



BIO 425/525 - Cancer Immunology

3 Credit Hours
M W F – 9:00-9:50AM
Norton 218

Office Hours: M W F – 10:00 – 12:00PM
Or by appointment

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Course Description: This course is designed to provide students an understanding of the interplay between tumors and the immune system, as well as current therapies that use the immune system in the setting of oncology. The course will be broken up into three main sections. The first section will cover basic immunology and tumor biology, the second will address the interplay between the immune system and tumors, and the third will discuss current immunological therapies. At the conclusion of the course, participants should understand how the immune system functions, how genesis of cancer and its progression, and the links between these two systems.

Prerequisites: For undergraduate students: BIO 319 – Genetics. Not required but strongly recommended for undergraduates: cellular biology and biochemistry For graduate students: no formal prerequisites, but students should possess a comfortable understanding of genetics, biochemistry, and cellular biology

Course Expectations: This course will be a hybrid of traditional lecture based material with a discussion of research papers and clinical trials. The course will begin by covering introductory immunology and cancer biology, so as to build a foundational knowledgebase in the subject area, and then will transition into data interpretation, analysis, and application of current research in the field. Tests will assess the student's mastery of the immunological and oncological components/dogma, as well as their ability to translate that knowledge into solving new problems in the field. Participants

should be prepared to discuss research papers, and to be able to think critically about solutions to existing challenges in the field.

Student Learning Outcomes:

Objectives/Outcomes	Measurement(s)
To be able to understand the common methods of cancer development, progression, and treatment	Test 1
To understand the basic functioning of the immune system (cells, organs, activation processes)	Test 2
To develop critical thinking, analytical, and interrogative skills	Class Participation Class Discussion Selected Readings
To understand the interplay between tumor and the immune system	Test 3 Selected Readings
To become familiar with standard and groundbreaking immunological therapeutics that target malignancies	Final Project Selected Readings

Course Requirements: Students are not required, but are strongly encouraged to acquire copies of Kuby Immunology (6th edition or later), as well as The Biology of Cancer (2nd edition preferred, but 1st will suffice).

Additional required reading with scientific publications to be entered into UBLEARNS.

Academic Content:

Instructor reserves right to alter and amend content as they deem appropriate, with the exception of the dates for the tests and final project. The following is a rough outline of the topics that will be covered for each lecture.

Lecture Number - Date	Topics Covered
1 – January 29	Introduction / Overview of Course
2 – January 31	Hallmarks of Cancer
3 – February 2	Tumor Origination + Progression
4 – February 5	Tumor Heterogeneity
5 – February 7	Cellular Circuitry
6 – February 9	Disrupted Signaling
7 – February 12	Metastasis and Invasion
8 – February 14	Traditional Therapeutics

9 – February 16	Test 1 – Cancer Biology
10 – February 19	Overview of the Immune System
11 – February 21	Cells + Organs of Immune System (1)
12 – February 23	Cells + Organs of Immune System (2)
13 – February 26	Antigens and Antibodies (1)
14 – February 28	Antigens and Antibodies (2)
15 – March 2	MHC (1)
16 – March 5	MHC (2)
17 – March 7	T-cell Signaling
18 – March 9	T-cell Activation
19 – March 12	Cytokines
20 – March 14	Cell Mediated Responses
21 – March 16	Tolerance + Autoimmunity
22 – March 26	Test 2 – Immunology
23 – March 28	Immunosurveillance (3Es) (1)
24 – March 30	Immunosurveillance (3Es) (2)
25 – April 2	Immunosurveillance (3Es) (3)
26 – April 4	Tumor Antigens (1)
27 – April 6	Tumor Antigens (2)
28 – April 9	Immune Cell Trafficking (1)
29 – April 11	Immune Cell Trafficking (2)
30 – April 13	DC Vaccines (1)
31 – April 16	DC Vaccines (2)
32 – April 18	Test 3 – Immuno-Oncology
33 – April 20	Current topics in Immunotherapy
34 – April 23	Current topics in Immunotherapy
35 – April 25	Current topics in Immunotherapy
36 – April 27	Current topics in Immunotherapy
37 – April 30	Current topics in Immunotherapy
38 – May 2	Current topics in Immunotherapy
39 – May 4	Current topics in Immunotherapy
40 – May 7	Current topics in Immunotherapy
41 – May 9	Current topics in Immunotherapy
42 – May 11	Final Project Due

Grading Policy: This course is cross-listed for both undergraduate and graduate students, with final grades determined for each section separately. Grading will be comprised of the three tests (65% total), final project (25%), and class participation (10%). Final grades will be determined using the +/- system. I reserve the right to not utilize all grades in the A > F grade range

Exams: There will be three exams, with each covering the material that was covered and presented during that section. Make-up exams will be given only with a valid medical excuse and will be oral or written at the instructor's option. If you believe that

you have a valid medical excuse for missing an exam, the instructor must be notified within 24 hours of missing the exam, and must be presented with appropriate medical documentation from a health care professional. If these conditions are not met, the student will receive a grade of 0 for the exam. Exam dates will not change. Exams will test the student's ability to recall information covered in lecture + in readings, and their ability to synthesize and use their knowledge to solve problems.

Final Project: Students will complete a final project, which will be a comprehensive review of a peer-reviewed publication in the field of cancer immunotherapy. This document should not be fewer than three pages in length (single spaced), and should adequately discuss: the purpose of the published research + how it addresses a gap of knowledge, a thorough explanation of the work that was performed, a significant amount of questions + follow up experiments to be conducted, what you thought was well done and what you thought was unconvincing, and whether you would feel comfortable testing this therapy in humans (or if it already had a clinical trial, are you convinced enough to invest money)? This is not simply a book report or summary of the research paper. The student must come up with original thoughts, interpretations, ideas, and analysis. Students will send the instructor two or more choices for papers that they would like to review by April 11, and the instructor will decide if the submissions are valid.

Class Participation: Students will be graded based on their participation throughout the semester through their involvement in class. Involvement will be assessed through student engagement (asked relevant questions, participated in class discussion, debated issues and shared viewpoints), disruption of class, and attendance. Grading of participation is at the discretion of the instructor and is non-negotiable.

Academic Integrity: I expect all students to uphold the standards of academic honesty and integrity as set forth by the University at Buffalo. Details regarding academic honesty can be found at: <https://catalog.buffalo.edu/policies/integrity.html>.

Accessibility Resources: If you require classroom or testing accommodations due to a disability, please visit the Accessibility Resources office at 60 Capen Hall (phone: 716-645-2608, email: stu-accessibility@buffalo.edu, website: <http://www.buffalo.edu/studentlife/who-we-are/departments/accessibility.html>, <http://www.buffalo.edu/administrative-services/policy1/ub-policy-lib/reasonable-accommodation.html>). Please inform me as soon as possible about your needs so that we may coordinate any reasonable accommodation.