Title of the Course: IMMUNOLOGY [T]

Course Code: MIC-523
Number of Credits: 3, Theory
Contact hours: 45
Effective from Academic Year: 2022-23

Prerequisites	Basic knowledge on pathogens, serology, and general principles of immunology.	
Objective:	1. To understand the concepts and mechanisms in the functioning of immunological cells and their interactions. 2. To get acquainted with the regulations of molecule synthesis, signalling, immune responses and allied activities of immune system at the molecular level.	
Content:		
1.		**(15)**
1.1	**Phagocytosis** – Cell surface receptors/markers and their role, killing mechanisms; **NK cells** – Cell to cell recognition for normal and modified cells, receptors, initiation of apoptosis and killing of target cells, malfunctioning of NK cells; role of mast cells in immunity.	**4**
1.2	Classification and concepts of immunoglobulin domain, distribution of immunoglobulin domain, superfamily member, structure and function of TCR and BCR, diversity of antigen binding domain, concept of segmented gene, gene organization of Ig and TCR, rearrangement and generation of gene during differentiation and development of B and T Cells, expression of Ig and TCR Cistrons, class switch and regulation of expression, B and T Cell ontogeny.	**5**
1.3	Major Histocompatibility Cluster – Introduction to MHC I, II and III, structure and function of MHC I and II, distribution and recognition of MHC I and II, gene organisation and concept of polymorphism, expression and its regulation, processing of extracellular antigen by APC, presentation of intracellular antigen by nucleated cells, recognition of MHC I and II by TCR/CD3 complex; Members of MHC III and their roles (in brief).	**6**
2.		**(15)**
2.1	Immunocompetent T and B cells, recognition, signaling and activation of T cells by APC, control and regulation of activated T-Cells, B-cell activation – Type 1 thymus-independent antigen, Type 2 thymus-independent antigen, thymus dependent antigen, co-operation with T-cells and activation of resting B-cells, antigen processing by B-cells, stimulation by cross-linking surface Ig.	**5**
2.2	Cytokine as messengers, receptor for cytokine – gp130 subfamily,	**5**

	beta-c and gamma-c receptor subfamily, signal transduction and effects, network interactions; TH1 and TH2 responses; Cytokine mediated chronic inflammatory response; Killer T Cell and its regulation; effect of antigen dose and maturation of affinity of antibodies; role of memory cells.	
2.3	Antigen as major factor in control, feedback control of antibody production, T cell regulation – T-helper cells, T-cell suppression; Idiotypic networks, influence of genetic factors, immune regulation through hormone; T-cell tolerance.	**5**
3.		**(15)**
3.1	Concept of inflammation, complement fixation, defense against intracellular bacterial pathogen, immunity to viral infection, immunity to fungi, immunity to parasitic infections; Passively acquired immunity, vaccination – herd immunity, strategies, killed organisms as vaccines, live attenuated vaccines, subunit vaccine, epitope vaccines, vaccines in use and experimental vaccines, Adjuvant and new approaches in vaccine development.	**5**
3.2	**Immuno-techniques**: Antigen antibody interactions in solution, identification and measurement of antigen, epitope mapping, hybridoma technology and monoclonal antibody revolution, catalytic antibodies, engineering antibodies, antigen-antibody based affinity chromatography, isolation of leukocyte and subpopulations, localization of antigen *in cyto* and *in tissue*, assessment of functional activity, genetic engineering of experimental animal for immune response investigation. **Immuno-assays and their application**: ELISA, SRID RIA, Immuno-fluorescence, Western Blotting.	**5**
3.3	**Clinical immunology (Immunodeficiency)**: phagocytic cell defects, complement system deficiency, primary B-cell deficiency, primary T-cell deficiency, combined immunodeficiency, secondary immunodeficiency, comparison between SCID and AIDS, recognition of immunodeficiency.	**5**
Pedagogy:	Lectures/tutorials/assignments/Moodle/videos	
References/ Readings	Abbas, A. K., Lichtman, A. H., & Pillai, S. Cellular and molecular immunology. Elsevier Health Sciences. (2021) Bona, C. A. and Bonilla, F. A., Textbook of Immunology, Fine Arts Press (1996). Chakraborty, P. and Pal, N. K., Manual of Practical Microbiology and Parasitology, New Central Book Agency (P) Ltd, Delhi, India. (2004). Delves, P., Martin, S., Burton, D. and Roitt, I., Roitt's Essential Immunology. Wiley-Blackwell. (2017). Goldsby, R. A., Kindt, T.J. and Osborne, B.A., Kuby Immunology.	

	W.H. Freeman (2007) Murphy, K., Janeway's Immunobiology, Garland Science. (2007)	
Course Outcomes	● Explain the mechanisms of immunological responses. ● Demonstrate the role of cellular ontogeny and the gene rearrangement in complex immune system. ● Apply the principles of immunology for immunodiagnostics. ● Correlate the clinical symptoms with imunological diseases	