



Semester – I

BRANCH	Subject	Subject Code
B.Sc. (Biotechnology – Minor/Generic elective course)	Microbiology and Immunology	BTM2/BT

Course Objective: - Course Objectives: To create general understanding about microbiology and immunology

1. The students will be able to understand microbial diversity and Nutrition.
2. The students will be able to understand immune system. Immune responses and Vaccination.
3. The students will be able to describe role of immune system in both maintaining health and contributing to disease.
4. The students will be able to understand immunological techniques.

Course Learning Outcomes: At the end of the course student will familiar with -

1. Microbial diversity and nutrition.
2. Immune system, its properties and types.
3. Immunoglobulin structure, types and functions and can apply the concept of hypersensitivity and vaccination for different diseases.
- 4 Perform various immunological techniques.

Unit - I

History, Basic concepts of Microbiology and Culture Media preparation

1. History, Basic concepts of Microbiology:

1.1 Fundamental, History and evolution Development of microbiology. Application of microbiology in human welfare.

1.2 Classification, General characteristic and structure of Bacteria, Fungi and Viruses.

2. Media Preparation:

2.1 Methods and Types: Culture, Minimal, Selective, differential. Transport media.

2.2 Synchronous, Batch and Continuous culture.

Unit - II

Microbial Growth and Growth measurement:

1. Microbial Growth:



1.1. Definition of growth, Mathematical expression of growth Curve, Generation time, Growth yield. Effect of nutrients on growth.

1.2. Factor affecting growth: Nutrient, Temperature, Oxygen, pH, Osmotic pressure.

2. Growth measurement:

2.1 Measurement of Growth (Direct and Indirect methods): cell number, Cell Mass and Cell Activity.

2.2. Cell Count: Turbidometric method, Plate count method. Membrane count method. Dry weight and Wet method by measurement of cellular activity.

Unit - III

Basics of Immunology:

1. Basics of Immunology:

1.1. Concept of Innate and Acquired immunity. Phagocytosis complement and inflammatory responses.

1.2. Immune cells and organs: Structure, Function and Properties of immune cells - Stem cell, T-cell, B-cell, NK-cell, Macrophages, Neutrophil. Eosinophil Basophil, Mast cell, Dendritic cell.

1.3. Immune organ: Bone marrow. Thymus, Lymph Node, Spleen, Lymphatic System.

Unit - IV

Immunoglobulins and Immune response:

1. Immunoglobulins

1.1. Antigens: Characteristics of an antigen: Foreignness. Molecular size. Chemical composition and Heterogeneity.

Antigen Adjuvants, Epitopes, Haptens.

1.2. Antibodies: Structure, Types, Functions and Properties of antibodies Antigenic determinant on antibodies (Isotypic, Allotypic, Idiotypic). Monoclonal, Polyclonal and Chimeric antibody.

2. Immune response:

2.1. Generation of immune response: Primary and Secondary immune response, generation of Humoral response (Plasma and Memory cell).

Generation of cell mediated immune response (self MHC restriction, T-cell activation, Co-stimulatory signals). Killing Mechanisms by CTL and NK cells, Introduction to tolerance.

Unit - V



Microbial, Immunological Techniques and Vaccination:

1. Microbial Techniques :

1.1. Principle, Working and applications of instruments -Laminar airflow, Autoclave, Hot air oven.

2. Immunological techniques:

2.1. RIA, ELISA, Western blotting. Principles of Precipitation.

Agglutination, Immunodiffusion, Immunolectrophoresis.

3. Vaccination:

3.1. Vaccines and vaccination: Rubella, Varicella(Chickenpox). Polio,Diphtheria.Hepatitis vaccine.

List of Practical's

1 To perform Aseptic technique, Cleaning of glassware's, preparation of Cotton Plugging and Sterilization.

2. To prepare Bacterial and Fungal media.

3. To isolate microbes from Air, Water and Soil.

4. To Study dilution and plating by Pour Plate, Spread Plate methods.

5. To Study microorganisms by Staining method - Simple staining, Gram staining. Endospore staining, Fungal staining. Negative staining

6. To identify bacteria based on staining, Shape and Size.

7. To enumerate microorganism - Total and Viable count.

8. To study Antibiotic sensitivity of microbes by the use of antibiotic discs.

9. To isolate and identify pathogenic bacteria from sewage and waste water.

10. To Determine growth curve and generation time of E. coli.

11. To identify of human blood groups.

12. To enumerate total WBC of the given blood sample by hemocytometer.

13. To enumerate differential Leukocyte of the given blood sample.

14. To enumerate total RBC of the given blood sample by hemocytometer.

15.To isolate and Identify aquatic Fungi from Local water body.