## SEMESTER-IV

## COURSE2: MICROBIOLOGY & IMMUNOLOGY

**Theory** **Credits: 3** **3 hrs/week**

**Course Objectives**

1. To introduce the history and development of microbiology and immunology.
2. To study the structure of microorganisms and their nutritional and growth requirements.
3. To understand microbial control methods such as sterilization and disinfection.
4. To learn the basic principles of immunity, immune cells, organs, antigens, and antibodies.
5. To explain antigen–antibody reactions, immunoassays, and applications like vaccines and monoclonal antibodies.

**Learning Outcomes**

After completing this course, students will be able to:

1. Describe the contributions of early microbiologists and immunologists.
2. Identify the structure of bacteria and viruses, and explain their growth and nutritional needs.
3. Explain methods of microbial control through sterilization and disinfection.
4. Describe the cells, organs, antigens, and antibodies of the immune system.
5. Apply knowledge of antigen–antibody reactions in understanding immunoassays, monoclonal antibodies, and vaccines.

**Syllabus**

**UNIT I –Microbiology: History, Staining & Structure**

History and development of microbiology – contributions of Louis Pasteur, Robert Koch, and Edward Jenner. Stains and staining procedures – acidic, basic, neutral, Gram staining, acid-fast staining.. Viruses – general characteristics, classification, structure of Lambda Phage.

**UNIT II –Microbial Nutrition, Growth & Control**

Basic bacterial nutritional requirements and classification (nutrition & temperature-based). Types of media. Selective and Differential media, Enriched media, Enrichment media. Bacterial growth curve. Sterilization and disinfection – methods and principles.

**UNIT III –Immunology: History, Immunity & Immune System**

History and scope of immunology. Immunity and its classification – innate and acquired. Cells of the immune system – T cells, B cells, NK cells. Organs of the immune system – bone marrow, thymus, spleen, lymph node, MALT.

**UNIT IV –Antigens, Antibodies & Immune Mechanisms**

Antibodies – structure, classes (IgG, IgM, IgA, IgE, IgD), diversity. Antigens – types, factors affecting antigenicity, epitopes, adjuvants, haptens. Immune responses – humoral and cell-mediated immunity (T-cell, NK-cell, ADCC). MHC and hypersensitivity. Autoimmunity

**UNIT V –Antigen-Antibody Reactions & Applications**

Antigen–antibody reactions – precipitation, agglutination, complement fixation, immunodiffusion. Hybridoma technology – monoclonal antibodies and applications. Immunoassays – ELISA. Vaccination – discovery, principles, significance, and types (live, attenuated, killed, recombinant, subunit).

**Reference Books:**

1. Prescott's Microbiology –Willey, Sherwood & Woolverton
2. Microbiology –Pelczar, Chan & Krieg
3. Ananthanarayanan & Paniker –Textbook of Microbiology
4. R.C. Dubey & D.K. Maheshwari –A Textbook of Microbiology
5. R.C. Dubey & D.K. Maheshwari –A Textbook of Microbiology
6. R.C. Dubey –Immunology
7. K. D. Tripathi –Essentials of Immunology

**SEMESTER-IV**
**COURSE2: MICROBIOLOGY & IMMUNOLOGY**
**Practical** **Credits: 1** **2 hrs/week**

**Practical Component:**

1. Observation of permanent slides using microscope
2. Preparation of nutrient agar medium for bacteria
3. Preparation of PDA medium for fungi
4. Sterilization techniques (autoclave, hot air oven, filter)
5. Isolation of bacteria from soil
6. Simple staining technique
7. Differential staining technique
8. Antigen–antibody reaction–determination of Blood group, Cross reactivity
9. Pregnancy test
10. Widal test
11. Ouchterlony immunodiffusion
12. Radial immunodiffusion
13. ELISA(Demonstration)