UNIT-I
2. Types of Immunity: Innate and Acquired Immunity, Humoral and cell-mediated immunity, Active and passive immunity
3. Structure and function of the immune system Primary lymphoid organs: Thymus, bone marrow and bursa fabricius. Secondary lymphoid organs: spleen and lymph nodes

UNIT-II
1. Cells of the immune system: B and T lymphocytes, null cells, monocytes, macrophages, neutrophils, basophils, eosinophils
2. Antigens – types of antigens, chemical nature of antigens, antigenic determinants, haptens, factors affecting antigenicity
3. Antibodies: Basic structure of immunoglobulins, types of immunoglobulin (IgG, IgM, IgA, IgE, IgD), Properties and functions of Immunoglobulins

UNIT-III
1. Types of antigen-antibody reactions - Agglutinations; Hemagglutinations, Bacterial agglutinations, Passive agglutinations. Precipitations: Precipitation reactions in fluids, precipitation reactions in Gels Radial immunodiffusion, Double immunodiffusion (Ouchterlony method), Neutralization and Compliment fixation
2. Antibody labeled immune reactions-ELISA (Enzyme linked immunosorbent assay) RIA (Radio immunoassay) and Immunofluorescence
3. Components of complement and activation of complement pathways, Classical pathway, Alternative pathway, Properdin pathway

UNIT-IV
1. Monoclonal antibodies: Production of monoclonal antibodies and their applications
2. Hyper sensitivity reactions - Immediate hypersensitivity: Systemic anaphylaxis, Localized anaphylaxis (Allergic rhinitis, asthma), Delayed hypersensitivity: Contact dermatitis
3. Auto immunity :Factors responsible for auto immunity, autoimmune disorders Systemic autoimmune disorders: Multiple sclerosis, Rheumatoid arthritis, Organ specific autoimmune disorders: Hashimoto’s thyroiditis, Good’s Pastuer’s syndrome
B. Sc (CBCS) Microbiology – III Year
Semester-V – Paper-V (Discipline Specific Course)
BASICS OF IMMUNOLOGY

Practical syllabus

1. Typing of human blood groups-slide agglutination
2. Estimation of hemoglobin content of human blood
3. Preparation of blood smear and different blood cell count
   i) RBC count
   ii) WBC count
4. Differential staining of WBC by Leishman’s stain
5. Widal-slide agglutination test
6. RPR card test for syphilis
7. Tridot test
8. Tube flocculation test

References:

UNIT - I
1. Introduction to Genetic Engineering: Milestones in genetic engineering and biotechnology.
2. Molecular Cloning: Tools and Strategies: Cloning Tools; Restriction modification systems: Types I, II and III.
3. Mode of action, nomenclature, applications of Type II restriction enzymes in genetic engineering.

UNIT - II
1. DNA modifying enzymes and their applications: DNA polymerases. Terminal deoxynucleotidyl transferase, kinases and phosphatases, and DNA ligases.
3. Use of linkers and adaptors.

UNIT - III
3. DNA, RNA and Protein analysis: Agarose gel electrophoresis, Southern - and Northern - blotting techniques, SDS-PAGE and Western blotting.

UNIT - IV
1. DNA Amplification and DNA sequencing: PCR: Basics of PCR, RT-PCR, Real-Time PCR.
2. Construction and Screening of Genomic and cDNA libraries: Genomic and cDNA libraries: Preparation and uses, Screening of libraries: Colony hybridization and colony PCR, Chromosome walking and chromosome jumping.
B. Sc (CBCS) Microbiology – III Year
Semester-V – Paper-VI/A (Discipline Specific Elective)
RECOMBINANT DNA TECHNOLOGY

Practical syllabus

1. Preparation of competent cells for transformation.
2. Demonstration of Bacterial Transformation and calculation of transformation efficiency.
3. Digestion of DNA using restriction enzymes and analysis by agarose gel electrophoresis.
4. Ligation of DNA fragments.
5. Cloning of DNA insert and Blue white screening of recombinants.
6. Demonstration of designing of primers for DNA amplification.
7. Demonstration of Amplification of DNA by PCR.
8. Demonstration of Southern blotting.

References:

B. Sc (CBCS) Microbiology – III Year
Semester-V – Paper-VI/B (Discipline Specific Elective)
INSTRUMENTATION AND BIOTECHNIQUES

Theory syllabus

UNIT – I

UNIT - II
1. Chromatography: Principles and applications of paper chromatography (including Descending and 2-D), Thin layer chromatography. Column packing and fraction collection.
2. Gel filtration chromatography, ion-exchange chromatography and affinity chromatography, GLC, HPLC.
3. Sedimentation and filtration.

UNIT - III
1. Electrophoresis: Principle and applications of native polyacrylamide gel electrophoresis.
2. SDS- polyacrylamide gel electrophoresis, 2D gel electrophoresis. Isoelectric focusing, Zymogram preparation and Agarose gel electrophoresis.

UNIT - IV
1. Centrifugation: Principle, working and applications of centrifuge. Preparative and analytical centrifugation, fixed angle and swinging bucket rotors.
2. RCF and sedimentation coefficient, differential centrifugation, density gradient centrifugation and ultracentrifugation.
B. Sc (CBCS) Microbiology – III Year
Semester-V – Paper-VI/B (Discipline Specific Elective)
INSTRUMENTATION AND BIOTECHNIQUES

Practical syllabus

1. Study of fluorescent micrographs to visualize bacterial cells.
2. Separation of mixtures by paper / thin layer chromatography.
3. To demonstrate column packing in any form of column chromatography.
4. Separation of protein mixtures by Polyacrylamide Gel Electrophoresis (PAGE).
5. Separation of components of a given mixture using a laboratory scale centrifuge.
6. Understanding density gradient centrifugation with the help of pictures.

References:

B. Sc (CBCS) Microbiology – III Year
Semester-V – Paper-VI/C (Discipline Specific Elective)
BIOSAFETY AND INTELLECTUAL PROPERTY RIGHTS (IPR)

Theory syllabus

UNIT - I
1. Biosafety: Introduction; biosafety issues in biotechnology; Biological Safety Cabinets & their types.
2. Primary Containment for Biohazards; Biosafety Levels of Specific Microorganisms.
3. Biosafety Guidelines: Biosafety guidelines and regulations (National and International); GMOs/LMOs- Concerns and Challenges.

UNIT - II
1. Role of Institutional Biosafety Committees (IBSC), RCGM, GEAC etc. for GMO applications in food and agriculture.
2. Environmental release of GMOs; Risk Analysis; Risk Assessment; Risk management and communication; Overview of International Agreements - Cartagena Protocol.
3. AERB/RSD/RES guidelines for using radioisotopes in laboratories and precautions.

UNIT - III
1. Introduction to Intellectual Property: Patents, Types, Trademarks, Copyright & Related Rights, Industrial Design and Rights, Traditional Knowledge.

UNIT - IV
1. Patent licensing and agreement; Patent infringement- meaning, scope, litigation, case studies, Rights and Duties of patent owner.
2. Agreements and Treaties: GATT, TRIPS Agreements; Role of Madrid Agreement; Hague Agreement; WIPO Treaties.
B. Sc (CBCS) Microbiology – III Year
Semester-V – Paper-VI/C (Discipline Specific Elective)
BIOSAFETY AND INTELLECTUAL PROPERTY RIGHTS (IPR)

Practical syllabus

1. Study of components and design of a BSL-III laboratory.
2. Filing applications for approval from biosafety committee (IBSC).
3. Filing primary applications for patents.
4. Study of steps of a patenting process.
5. A case study.

References: