

Syllabus template

Semester:	5	
Course :	Major	
Paper Title:	C3MB230531T	
Paper code:	Immunology	Credits: 4
Hours/week :	4hours/wk	
Category: Core/MDC/SEC/VAC :	Core	
Theory / Practical / Composite :	Theory	
No of Modules :	No	

Course Overview: This course provides an overall idea on immunology and cancer biology starting from basic to advanced level.

Students will learn about the components of immune system, their functions and underlying mechanisms. They will learn to explain the role of immune system against common infections and diseases. They will apply the knowledge in the study of vaccine development and finally will establish the relation between immune system and cancer.

Course Outcome:

1. Remember: Remembering and acquiring basic knowledge on types of immunity, immune components and mechanism of immune system, cancer biology, complement system, vaccines
2. Understand: Understanding the essential features of antigens and antibodies, types and theories of Antibody formation.
3. Analyze: Analyze the concept of complement system, hypersensitivity, auto immunity and transplantation.
4. Apply: application of the knowledge of immune system to describe natural infections, immune deficiencies, immunological techniques, vaccine development, transplantation.
5. Evaluate: evaluation of the concept of immune system in explaining transplantation biology
6. Create: create co-relations between immune system, infections, cancer biology and transplantation

Prerequisites: *Basic knowledge about any prior course*

SYLLABUS

UNIT/Module	CONTENT	HOURS or NUMBER OF CLASSES	CO Mapping	COGNITIVE LEVEL
I.	Scope of Immunology, Historical background of Immunology, Biological aspects of Immunology, Self and non-self recognition, specificity, memory of immune system. Concept of Innate and Adaptive	2	CO1, CO2	K1,K2

	immunity, cell mediated and humoral immunity			
II.	Immune Cells and Organs: Structure, Functions and Properties of: Immune Cells – Stem cell, T cell, B cell, NK cell, Macrophage, Neutrophil, Eosinophil, Basophil, Mast cell, Dendritic cell; and Immune Organs – Bone Marrow, Thymus, Lymph Node, Spleen, GALT, MALT, CALT	4	CO1, CO4	K1, K4
III.	Major Histocompatibility Complex and antigen presentation Organization of MHC locus (Mice & Human); Structure and Functions of MHC I & II molecules; Antigen processing and presentation (Cytosolic and Endocytic pathways)	4	CO1, CO3, CO5	K1, K3, K5
IV.	Development and activation of lymphocytes Development of T lymphocytes in thymus, positive and negative selection, activation of T lymphocytes in secondary lymphoid organs; T helper, CTL and NK cells (Killing Mechanisms); Development of B lymphocytes in bone marrow, selection, activation in response to antigens; Plasma and Memory cells; Primary and Secondary Immune Response; Introduction to tolerance (central and peripheral), regulatory T cells.	6	CO1, CO4	K1, K4
V.	Antigens Characteristics of an antigen (Foreignness, Molecular size and Heterogeneity); Haptens; Epitopes (T & B cell epitopes); T-dependent and	4	CO1, CO2, CO4	K1, K2, K4

	T-independent antigens; Adjuvants.			
VI.	Antibodies Structure, Types, Functions and Properties of antibodies; Antigenic determinants on antibodies (Isotypic, allotypic, idiotypic); VDJ rearrangements; Monoclonal and Chimeric antibodies	4	CO1, CO2, CO4	K1, K2, K4
VII.	Components of the Complement system; Activation pathways (Classical, Alternative and Lectin pathways); Biological consequences of complement Activation	4	CO1, CO3	K1, K3
VIII.	Immunological Disorders and Transplantation Types of Autoimmunity and Types of Hypersensitivity. Immunodeficiencies - SCID, DiGeorge syndrome, Chediak- Higashi syndrome, Leukocyte Adhesion deficiency, Types of Animal Models (Nude, Balb/c and SCID mice). Transplantation: Grafting, Immunological basis of transplantation reactions, GVH reaction, Immuno suppression.	4	CO3, CO4, CO5, CO6	K3, K4, K5, K6
IX.	Vaccine Immunology Types of vaccines- first, second and third generation vaccines (with examples); merits and demerits. Immune response by vaccines; Vaccine development and manufacture.	4	CO1, CO4	K1, K4
X.	Immunological Techniques ELISPOT, Immuno-fluorescence, Flow cytometry, Immuno-electron microscopy. Agglutination: Direct and Indirect, Widal test, VDRL test.	4	CO2, CO4,	K2, K4
XI.	Tumor Immunity and Cancer biology Tumor antigens and	8	CO1, CO6	K1, K6

	<p>their properties. Basic mechanisms of tumor recognition and rejection. Mechanism of detection of tumour-associated antigens by immune cells and antibodies. Role of tumour markers in the diagnosis and treatment of malignancy. Types and symptoms of cancer, various causes of cancer (physical, chemical, biological), Pathophysiology of cancer (biological properties of cancer cells, physical and hormonal changes associated with cancer), Basics of cancer therapeutics.</p>			
Text Books				
1. Goldsby RA, Kindt TJ, Osborne BA. Kuby's Immunology. 6th edition W.H. Freeman and Company, New York.				
2. Abul K. Abbas, Andrew H. Lichtman. Cellular and Molecular Immunology 9th Edition				
Suggested readings				
1. The cell biology of receptor-mediated virus entry. Joe Grove and Mark Marsh. J Cell Biol (2011) 195 (7): 1071-1082. https://doi.org/10.1083/jcb.201108131				
2. Cellular receptors for viruses: links to tropism and pathogenesis. Ju\$rgen Schneider-Schaulies. Journal of General Virology (2000), 81, 1413–1429.				
3. Powerpoint presentation provided in class				
Web Resources				
1. SWAYAM course Industrial Microbiology and Immunology SWAYAM by Dr. Kasturi Sarkar				
Evaluation: Theory CIA: 30 Semester Exam:70				
Paper Structure for Theory Semester Exam Module : Full marks 70 Short questions: 10 (each 2 marks) from 12 (10x2=20) Long questions: 5 (each 10 marks) from 7 (5x10=50)				

Course outcomes (COs) and Cognitive Level Mapping

COs	CO Description	Cognitive levels
CO1	Remember: Acquiring basic knowledge on types of immunity, immune components and mechanism of immune system, cancer biology, complement system, vaccines	K1
CO2	Understand: Understanding the essential features of antigens and antibodies, types and theories of Antibody formation.	K2

CO3	Analyze: To explain the concept of complement system, hypersensitivity, auto immunity and transplantation.	K3
CO4	Apply: application of the knowledge of immune system to describe natural infections, immune deficiencies, immunological techniques, vaccine development.	K4
CO5	Evaluate: evaluation of the concept of immune system in explaining transplantation biology	K5
CO6	Create: creation of relations between immune system and cancer biology.	K6