover the McGill Library's rich array of resources. Watch a short welcome video in English, French, Arabic, Chinese, Hindi, Persian, Spanish, or Urdu: <https://www.mcgill.ca/library/orientation>.

McGill University Policy Statements

1) “McGill University values academic integrity. Therefore all students must understand the meaning and consequences of cheating, plagiarism and other academic offences under the Code of Student Conduct and Disciplinary Procedures (see <http://www.mcgill.ca/integrity> for more information).”

“L'université McGill attache une haute importance à l'honnêteté académique. Il incombe par conséquent à tous les étudiants de comprendre ce que l'on entend par tricherie, plagiat et autres infractions académiques, ainsi que les conséquences que peuvent avoir de telles actions, selon le Code de conduite de l'étudiant et des procédures disciplinaires (pour de plus amples renseignements, veuillez consulter le site www.mcgill.ca/integrity).”

2) “In accord with McGill University’s Charter of Student’s Rights, students in this course have the right to submit in English or in French any written work that is to be graded.”

“Conformément à la charte des droits de l’étudiant de l’Université McGill, chaque étudiant a le droit de soumettre en français ou en anglais tout travail écrit devant être noté (sauf dans les cours dont l’un des objets est la maîtrise d’une langue).”

3) “In the event of extraordinary circumstances beyond the University’s control, the content and/or evaluation scheme in this course is subject to change.”

4) McGill has policies on sustainability, paper use and other initiatives to promote a culture of sustainability at McGill.

5) If you have a disability please contact the instructor to arrange a time to discuss your situation. It would be helpful if you contact the Office for Students with Disabilities at 514-398-6009 before you do this.

6) © Instructor generated course materials (e.g., handouts, notes, summaries, exam questions, etc.) are protected by law and may not be copied or distributed in any form or in any medium without explicit permission of the instructor. Note that infringements of copyright can be subjected to follow up by the University under the Code of Student Conduct and Disciplinary Procedures.

7) “End-of-course evaluations are one of the ways that McGill works toward maintaining and improving the quality of courses and the student’s learning experience. You will be notified by e-mail when the evaluations are available on Mercury, the online course evaluation system. Please note that a minimum number of responses must be received for results to be available to students.”

8) Additional policies governing academic issues which affect students can be found in the McGill Charter of Students’ Rights and Responsibilities (www.mcgill.ca/files/secretariat/Handbook-on-Student-Rights-and-Responsibilities-2010.pdf).