

Programme	BS Biotechnology	Course Code	BCBT. 302	Credit Hours	3
Course Title	Immunology				
Course Introduction					
<p>The course offers a detailed introduction to the basic principles of immunology, describing the development and differentiation of various immune cells and their functions, gaining a comprehensive understanding of the immune system's components, functions, and responses, from innate immunity to adaptive immune processes and analyzing the molecular mechanisms underlying immune responses.</p>					
Learning Outcomes					
<p>On the completion of the course, the students will:</p> <ul style="list-style-type: none"> • Explain the mechanisms of immune responses to pathogens. • Describe the components and functions of the immune system. • Analyze the principles and applications of vaccination and immunotherapy. 					
Course Content					
<ul style="list-style-type: none"> • Overview of the immune system as the body's main defense mechanism and historical perspective of immunology. Important concepts for understanding the mammalian immune response. Introduction to the innate and adaptive immunity, properties and types of adaptive immune response • Cells of the Immune System, cells of the myeloid lineage. Cells of the lymphoid lineage; B-Lymphocytes, T-lymphocytes and natural killer cells. Antigen presenting cells and effector cells. • Role of Primary Lymphoid Organs (bone marrow and thymus) in the development of immune cells. • Tissues of the immune system, Peripheral Lymphoid Organs, Lymphocyte recirculation and migration into Tissues. Role of innate immunity in stimulating adaptive immunity responses. • Overview of immune responses to microbes, Microbial evasion of innate immunity. Antigen recognition and their presentation to lymphocytes. Structure and function of major histocompatibility complex molecules • Processing and presentation of protein antigens • Antigens recognized by B cells and other lymphocytes. Antigens and antibodies; antibody types, structure and functions • Properties of antibodies and antigens together with their structure, function and interactions; Genetics of antibody structure and diversity. Expression of immunoglobulins genes; VDJ recombination • Molecules of the innate immune system, Phagocytosis, anatomical barriers to infection, antimicrobial peptides. Role of complement system in innate immunity. Acute phase proteins and innate immunity. • Pattern recognition receptors and their types Biochemical pathways of T cell activation. Humoral vs cell-mediated immunity. 					

<ul style="list-style-type: none"> • Hypersensitivity reactions, Allergy: A Type I Hypersensitivity Reaction. Acute and chronic inflammation. • Production applications of specific antibodies. Polyclonal antibodies; advantages and disadvantages. Monoclonal antibodies; hybridoma technology, advantages and disadvantages of monoclonal antibodies • T-cell receptors, maturation, activation and differentiation. B-cell generation, activation and differentiation. Functions of memory T-Cell • Effector Responses: Cell and Antibody-Mediated Immunity. Interactions between the innate and adaptive Immune Systems. Regulation of adaptive immune responses • Cytokines; their types and functions. Cytokines related diseases and cytokines based therapeutics • Immunological Tolerance and Autoimmunity • B lymphocytes and T lymphocytes tolerance • Pathogenesis and genetic factors associated with autoimmunity • Active and passive immunization, history and basic concepts of vaccination. Types and strategies to produce vaccines. Immunotherapy drugs and their applications • Overview of applications of immunological techniques. Types of ELISA and Radioimmunoassay. Types and applications immunofluorescence assay 			
Textbooks and Reading Material			
<ul style="list-style-type: none"> • Janeway, C. A., Jr., Walport, M., Shlomchik, M. J., & Travers, P. (2021). Immunobiology (9th ed.). Taylor and Francis. • Runte, F., Renner IV, P., & Hoppe, M. (2022). Kuby immunology (8th ed.). Publisher. • Cruse, J. M., & Lewis, R. E. (2020). Atlas of immunology (3rd ed.). Springer. • 4. Abbas, A. K., Lichtman, A. H., & Pillai, S. (2019). Basic Immunology: Functions and Disorders of the Immune System (6th ed.): Sae-E-Book. Elsevier. 			
Teaching Learning Strategies			
<ul style="list-style-type: none"> • Lectures • Quizzes • Case Studies • Assignment 			
Assignments: Types and Number with Calendar			
<ul style="list-style-type: none"> • 1st Quiz in 4th Week of 5 marks • 2nd Quiz in 10th Week of 5 marks • 3rd Quiz in 14th Week of 5 marks • Assignment in 8th Week of 10 marks 			
Assessment			
Sr. No.	Elements	Weightage	Details
1	Midterm Assessment	35%	Written Assessment at the mid-point of the semester.

2	Formative Assessment	25%	Continuous assessment includes: Classroom participation, assignments, presentations, viva voce, attitude and behavior, hands-on-activities, short tests, projects, practical, reflections, readings, quizzes etc.
3	Final Assessment	40%	Written Examination at the end of the semester. It is mostly in the form of a test, but owing to the nature of the course the teacher may assess their students based on term paper, research proposal development, field work and report writing etc.