

# IMM 701: METHODS IN BASIC AND CLINICAL IMMUNOLOGY

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## COURSE RATIONALE

The objective of this course is to provide you with an understanding of research methods commonly used in basic and clinical immunology. It is designed to focus on how we can use techniques in the laboratory to answer specific research questions and expand our understanding of the immune system. Not only is this knowledge needed for you to interpret and judge the validity of research conducted by others, but it is also needed to weigh your options and limitations while designing and conducting your own experiments.

## COURSE DESCRIPTION

This course will survey experimental methods and procedures commonly used in basic and clinical immunology. Throughout the course, students will be expected to apply their conceptual understanding of immunology to research contexts in order to reason about research questions, experiments, and data. Emphasis will be placed on procedural and conceptual understanding of laboratory techniques, analyzing and presenting data, and experimental design.

First, we will begin the course with some review of molecular biology and a quick overview of fundamental methods. Then, through a series of guest speakers, we will focus on a individual experimental methods. A combination of readings, videos, guest lectures, data analysis workshops, and writing assignments will provide you with a variety of approaches to learn about each method and how to apply them in research. At the end of the first semester, you will work in groups to identify research questions and propose experiments to investigate them.

In the second semester, clinical immunologists will join us each week to share their knowledge of studying the immune system in actual patients. They will explain to us the difficulties of working with patients and the challenges of clinical trials.

## LEARNING OBJECTIVES

- 1) Develop procedural and conceptual understanding of common methods used in immunology research, including their strengths and limitations.
- 2) Gain experience working with raw data outputs from these methods
- 3) Be able to design figures that clearly and cogently present results.
- 4) Learn about the methods used in the detection or diagnosis of certain diseases.
- 5) \*Become proficient at interpreting the results of journal articles that use these methods, including being able to judge the validity and reliability of these results.
- 6) \*Be able to design and propose future experiments (e.g. ask appropriate research questions, collect appropriate data, consider appropriate controls)
- 7) \*Further develop scientific reasoning, critical thinking, and problem-solving skills.

## GRADING AND REQUIREMENTS

A	94 – 100%	B+	86 – 89%	C+	76 – 79%
A-	90 – 93%	B	83 – 85%	C	73 – 75%
		B-	80 – 82%	C-	70 – 72%

*First semester*

20%	Participation & attendance
10%	2nd week presentation
40%	Workshop assignments
30%	Final project

*Second semester*

40%	Participation & attendance
30%	Weekly assignments
30%	Final project

**ASSIGNMENTS**

**Participation & attendance.** I am a strong proponent of collaborative learning. In this class, learning will be framed much less around lectures and exams and more around collective knowledge. Given that our program brings together students of diverse backgrounds, it is an ideal environment for us to learn from each other, drawing on each other's strengths and supporting each other's weaknesses. You are expected to share your ideas in this class and help to create a safe and supportive space. Please be mindful and respectful of your classmates.

**Presentation.** In the beginning of the semester, pairs of students will create a presentation dedicated to one basic experimental method. The goal is to provide a quick overview of common methods and provide students with a foundation to help them interpret articles as they dive right into research literature. Each presentation will be accompanied by a summary of the important aspects of the method that can be shared with the entire class so that each student will have a summary to reference if the method appears in a later paper. Additional details about this assignment will be discussed in class.

**Workshop assignments.** Guest speakers will have a workshop component to their lesson. Some will involve assignments that allow students to gain hands-on experience working with data and software used in labs. These assignments will begin in class, but will need to be completed by students after class. For some, you will be required to design experiments, manipulate data, and/or prepare figures. The details of these assignments will change, depending on the method. Additional details about these assignments will be discussed in class.

**Final project.** Throughout the semester of this methods course, we will be focusing on methods without much regard for context. Simultaneously, we will largely be focusing on context as we read articles associated with seminar speakers every week for our other course. At the end of the semester, you will put the two together to write a research proposal. In groups, you will conduct a short literature review to form the introduction section of your paper, develop hypotheses and specific research questions about your topic, design potential experiments that would address the questions, and predict and explain results you would get. More later.

First Semester Schedule

Date				Topic	Instructor
September	9/2	Fri		Advice from 2 <sup>nd</sup> years, Syllabus, MBCA, Survey	Diane Lam
	9/5	Mon		Labor Day	
	9/9	Fri		Student Presentations	Diane Lam
	9/12	Mon		Molecular Biology Review	Shiv Pillai
	9/16	*Fri		Student Presentations	Diane Lam
	9/19	Mon	Lesson	Fluorescence Microscopy	Vinidhra Mani
	9/23	Fri	Workshop		Vinidhra Mani
	9/26	Mon	Lesson	Flow Cytometry	Nicholas Giovannone
	9/30	Fri	Workshop		Nicholas Giovannone
October	10/3	Mon	Lesson	Statistics	Ina Jazic
	10/7	*Fri	Lesson		Ina Jazic
	10/10	Mon		Columbus Day	
	10/14	Fri	Workshop	Statistics	Diane Lam
	10/17	Mon	Lesson		Ina Jazic
	10/21	Fri	Lesson	TBD (Gene expression)	Deb or David
	10/24	Mon	Workshop		Deb or David
	10/28	Fri		Retreat: No Class	
	10/31	Mon	Lesson	Biochemistry	Semir Bayez
11/4	Fri	Workshop	Semir Bayez		
November	11/7	Mon	Lesson	Mouse Models	Kevin Bonham
	11/11	Fri	Workshop		Kevin Bonham
	11/14	Mon		Science writing	Vinidhra Mani
	11/18	*Fri		Science writing	Vinidhra Mani
	11/21	Mon		Group project	Diane Lam
	11/25	Fri		Thanksgiving	
	11/28	Mon		Group project	Diane Lam
	Dec	12/2	Fri		Group project
12/5		Mon		Reading week	
12/9		*Fri			