

Biology 4150: Fundamentals of Immunology

Fall 2016

5 Credits

Instructor: Brian Daniels, PhD
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Office hours: By appointment.

Time: M/W/F 12:30-1:35PM, Lecture (BANN 202)
W 2:05-4:05PM, Journal Club (PIGT 306)

Textbook: *Kuby Immunology*, 7th Edition. (ISBN: 1464119910)
Note: The textbook is REQUIRED. The 7th edition of the textbook is significantly different than older versions, so please acquire the most recent version.

Course Description

This course will serve as an introduction to the immune system, with a focus on mammalian organisms (particularly humans). In general terms, we will uncover how the cells and organs of the immune system orchestrate protective responses to pathogen infection across distance and time in the body. While immunology encompasses a vast body of facts and terminologies, we will deemphasize rote memorization and classification. Instead, a primary goal of this 4000-level course is to engage your critical thinking and problem solving abilities, as well as to introduce you to primary research addressing contemporary immunological questions. An additional, related goal will be the ongoing cultivation of your scientific and information literacy. During this course, we will undertake our studies guided by three principle understandings about scientific communication in general, and about the immune system in particular. These understandings will inform the essential questions we explore in our studies and the learning objectives we will attempt to achieve by the end of the quarter.

Enduring Understanding 1: Communication of immunological research happens at multiple levels and is influenced by social, economic, and ethical concerns.

Essential Question 1A: What are the venues of scientific communication?

Goal 1 Distinguish primary, secondary, and tertiary scientific sources.

Goal 2 Distinguish scientific journals from popular scientific media.

Essential Question 1B: How do we judge the quality and reliability of scientific information?

Goal 1 Understand the process of peer review.

Goal 2 Contextualize scientific narratives within historical and conceptual frameworks.

Goal 3 Understand how the subjectivities of authors and audiences impact the generation and interpretation of data.

Essential Question 1C: What are the experimental approaches that facilitate discovery in the field of immunology?

Goal 1 Understand the basics of cellular and molecular research techniques relevant to immunological research questions.

Goal 2	Understand how laboratory animals are used to model infectious and immunological diseases.
Goal 3	Interpret and summarize the graphical representation of immunological data.
Enduring Understanding 2: Immunity is a complex process that is coordinated by multiple cell types across time, anatomic locations, and pathogenic stimuli.	
Essential Question 2A: How do the physical interactions of immune cells with pathogens and each other contribute to host immunity?	
Goal 1	Understand how host cells detect pathogens and distinguish self from nonself.
Goal 2	Understand the various innate immune responses that destroy or arrest the growth of pathogens.
Goal 3	Understand how antigen peptide processing and presentation instructs pathogen-specific immunity.
Goal 4	Understand how cytotoxic responses and programmed cell death control infection.
Essential Question 2B: How do immune cells coordinate their actions across space and time?	
Goal 1	Understand the triggers and anatomic features that contribute to immune cell development.
Goal 2	Understand the molecular signals that facilitate communication between immune cells.
Goal 3	Understand how immune cells are recruited to and maintained in developmental niches, key functional sites, and/or infected tissues.
Goal 4	Understand the concept of and key contributors to immunological memory.
Enduring Understanding 3: Immune responses are dynamically regulated and can result in both protective and pathological outcomes.	
Essential Question 3A: How are the intensity, duration, and outcomes of immune responses dynamically controlled?	
Goal 1	Understand the host regulatory signals that amplify or suppress immune responses.
Goal 2	Understand immune evasion strategies by pathogens and cancer cells, as well as host counter-adaptations to these strategies.
Goal 3	Understand the concept of "immune privilege," its purpose, and how it is maintained.
Essential Question 3B: What are the causes and consequences of poorly regulated immune responses?	
Goal 1	Understand the concepts of immunological tolerance, allergy, and autoimmunity.
Goal 2	Understand and distinguish between genetic and infectious immunodeficiency disorders.
Goal 3	Understand basic diagnostic and therapeutic strategies for infectious and immunological diseases.

Assessment and Course Activities

Quizzes: You will be asked to complete a short quiz before every class session. These quizzes will be online, completed via Canvas, and will be primarily multiple-choice format. Quizzes will be open book and open resource, but must be completed within an allotted time limit (generally 1 minute per question). Each quiz will consist of a mix of questions covering the reading due for class, as well as the material covered in the previous class session. There will be at least 25 quizzes given in the course, but you are only responsible for 20. Points earned on quizzes beyond the 20th quiz taken will count as extra credit. You will thus benefit greatly by keeping up with the reading and diligently completing quizzes before class. Quizzes cannot be made up if they are not completed before class time on the day they are due.

Exams: There will be six take-home exams in this course, which will consist of short answer and short essay style questions. You may use your textbook, class notes, and any online resource to work on exam questions. You may also work with other students in the course, with the following limitations: (1) On your exam document, you **MUST** identify every student with whom you collaborated on the exam. (2) Each student **MUST** generate his or her own answer to all questions, written in his or her own words. Students may discuss exam questions and their thinking about answers, but should not let other students read the text of their written answers.

Exams are due at the beginning of class on the due date indicated on the course schedule. Exams will **NOT** be accepted after this time, under any circumstances. Exams should be submitted electronically via the course page on Canvas. Avoid waiting until the last moment to submit your exam in case there are any technical issues. If you experience any technical issues when you attempt to submit your exam, you may email it to me or bring a paper copy to class as a backup precaution to make sure I receive it before the deadline. In any event, it is your responsibility to be proactive in making sure your exam is successfully submitted before class time on the day it is due. You will have 1.5-2 weeks to complete each exam, so there will be no extensions of due dates except in the case of serious, prolonged, and documented illness or family emergency.

Article Analyses: We will read and discuss 6 primary research articles in this course. You will be expected to carefully read each article before the scheduled discussion (Journal Club). To facilitate your critical reflection and prepare you for the class discussion, you will be asked to complete an article analysis worksheet before class. Please print and bring your completed worksheet with you to class. Each Journal Club session is worth 25 points towards your final grade, of which 15 will be earned by careful completion of the analysis worksheet, and 10 will be earned from active participation in the article discussion. If you are absent from the journal club discussion, you may still earn 15 points for your analysis worksheet as long as it is turned in to me **BEFORE** the Journal Club session. Worksheets will not be accepted after Journal Club under any circumstances.

Journal Club Presentation: For each Journal Club session, a group of 3 students will be responsible for presenting the assigned article, including topical background information, an explanation of the major methodologies used by the authors, and a discussion of their experimental findings. These presentations should be 45-60 minutes in length. Student groups will be evaluated both by the instructor and their peers for the content and quality of their presentations. A detailed rubric and further instructions will be provided in a separate document.

Translational Presentation: Towards the end of the semester, you will be asked to give a 12-15 minute presentation on a topic of your choice that relates to a human infectious/immunological disease or an immunotherapy designed to treat a non-immunological disease (such as cancer or a behavioral disorder). Your presentation should frame the relevant background literature on your topic, as well as share one or two recent research advancements in the field. Following your presentation, you should be prepared for about 5 minutes of questions from the instructor and your fellow classmates. These presentations will **NOT** be done in groups, so you are free to explore and develop

any topic that interests you. Suggested topics and additional guidelines for this project will be provided in a separate document.

Extra Credit: As mentioned above, if you attend class regularly you will have the opportunity to earn a significant amount of extra credit by completing (and doing well on) >20 reading quizzes. However, an additional 15 points of extra credit may be earned by completing the first three levels of the game ImmuneQuest. ImmuneQuest is a turn-based strategy game that allows you to take on the role of various immune cells as they coordinate efforts in battling a bacterial infection. To download ImmuneQuest, visit immunequest.com and click on the orange button entitled “Students: Download Now.” Once you have downloaded the game, you MUST register with the following information in order to receive credit:

Course Title: BIO 4150, Seattle University
 Course Code: **X8U3**

You will receive 5 points for completing each of the first three levels of Part 1 (for a maximum of 15 points). These three levels are completely free, though, if you are inclined, you can pay for access to additional levels (no additional extra credit will be given for levels beyond the first three). In order to receive credit for this activity, levels must be completed by class time on **Monday, October 17th**.

Grading: Final course grades will be assigned according to the total points accumulated from scores on the assignments indicated below. Neither individual assignments nor final course grades will be “curved” in any way.

Assignment	Number	Points	Total
Reading Quizzes	20	10	200
Take-home Exams	6	75	450
Primary Article Analyses	6	25	150
Journal Club Presentation	1	100	100
Translational Presentation	1	100	100
Total Course Points:			1000

Final Grade	Grade Points	Point range
A	4.0	930-1000
A-	3.7	900-929
B+	3.3	870-899
B	3.0	830-870
B-	2.7	800-830
C+	2.3	770-800
C	2.0	730-770
C-	1.7	700-730
D	1.0	600-700
F	0.0	0-600

Course Schedule:

Date			Topic	Journal Club	Reading Due	Assignment Due
Sep	W	21	1. Introductions and Syllabus	Scientific Literacy		
	F	23	2. Chapter 2: Immune Cells and Organs, Part 1		27-41	
	M	26	3. Chapter 2: Immune Cells and Organs, Part 2		41-61	
	W	28	4. Chapter 3: Receptors and Signaling	Intro to Journal Club	65-80	
	F	30	5. Chapter 3: Antibodies		80-91	
Oct	M	3	6. Chapter 4: Cytokines and Chemokines, Part 1		106-129	Take-home Exam 1
	W	5	7. Chapter 4: Cytokines and Chemokines, Part 2	Journal Club 1	129-138	Article Analysis 1

Oct	F	7	8. Chapter 5: Innate Immunity, Part 1		141-166	Presentation Topic
	M	10	9. Chapter 5, Innate Immunity, Part 2		166-182	
	W	12	10. Chapter 6: Complement	Journal Club 2	187-221	Article Analysis 2
	F	14	Review and Problem Solving			Take-home Exam 2
	M	17	11. Chapter 7: Lymphocyte Receptor Genes, Part 1		225-242	ImmuneQuest
	W	19	12. Chapter 7: Lymphocyte Receptor Genes, Part 2	Journal Club 3	242-259	Article Analysis 3
	F	21	13. Chapter 8: MHC and Antigen Presentation, Part 1		261-276	
	M	24	14. Chapter 8: MHC and Antigen Presentation, Part 2		277-295	
	W	26	15. Chapter 9: T Cell Development	Journal Club 4	299-325	Article Analysis 4
	F	29	16. Chapter 11: T cell Activation, Differentiation, and Memory		357-382	Take-home Exam 3
	M	31	17. Chapter 10. B Cell Development		329-354	
Nov	W	2	18. Chapter 12: B cell Activation, Differentiation, and Memory	Journal Club 5	385-413	Article Analysis 5
	F	4	19. Chapter 13: Effector Responses		415-447	
	M	7	Review and Problem Solving			Take-home Exam 4
	W	9	20. Chapter 20: Experimental Approaches in Immunology	Journal Club 6	653-671	Article Analysis 6
	F	11	Veteran's Day			
	M	14	21. Chapter 20: Experimental Approaches in Immunology		672-690	
	W	16	22. Chapter 15: Allergy and Chronic Inflammation	Translational Presentations	485-515	
	F	18	23. Chapter 16: Tolerance, Autoimmunity, and Transplantation		517-550	
	M	21	24. Chapter 17: Infectious Diseases and Vaccines		553-587	Take-home Exam 5
	W	23	Thanksgiving			
	F	25	Thanksgiving			
	M	28	25. Chapter 18: Immunodeficiency		593-623	
	W	30	26. Chapter 19: Cancer Immunology	Translational Presentations	627-650	
Dec	F	2	Translational Presentations			
	T	6	Review and Problem Solving			Take-home Exam 6

Course Policies

Late work: All assignments in this class are known to you in advance, and you will have ample time to complete each one. Moreover, we will be moving quickly through a tremendous volume of material, so it is essential that you stay on top of the assigned reading and course activities. Therefore, **no work may be turned in to me after the established deadline under any circumstances.** If you know in advance you will be absent from class on a Journal Club day due to a legitimate university activity or observation of a religious holiday, you must let me know within **one week** of the start of the

course so we can arrange a separate meeting for you to earn discussion points for that class session. No other make-up activities will be permitted.

Academic Integrity: Cheating of any kind in this course will result in a score of 0 on the assignment and the initiation of an Academic Integrity Violation Report with the university. For more details about the university's academic integrity policy, including a description of your rights to appeal, please visit: <https://www.seattleu.edu/media/redhawk-axis/registrar/registrar-policies/Academic-Integrity-2011-3.pdf>

Accommodations & Student Services: If you have, or think you may have, a disability (including an "invisible disability" such as a learning disability, a chronic health problem, or a mental health condition) that interferes with your performance as a student in the class, you are encouraged to arrange support services and/or accommodations through Disabilities Services staff in the Learning Center, Loyola 100 (206-296-5740). Disability-based adjustments to course expectations can be arranged only through this process. Students experiencing personal problems or situational crises during the quarter are encouraged to contact the Seattle University's Counseling and Psychological Services (CAPS) [(206)-296-6090; <http://www.seattleu.edu/student/counsel/index.asp>] for assistance, support, and advocacy. This service is free and confidential.