Semester	**5**
Course	**Major**
Paper Code	**C3MB230531T**
Paper Title	**Immunology**
No. of Credits	**4**
Theory / Practical / Composite	**THEORY**
Minimum No. of preparatory hours per week a student has to devote	4 hours/week
Number of Modules	No modules
Syllabus	**Unit 1 Introduction** 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 immunity, cell mediated and humoral immunity **Unit 2 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 **Unit 3 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) **Unit 4 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. **Unit 5 Antigens** Characteristics of an antigen (Foreignness, Molecular size and Heterogeneity); Haptens; Epitopes (T & B cell epitopes); T-dependent and T-independent antigens; Adjuvants.

	Unit 6 Antibodies Structure, Types, Functions and Properties of antibodies; Antigenic determinants on antibodies (Isotypic, allotypic, idiotypic); VDJ rearrangements; Monoclonal and Chimeric antibodies **Unit 7 Complement System** Components of the Complement system; Activation pathways (Classical, Alternative and Lectin pathways); Biological consequences of complement Activation **Unit 8 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. **Unit 9 Vaccine Immunology** Types of vaccines- first, second and third generation vaccines (with examples); merits and demerits. Immune response by vaccines; Vaccine development and manufacture. **Unit 10. Immunological Techniques** ELISPOT, Immuno-fluorescence, Flow cytometry, Immuno-electron microscopy. Agglutination: Direct and Indirect, Widal test, VDRL test. **Unit 11 Tumor Immunity and Cancer biology** Tumor antigens and 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.

Learning Outcomes	• To acquire knowledge on types of immunity, immune components and mechanism of immune system. • To provide knowledge on essential features of antigens and antibodies, types and theories of Antibody formation. • To explain the concept of complement system, hypersensitivity, auto immunity and transplantation. • To provide knowledge on immune deficiencies and several immunological techniques. 5. To gain the basic concepts of cancer biology.	
Reading/Reference Lists	1. Abbas AK, Lichtman AH, Pillai S. (2007). Cellular and Molecular Immunology. 6th edition. Saunders Publication, Philadelphia. 2. Delves P, Martin S, Burton D, Roitt IM. (2006). Roitt's Essential Immunology.11th edition WileyBlackwell Scientific Publication, Oxford. 3. Goldsby RA, Kindt TJ, Osborne BA. (2007). Kuby's Immunology. 6th edition W.H. Freeman and Company, New York. 4. Murphy K, Travers P, Walport M. (2008). Janeway's Immunobiology. 7th edition Garland Science Publishers, New York. 5. Peakman M, and Vergani D. (2009). Basic and Clinical Immunology. 2nd edition Churchill Livingstone Publishers, Edinberg. 6. Richard C and Geiffrey S. (2009). Immunology. 6th edition. Wiley Blackwell Publication	
Evaluation	Theory CIA: 30 Semester Exam:70	Practical (if applicable) CA: Semester Exam:
Paper Structure for Theory Semester Exam	**Full marks 70** Short questions: 10 (each 2 marks) from 12 (10x2=20) Long questions: 5 (each 10 marks) from 7 (5x10=50)	