Course Code	Course Name	Credits
26ZY509	IMMUNOLOGY	04

Course Objectives

- To understand the fundamental concepts and principles of immunology.
- To explain the structure and functions of the immune system and immune cells.
- To develop knowledge on innate and adaptive immunity, antigens, and antibodies.
- To analyze immune responses, hypersensitivity, autoimmune disorders, and immunodeficiency diseases.
- To enhance practical and analytical skills related to immunological techniques and applications.

Learning Outcomes

- Explain the basic concepts and mechanisms of the immune system.
- Differentiate innate and adaptive immune responses and their components.
- Examine the role of antigens, antibodies, and immune cells in defense mechanisms.
- Analyze immune-related disorders, vaccination, and immunological reactions.
- Apply immunological principles and laboratory techniques in biological and medical research.

Unit 1 – Introduction (12 Hrs.)

Immunity-innate and acquired immunity; Cells of immune system – lymphoid cells, mononuclear cells, granulocytes, dendritic cells & mast cells; organs of immune system - primary and secondary lymphoid organs; Humoral and Cell mediated immunity; Antigens: structure and types, antigenicity/Immunogenicity, Haptens, adjuvants; Antibodies: structure and function, Immunoglobulin classes and subclasses (isotypic, allotypes, idiotypes and anti-idiotypic antibodies).

Unit 2 – Immunity (12 Hrs.)

B-lymphocytes and their activation, development and maturation. production of monoclonal antibodies, polyclonal antibodies and applications; Thymus derived lymphocytes (T cells): activation, development and maturation, their types. Major histocompatibility Complex (MHC) Complex, MHC Class I and II molecules. Antigen processing and presentation process.

Unit 3 - Health and disease (12 Hrs.)

Complement system, pathways of complement activation and its functions, Hypersensitivity: classification of Hypersensitivity. Immunodeficiency disorders: Primary and secondary immunodeficiencies (AIDS); Autoimmune diseases - Organ specific auto immune diseases – Grave's disease, insulin– dependent diabetes mellitus (type–I diabetes). Systemic autoimmune diseases – Systemic Lupus Erythematosus (SLE), Rheumatoid arthritis. Treatment of autoimmune diseases.

Unit 4 – Transplantation immunology (12 Hrs.)

Transplantation and its classification, graft rejection and its mechanism, transplantation antigens, tissue typing, role of MHC molecules in allograft rejection, Clinical transplantations, bone marrow, HSC transplantation and immunosuppressive therapy; Tumours of the immune system-tumour antigens, tumour immune-therapy. Vaccines and their types, production of recombinant vaccine, Vaccine for hepatitis B surface antigen.

Unit 5 - Molecular immunology (12 Hrs.)

Antigen antibody interaction – Precipitation reactions, Agglutination reactions; ABO Blood typing principles; Principles and applications of ELISA, Radio Immuno Assay (RIA), western blot analysis, immunoelectrophoresis, Immunofluorescence, Fluorescence Activated Cell Sorting (FACS) analysis. Role of stem cells technology in immunology, Production of humanized monoclonal antibodies (Single chain fragment variable).

Reference Books:

1. Kuby Immunology by by Jenni Punt, Sharon Stranford, Patricia Jones, Judith A Owen, WH Freeman; 8th ed. 2018.
2. Immunology &Immunotechnology, Ashim K Chakravarthy, Oxford University Press. 2006.
3. Essential Immunology by Roitt I. Blackwell Scientific Publications, 13th Edition, 2017.
4. Immunology: A Short Course Richard Coico, Geoffrey Sunshine Wiley-Blackwell 7th Edition, 2015.
5. Understanding Immunology by Peter Wood, Pearson Education, 2001.

Websites and eLearning Sources:

- https://openstax.org/details/books/microbiology
- https://www.biologydiscussion.com/immunology
- https://www.easybiologyclass.com/category/immunology/