B.Sc., Biotechnology: Choice based credit system

B.Sc., -III- Semester W.E.F. 2021-22

Paper III

Immunology and rDNA technology

Course Objectives: To acquaint students with concepts of immunology and recombinant DNA technology. This course is aimed to give an understanding of the basics of immunology dealing cells and organs of the immune system, types of immune responses, antigen-antibody interactions, vaccines and tools, techniques and strategies and applications of genetic engineering.

Unit- I –Concepts, Cells and Organs of the Immune System

Terminology, antigen, hapten, antibody (structure and types), antigenicity, immunogenicity. Types of immunity- Innate and adaptive immunity. Hematopoiesis, organs, tissues, cells and mediators of the immune system (primary and secondary lymphoid organs, lymphocytes and cytokines). Introduction to MHC. Basic concepts of humoral and cell-mediated immune response.

Unit-II-Vaccinology and Clinical Immunology

Live, killed, attenuated, subunit and recombinant vaccines. Role and properties of adjuvants. Hybridoma technology, monoclonal antibodies and their application in immunodiagnosis. Antigen and antibody interactions - precipitation, agglutination, immune diffusion and ELISA. Introduction to hypersensitivity and autoimmunity.

Unit-III –Introduction, Tools and Techniques of rDNA Technology

Introduction to rDNA technology, steps involved in cloning, tools of genetic engineering (Genes, Cloning vectors – plasmids, bacteriophages and cosmids, Enzymes – restriction endonucleases and DNA Ligase, Hosts – bacteria). Principles and application of PCR. Southern Blotting. Introduction to DNA sequencing (Sanger Sequencing).

Unit-IV-Cloning Strategies and Application of rDNA Technology

cDNA library, construction, methods of transformation, recombinant selection and screening methods. Applications of rDNA technology in agriculture (transgenic plants, edible vaccines) and medicine (disease diagnosis).

Unit-V-Bioinformatics

Databases (PubMed, NCBI, EMBL and ExPASy), nucleotide and protein BLAST analysis, CLustal W and phylogenetic tree construction.