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**BIOT 6334                      Advanced Immunology                      Credit Hours: 3**

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**Semester:** Summer 9-week                      **Year:** 2022  
**Class Day/Time:** Mon & Wed 9a-12p                      **Class Location:** BMR 116.1

**Instructor of Record:** Dr. Buka Samten

Office: BMR Lab D1  
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Office Hours: By appointment

**Course Description:** Advanced survey of the immune system with focus on the human and mouse models. Covers the origin and differentiation of the hematopoietic system, antibody structure and function, T cell subsets and the function of each subset, and the role of innate and adaptive immunity in the response to infection.

**Prerequisite:** None

**Co-requisite:** None

**Goals of Course:**

1. To gain an understanding of all common serological and immunological techniques and methods.
2. To learn to communicate clearly and concisely in an appropriate scientific form.
3. To gain an understanding of the components, cells, tissues, and organs of the immune system.
4. To gain an understanding of the properties of antigens and mitogens.
5. To gain an understanding of the various classes, structures and functions of antibodies and related immunoglobulin superfamily proteins.
6. To gain an understanding of antigen-antibody and antigen-receptor interactions, including co-signaling molecules.
7. To gain an understanding of the organization and expression of the genes and the structures of the gene products associated with the immune system: T- and B-cell receptors, major histocompatibility complex proteins and complement.
8. To gain an understanding of the mechanisms associated with antigen processing and presentation and the resulting primary and secondary immune response and cellular proliferation, differentiation, and memory formation in both humoral and cell-mediated immunity and helper T cells.
9. To gain an understanding of the functions of cytokines and cytokine receptors.
10. To gain an understanding of the processes involved in complement activation and regulation.
11. To gain an understanding of hypersensitivity reactions, autoimmunity, evasion of the immune response by pathogens, tumor immunotherapies, and immunodeficiency conditions.

**Student Learning Outcomes (SLO or “course objectives”):**

1. The student will be able to differentiate between innate and adaptive immune functions and their cellular basis and differentiate between humoral and cellular immune responses.
2. The student will be able to describe the structures and functions of the five immunoglobulin (Ig) isotypes and how they are involved in the primary and secondary immune responses to the antigenic challenges.
3. The student will be able to identify and describe the functions of all the cells, tissues and organs of the immune system and how they interact.

4. The student will be able to describe the interaction and functions of all components and regulatory substances of the complement cascade
5. The student will be able to describe the genetic mechanisms involved in the generation of diversity for both T-cell and B-cell receptors and the processes involved in their expression.
6. The student will be able to describe the role of intercellular interactions, signaling pathways, chemokine gradients, and cytokine production in the initiation and regulation of the immune response.
7. The student will be able to describe the mechanisms and surface proteins involved in recognition of “self” and its implications in tissue and organ transplantation.
8. The student will be able to describe the mechanisms involved in immunodeficiency conditions and the therapeutic approaches involved in reinstating a normal response.
9. The student will be able to describe the mechanisms involved in autoimmune disorders.
10. The student will be able to differentiate between the forms and effects of hypersensitivity and tumor immunity

Subject-specific Skills:

See Marketable Skills list for this course.

**Course Assessment/Methods of Evaluation:**

The student's understanding will be evaluated with comprehensive exams exclusively of a subjective nature covering each topic in detail.

Comprehensive Lecture Examinations: There will be three take home examinations of exclusively a subjective format and worth 1/3 of the final grade.

**Grade:**

- A >90%
- B 89-80%
- C 79-70%
- D 69-60%
- F <59%

**Assignments**

Students are expected to turn in assignments on time. Late assignments will be handled as follows:

- 1 day late: 5% deducted from overall assignment grade
- 2 - 3 days late: 10% deducted from overall assignment grade
- 4 -7 days late: 20% deducted from overall assignment grade
- 7-14 days late: 30% deducted from overall assignment grade
- 14+ days late: An additional 5% deduction for each additional week
- 4 weeks late: Assignment will not be accepted

**Linked Program Learning Outcomes:**

The student learning outcomes listed above address the following Biotechnology Program PLOs:

- PLO1 - The student will demonstrate English communication skills in both oral and written forms.
- PLO4 - The student will demonstrate independent and critical thinking skills integrated with the ability to utilize multiple informational resources.
- PLO5 - The student will explain the principles, mechanisms, and interrelatedness of both in vivo and in vitro biochemical, molecular biological, and genetic processes.

**Textbook:**

*Roitt's Essential Immunology, 12<sup>th</sup> edition.* Peter J. Delves, Seamus J. Marting, Dennis R. Burton, and Ivan M. Roitt. 2011. ISBN: 978-1-4051-9683-3

**Course Content:**

*Lecture Topical Outline:*

- Basic concepts in immunology
- Adaptive immunity
- Antigen recognition by B and T cells
- Generation of antigen receptors
- Antigen presentation to T lymphocytes
- Receptor signaling
- Lymphocyte development
- T cell mediated immunity
- Humoral immune responses and using antibodies as research tools
- Kinetics of the adaptive immune response and characterization of lymphocyte specificity, frequency, and function
- Mucosal Immunity
- The immune system in health and disease and detection of immunity in vivo
- Manipulating the immune response

**2022 Advanced Immunology Summer Lecture Schedule**

| Date   |         | Topic   | Related Reading | Instructor    |
|--|---------|---|-----------------|---------------|
| <b>Week 1</b>  | June 6  | Innate and Acquired Immunity                    | Ch 1 & 2        | Vankayalapati |
|  | June 8  | Antibodies, and Membrane Receptors for Antigens | Ch 3 & 4        | Kurdowska     |
| <b>Week 2</b>  | June 13 | Primary interaction with Antigen                | Ch 5            | Mulik         |
|  | June 15 | Anatomy of the Immune Response                  | Ch 7            | Samten        |
| <b>TAKE-HOME EXAM I available on Canvas (Ch 1-5) – Due June 22</b>                 |         |   |                 |               |
| <b>Week 3</b>  | June 20 | Immunological Methods                           | Ch 6            | Kurdowska     |
|  | June 22 | Lymphocyte Activation                           | Ch 8            | Samten        |
| <b>Week 4</b>  | June 27 | Production of Effectors / Control Mechanisms    | Ch 9 & 10       | Samten        |
|  | June 29 | Ontogeny and Phylogeny                          | Ch 11           | Tvinnereim    |
| <b>Week 5</b>  | July 4  | <b>HOLIDAY, No Class</b>                        | -               | -             |
|  | July 6  | Evasion of the Immune Response                  | Ch 12           | Gomez         |
| <b>TAKE-HOME EXAM II available on Canvas (Ch 6-11) – Due July 13</b>               |         |   |                 |               |
| <b>Week 6</b>  | July 11 | Vaccines  | Ch 13           | Kujur         |
|  | July 13 | Immunodeficiency                                | Ch 14           | Radhakrishnan |
| <b>Week 7</b>  | July 18 | Allergy   | Ch 15           | Kurdowska     |
|  | July 20 | Transplantation                                 | Ch 16           | Tripathi      |
| <b>Week 8</b>  | July 25 | Tumor Immunology                                | Ch 17           | Gomez         |
|  | July 27 | Autoimmune Diseases                             | Ch 18           | Kujur         |
| <b>TAKE-HOME EXAM III available on Canvas (Ch 12-18) – Due by 5 pm on August 3</b> |         |   |                 |               |
| <b>FINALS WEEK (August 1-5)</b>  |         |   |                 |               |

## Other Class Policies

### **Attendance:**

Regular or punctual attendance is expected. If a student misses a class or lab, the student is responsible for obtaining any information distributed during those times. Make-ups are possible only under certain instances (labs cannot be made up). Arrangements for any make-ups and/or missed labs should be discussed directly with the instructor for that day's class.

### **Academic Honesty:**

Any student who commits an act of scholastic dishonesty is subject to discipline. Scholastic dishonesty includes, but is not limited to, cheating, plagiarism, collusion, the submission for credit of any work or materials that are attributable in whole or in part to another person, taking an examination for another person, any act designed to give unfair advantage to a student or the attempt to commit such acts.

#### Cheating

Dishonesty of any kind involving examinations, assignments, alteration of records, wrongful possession of examinations, and unpermitted submission of duplicate papers for multiple classes or unauthorized use of keys to examinations is considered cheating. Cheating includes but is not limited to:

- Using or attempting to use unauthorized materials to aid in achieving a better grade on a component of a class.
- Falsifying or inventing any information, including citations, on an assigned exercise.
- Helping or attempting to help another in an act of cheating or plagiarism.

#### Plagiarism

Plagiarism is presenting the words or ideas of another person as if they were your own. Materials, even ideas, borrowed from others necessitate full and complete acknowledgment of the original authors. Offering the work of another as one's own is plagiarism and is unacceptable in the academic community. A lack of adequate recognition constitutes plagiarism, whether it utilizes a few sentences, whole paragraphs, articles, books, audio-visual materials, or even the writing of a fellow student. In addition, the presentation of material gathered, assembled or formatted by others as one's own is also plagiarism. Because the university takes such misconduct very seriously, the student is urged to carefully read university policies on Misconduct in Research and Other Scholarly Activity 05.00. Examples of plagiarism are:

- Submitting an assignment as if it were one's own work when, in fact, it is at least partly the work of another.
- Submitting a work that has been purchased or otherwise obtained from an Internet source or another source.
- Incorporating the words or ideas of an author into one's paper without giving the author due credit.

### **Adding/Dropping:**

The official deadline for adding and dropping courses is as published in the academic calendar ([Registrar Withdrawal webpage](#)). However, students are strongly encouraged to meet with their graduate advisor or the Program Coordinator prior to adding/dropping courses. Movement into and out of classes after the 4th class day requires approval of the Program Director. Each student is responsible for their own enrollment status with the university.

### **Disability Accommodations:**

UT Tyler HSC abides by Section 504 of the Rehabilitation Act of 1973 and the Americans with Disabilities Act, which mandate reasonable accommodations be provided for students with documented disabilities. If you have a disability and may require some type of instructional and/or examination accommodations, please contact me early in the semester so that I can provide or facilitate provision of accommodations you may need. If you have not already done so, you will need to register with the Student Services Office (located on the main campus). You may call 903-566-7079 for more information.