

Name of the Programme: M.Sc. Part-I (Biochemistry)

Course Code: CHB-506

Title of the Course: Immunology and Immunotechniques

Number of Credits: 4

Effective from AY: 2022-23

Pre-requisites for the Course:	Students should have graduate level knowledge either in chemical or life sciences or should have qualified change of discipline test.	
Course Objectives:	1. The objective of the course is to provide an insight into the components of the immune system, their development, their functions and their mechanisms of action and various Immunological techniques. 2. This course will enable students to understand the role of the immune system in eliciting immune response.	
Content:	1. Cells and Organs of the Immune system a. Cells of the immune systems. i. Hematopoiesis; Lymphocytes and Antigen presenting cells (APCs). ii. T cells: Maturation; Activation and Proliferation; T cells subsets and their functions; T cell receptor; structure and organization. iii. B cells: Maturation, Activation and Proliferation; Functions; T cell receptor, Structure and Organization. b. Organs of the immune systems. i. Primary and secondary lymphoid organs: Structure and function.	No of hours 10
	2. Innate Immune response a. Mechanical barriers to infection. b. Physiological factors contributing to innate immunity. c. Inflammatory response: Mechanism and mediators involved. d. Phagocytic system: Activation of macrophages and mechanism of phagocytosis. e. Complement system: Components; Properties; function; Activation of complement pathways (Classical, Alternative and lectin pathways); Consequences of complement activation; Complement fixation test.	8
	3. Adaptive immune response a. Cell-mediated and Humoral immunity: primary and secondary immune response. b. Major Histocompatibility Complex: Molecular organization of MHC molecules (H-2, HLA); Structure of MHC molecules; Class I MHC-peptide and Class II MHC-Peptide interactions; self MHC restriction of T cells; Gene	8

	organisation and concept of MHC polymorphism; MHC expression and its regulation. c. Antigen processing and presentation pathways: Cytosolic and Endocytic pathways.	
	4. Antigens and Antibodies a. Antigens: Chemical complexity and molecular property of Antigens; Immunogens; Haptens; Epitopes; Antigenicity and Immunogenicity. b. Antibodies: i. Structure and function of various classes of immunoglobulins. ii. Antigenic determinants on immunoglobulins. iii. Monoclonal and Polyclonal antibodies: their production by hybridoma technology and clinical uses.	6
	5. Immunogenetics a. Theories of antibody formation. b. Generation of antibody diversity. c. Class switching among constant-region genes.	4
	6. Immune effector mechanisms a. Cytokines: properties; Receptors and Functions. b. Immunological tolerance. c. Hypersensitivity reactions: Classification and mechanisms. d. Autoimmunity: Pathogenesis; Classification (Organ-specific autoimmune disease and Systemic Autoimmune diseases).	6
	7. Immune system in health and disease: a. Immunodeficiencies: Primary and secondary immunodeficiencies. b. Transplantation immunology: Definition; Immunologic Basis of Graft Rejection; Allograft rejection; Clinical features of graft rejection; Graft v/s host reaction; Immune tolerance to allograft; Immunosuppressive therapy for prevention of graft rejection. c. Concepts of vaccines: whole-organism vaccines; recombinant vaccines; DNA vaccine; synthetic peptide and multivalent subunit vaccines.	8
	8. Immunotechniques: a. Antigen – antibody reactions: General features of Ag-Ab reactions, Stages of Ag-Ab reactions (primary and secondary). b. Principles and techniques: <i>in vitro</i> precipitation; agglutination; immunofluorescence; immunodiffusion;	10

	immuno-electrophoretic; ELISA; RIA; Avidin-Biotin complex (ABC) method; Western blotting; Immunohistochemistry; flow cytometry.	
Pedagogy:	Mainly lectures and tutorials. Seminars / term papers / assignments / presentations / self-study or a combination of some of these can also be used. ICT mode should be preferred. Sessions should be interactive in nature to enable peer group learning.	
References/ Readings:	1. Owen, J.; Punt, J.; Stranford, S.; Patricia, J.; Kuby Immunology, WH Freeman and Company, 2012, 8th Edition. 2. Martins, S.J.; Burton, D.R.; Roitt, I.M.; Delves, P.J.; Roitt's Essential Immunology; Wiley Blackwell; 2017; 13th Edition. 3. Abbas, A.; Lichtman, A.; Pillai, S.; Cellular and Molecular Immunology; Ed. Saunders; Elsevier; 2014; 8th Edition. 4. Parija, S.C.; Textbook of Microbiology and Immunology; Elsevier; 2012; 2nd Edition. 5. Hay, F.C.; Westwood, O.M.R; Practical Immunology; Cold spring Harbour; 2002; 4th Edition.	
Course Outcomes:	1. Students will be able to visualize the importance of the immune system in the human body to fight pathogens. 2. Students will be able to schematize mechanisms of Immunological response. 3. Students will be able to illustrate the importance of antigen-antibody interactions and various serological techniques for immunological research. 4. Students will be able to devise strategies in designing immunological experiments based on their understanding about immunological processes.	