

Laboratory in Immunology

MIMM 385 Winter 2024

Course Outline v 1.0

Course Coordinator

Prof Samantha Gruenheid

samantha.gruenheid@mcgill.ca

Laboratory Coordinator

David Gagnon, PhD

david.gagnon3@mcgill.ca

Teaching Assistants

Mina mina.sadeghi@mail.mcgill.ca

Jackie chia-ling.sung@mail.mcgill.ca

Jessica jessica.pei@mail.mcgill.ca

Dania danialshaban@mail.mcgill.ca

Jana jana.ridani@mail.mcgill.ca

Wimmy willemien.miller@mail.mcgill.ca

Celeste celeste.pilon@mail.mcgill.ca

Katie kaitlin.olsen@mail.mcgill.ca

Edwin ramon.caballero@mail.mcgill.ca

Flow cytometry data analysis workshop facilitator

Christian Young

Manager, Flow Core Facility, Lady Davis Institute

cyoung.cytometry@gmail.com

TIMETABLE

Wednesdays 1:30-5:30 PM - Lab

Laboratory Cubicles, C floor of the Duff Building

Fridays 11:35-12:25 PM - Lecture

Duff Amphitheater

Fridays 1:30-3:25- Lab Follow up period

Laboratory Cubicles, C floor of the Duff Building

This course was developed with input from: Sylvie Fournier, Jasmin Kaur Chahal, Claire Trottier, Samantha Gruenheid, David Gagnon, Celeste Pilon

COURSE DESCRIPTION

This laboratory course allows students to gain expertise in following protocols and performing key techniques in immunology. Students also develop basic experimental design and scientific thinking skills by designing their own experiment based on available reagents to solve a problem. Students learn to keep a lab book and communicate scientific findings in written and oral formats.

PREREQUISITES

MIMM 212 Laboratory in Microbiology

MIMM 214 Introduction to Immunology

LEARNING OBJECTIVES

- Perform key laboratory techniques in immunology
- Demonstrate ability to follow an experimental protocol
- Use a lab book to keep a thorough record of laboratory work
- Plan tasks in advance and develop effective time management
- Propose appropriate scientific hypotheses and approaches
- Design, plan, and carry out an experiment based on available reagents to solve a problem
- Record, analyze and interpret scientific data
- Communicate scientific findings clearly in written and oral formats
- Work effectively in a team
- Provide constructive feedback to peers

COURSE CONTENT & INSTRUCTIONAL APPROACH

Students work in pairs, groups of 4-6 pairs are supervised by a dedicated TA.

Two scientific aspects will be developed in this course:

Section 1: Key techniques in immunology

This section focuses primarily on developing technical, hands-on skills for four key techniques in immunology: mammalian cell culture (CC), flow cytometry (FC), enzyme-linked immunosorbent assay (ELISA), and quantitative reverse-transcription polymerase chain reaction (qPCR).

These key techniques will be performed according to a rotation schedule (see Table 1 below). The class will be divided into 8 groups, each with its own TA. These 8 groups will rotate through the four key techniques over a four-week period, as shown below. All four techniques will be performed to test a single hypothesis. The primary assessment for this section will be an individual research report that includes data from all four experiments.

Section 2: Scientific skills in a problem-based situation

This section focuses on allowing students to develop their scientific thinking skills. Students will be presented with a scientific problem and will propose different hypotheses to explain the problem. They will develop and refine an experimental plan to test one of these hypotheses using available reagents, carry out their own experiment, analyze and interpret the data, and present their findings at a poster presentation. The goal of this section is for students to explore the scientific method and improve their scientific thinking skills.

TABLE 1: GROUP ROTATIONS FOR SECTION 1

Group	Week 4		Week 5		Week 6		Week 7	
	24-Jan	26-Jan	31-Jan	2-Feb	7-Feb	9-Feb	14-Feb	16-Feb
A	Flow Lab: 1-2		qPCR Lab: 5-6	qPCR Lab: 5-6	C. culture: 1h30 Lab: 12-13-14	C. culture Lab 1-2	ELISA Lab: 5-6	ELISA Lab: 5-6
B	C. culture: 1h30 Lab: 12-13-14	C. culture Lab: 1-2	qPCR Lab: 7-8	qPCR Lab: 7-8	Flow Lab: 1-2		ELISA Lab: 7-8	ELISA Lab: 7-8
C	qPCR Lab: 5-6	qPCR Lab: 5-6	Flow Lab: 1-2		ELISA Lab: 5-6	ELISA Lab: 5-6	C. culture: 1h30 Lab: 12-13-14	C. culture Lab: 1-2
D	qPCR Lab: 7-8	qPCR Lab: 7-8	C. culture: 1h30 Lab: 12-13-14	C. culture Lab: 1-2	ELISA Lab: 7-8	ELISA Lab: 7-8	Flow Lab: 1-2	
E	C. culture: 3h30 Lab: 12-13-14	C. culture Lab: 3-4	qPCR Lab: 10	qPCR Lab: 10	Flow Lab: 3-4		ELISA Lab: 10	ELISA Lab: 10
F	qPCR: Lab: 10	qPCR Lab: 10	Flow Lab: 3-4		ELISA Lab: 10	ELISA Lab: 10	C. culture: 3h30 Lab: 12-13-14	C. culture Lab: 3-4
G	Flow Lab: 3-4		qPCR Lab: 11	qPCR Lab: 11	C. culture: 3h30 Lab: 12-13-14	C. culture Lab 3-4	ELISA Lab: 11	ELISA Lab: 11
H	qPCR Lab: 11	qPCR Lab: 11	C. culture: 3h30 Lab: 12-13-14	C. culture Lab: 3-4	ELISA: Lab: 11	ELISA Lab: 11	Flow Lab: 3-4	

TABLE 2: COURSE CALENDAR

Week	Day	Date	Course content
1	F	05-Jan	Lecture: Introduction to MIMM 385- cell culture lecture
2	W	10-Jan	Research problem discussion Group A: D13 Group B: 507 Group C: Sheldon Group D: C10 Group E: C11 Group F: C13 Group G: 333 Group H: A5
	F	12-Jan	Lecture: qPCR (assignment of pre-lab problem, to be submitted before the beginning of next Wednesday lab period)
3	W	17-Jan	Cell culture demonstration
	F	19-Jan	Lecture: Flow cytometry- Celeste (assignment of pre-lab problem, to be submitted before next Wednesday lab period)
	F	19-Jan	Cell culture demonstration
4	W	24-Jan	Group rotations: FLOW, QPCR, CC (see table 1)
	F	26-Jan	Lecture: ELISA (assignment of pre-lab problem, to be submitted before next Wednesday lab period)

	F	26-Jan	Flow cytometry workshop Follow up QPCR Follow up CC
5	W	31-Jan	Group rotations: FLOW, QPCR, CC (see table 1)
	F	2-Feb	In class problem on Flow cytometry
	F	2-Feb	Flow cytometry workshop Follow up QPCR Follow up CC
6	W	7-Feb	Group rotations: ELISA, FLOW, CC (see table 1) Lab book assessment + PBA
	F	9-Feb	Lecture Instructions for research report section 1
	F	9-Feb	Flow cytometry workshop Follow up ELISA Follow up CC
7	W	14-Feb	Group rotations: ELISA, FLOW, CC (see table 1)
	F	16-Feb	Introduction to section 2
	F	16-Feb	Flow cytometry workshop Follow up ELISA Follow up CC
8	W	21-Feb	Hypothesis workshop Lab book assessment + PBA
	F	23-Feb	Electronic submission (Word format) of your research report for section 1 to your TA. Deadline 11h59pm. Assignment of section 2 experiments
9	W	28-Feb	Pairs work on experimental plan with their TA
	F	1-Mar	Electronic submission (Word format) of Version 1 of your experimental plan to your TA. Deadline 11h59pm.
10	W	6-Mar	Reading Week
	F	8-Mar	Reading Week
11	W	13-Mar	TA feedback on experimental plan (by Monday March 11) Teams work on experimental plan
	F	15-Mar	Electronic submission (Word format) of Version 2 of your experimental plan to your TA. Deadline 5pm.

12	W	20-Mar	Section 2 lab session
	F	22-Mar	Lecture on poster presentations/open discussion
	F	22-Mar	Section 2 lab follow up
13	W	27-Mar	Data analysis of section 2 experiment- TAs available in cubicles

	F	29-Mar	Good Friday
14	W	3-Apr	Guidance from TA for poster presentation (mandatory) Lab book assessment + PBA
	F	5-Apr	Teams work on poster presentation-
	W	10-Apr	poster presentations

COURSE MATERIAL

Instructions, protocols, assigned readings and videos will be posted on myCourses

COURSE ASSESSMENTS

Below is a brief description of the assessments in this course. More detailed descriptions of these assessments (including grading rubrics) will be posted on myCourses and discussed during class time.

1) Lab book

Each student is required to purchase a lab book. This lab book should have numbered pages and a hard cover. Examples will be shown in class. Each student is required to write down all flow charts, plans, observations, calculations and data in their lab book. You may use the same notebook you used for MIMM212 and/or 384 if there is enough remaining space. TAs will formally assess your lab book 3 times during the semester (7-Feb, 21-Feb, Apr-3). The first instance will be worth 1%, the second 3% and the final instance will be worth 5%.

2) Performance-based assessment (PBA)

TAs will be using a detailed checklist to assess each student on their laboratory practices (e.g. time management, level of preparedness) and team work and self-regulation (e.g. sharing responsibilities, contributions to group discussion). TAs will conduct a PBA three times during the semester (7-Feb, 21-Feb, 3-Mar). The first instance will be worth 2%, the second 3% and the final instance will be worth 4%.

3) Pre-lab problems and in class problem

There will be prelab problems assigned in class as indicated in the course calendar above. You will be marked based on completion of these problems. Each in pre-lab problem is worth 1 point.

There will be a formally-assessed in-person in class problem on flow cytometry on 2-Feb. This problem is completed during class time and is worth 6%.

4) Research report

Each student will submit one research report for section 1. The report is worth 21%.

5) Poster presentation

Each team will give a poster presentation of their experimental plan and data from section 2. The oral presentation is worth 21%.

6) Experimental Plan

Each team will be required to develop their own experimental plan in two stages. Students will submit “version 1” of their experimental plan to their TA for feedback. Version 1 is worth 17%. TAs will read “version 1” carefully and provide feedback to improve the experimental plan. Each group will then incorporate this feedback to create the final “version 2” of their experimental plan, which they will use to carry out their own experiment. Version 2 MUST be submitted with the original copy of version 1 attached (including TA comments). Version 2 is worth 8%.

7) Peer evaluation

Each student will be evaluated by their team member(s) according to an assigned rubric. The average of this mark will count toward the peer evaluation mark, for a total of 3%. The deadline to hand in the peer evaluation(s) to your TA is the last day of class (April 10th). If a student does not submit evaluations for their peers by this deadline, they will receive a mark of 0 for their own peer evaluation.

IMPORTANT NOTES

A 5% deduction will be applied for each day of late submission for the lab report and for both versions of the experimental plan. A mark of zero will be given for any assignment submitted beyond 4 days after the due date.

Attendance at laboratory sessions is mandatory. A documented excuse (e.g. doctor’s note) should be submitted to Prof Gruenheid for missing a lab session.

A documented excuse (e.g. doctor’s note) should also be submitted to the professor for missing your final poster presentation. If a documented reason is provided for missing your poster, your final mark for this section will be made up of all the other marks for this section.

TABLE 3: MARK BREAKDOWN

	%
Lab book	9
Performance-based assessment	9
In class problems	6
Flow cytometry quiz	6
Peer evaluation	3
Research report for Section 1	21
Version 1 of experimental plan	17
Version 2 of experimental plan	8
Poster presentation	21
TOTAL	100

MCGILL UNIVERSITY POLICY STATEMENTS

In accord with McGill University's [Charter of Students' Rights](#), students in this course have the right to submit in English or in French written work that is to be graded. This does not apply to courses in which acquiring proficiency in a language is one of the objectives.

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 le cas des cours dont l'un des objets est la maîtrise d'une langue.

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 [McGill's guide to academic honesty](#) 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 procédures disciplinaires](#). (pour de plus amples renseignements, veuillez consulter le [guide pour l'honnêteté académique de McGill](#).)

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

Many students may face mental health challenges that can impact not only their academic success but also their ability to thrive in our campus community. Please reach out for support when you need it; [wellness resources](#) are available on campus, off campus, and online.

If you are feeling overwhelmed by your academic work and/or would like to further develop your time and workload management skills, don't hesitate to seek support from [Student Services](#).

"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."

"End-of-term [course evaluations](#) are one of the ways that McGill works towards 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."

"McGill has policies on sustainability, paper use and other initiatives to promote a culture of sustainability at McGill." (See the [Office of Sustainability](#).)

"In the event of extraordinary circumstances beyond the University's control, the content and/or evaluation scheme in this course is subject to change."

"Any midterm examination, quiz, essay, problem set, laboratory report, or other assignment, should be marked in a reasonable time frame and although the work may be retained by the University, the student will receive feedback on expected and achieved outcomes (within 2-3 weeks from the date of the test/assignment)."