

Dr. V. S. KRISHNA GOVERNMENT DEGREE AND PG COLLEGE (A), VSKP
DEPARTMENT OF BIOTECHNOLOGY
I B.Sc BIOTECHNOLOGY SYLLABUS
SEMESTER II

Course II – MICROBIOLOGY AND IMMUNOLOGY

(Total Hours of Teaching 60 @ 04 hrs/week)

Credits - 04

Course Outcomes:

On successful completion of this course, the students will have the knowledge and skill to:

- Explain the history and development of microbiology.
- Explain the different types of microscopes with their significance and importance.
- Classify and illustrate the diversity among bacteria and viruses.
- Explain basic microbial nutrition requirements and nutritional classification of bacteria.
- Illustrate microbial growth, control (physical and chemical), and maintenance of pure cultures and analyze cultural activity.
- Define central immunological principles and concepts.
- Illustrate immunological processes and identify immune responses at a cellular level and molecular level.
- Describe the roles of the immune system in both maintaining health and contributing to disease and the triggering and regulation of immune responses.

MODULE I: Fundamentals of Microbiology **12 Hours**

- 1.1. Historical development of Microbiology and contribution of Scientists to microbiology.
- 1.2. Microscopy: Principles, working and applications of Bright field, Dark field, Phase contrast, Fluorescent, Scanning and Transmission Microscopy.
- 1.3. Morphology, structure, characteristics and classification of bacteria; Difference between Gram +ve and Gram –ve bacteria. Chromatin material, plasmids; definition and kinds of plasmids (conjugative and non-conjugative) F, R, and Col plasmids.
- 1.4. General Characteristics, structure and symmetries of Viruses. Phage, plant and animal viruses; Classification of viruses. Brief idea on lytic and lysogenic cycles.

MODULE II: Microbial nutrition, Growth and Control **12 Hours**

- 2.1. Microbial nutrition: Micro and macro nutrients, growth factors; Classification of bacteria based on nutrition.
- 2.2. Nutrient media: Natural, synthetic and different types of media.
- 2.3. Bacterial growth curve; Batch and continuous cultures, synchronous cultures; measurement of bacterial growth; pure culture and its characteristics.
- 2.4. Methods of sterilization: Terminology, Physical and chemical methods

MODULE III: Immune system **12 Hours**

- 3.1 Immunity: Innate and Acquired immunity; Humoral immunity.
- 3.2 Cells of immune system; Organs of immune system.
- 3.3 Antigen types; Antigenicity and factors affecting antigenicity
- 3.4 Antibodies: Structure and different classes of antibodies.

MODULE IV: Immunity and Hypersensitivity

12 Hours

- 4.1. Cell mediated immunity: TC-cell mediated, NK cell mediated immunity; ADCC.
- 4.2. Cytokines: types and mechanism; MHC: types and diversity.
- 4.3. Hypersensitivity: General features and types of hypersensitivity.
- 4.4. Vaccines: Discovery, significance and types.

MODULE V: Immunological techniques

12 Hours

- 5.1 Antigen-antibody reactions: Precipitation, agglutination, neutralization and complement fixation
- 5.3. Immuno diffusion and Radial diffusion; Radioimmuno assay & immunofluorescent assay
- 5.2. ELISA and Western blotting –Principle and applications.
- 5.3. Hybridoma technology: Monoclonal antibodies and their applications

PRACTICALS SEMESTER -II

Course II – MICROBIOLOGY AND IMMUNOLOGY (Total hours of Laboratory Exercises – 30 hours @ 03 hrs/week) Credits - 02

Course Outcomes:

On successful completion of this practical course, the students have the knowledge and skills to:

- Use and demonstrate various microbiological lab equipment
- Prepare the nutrient medium and grow the bacteria under sterile conditions.
- Identify the bacteria using staining techniques
- Isolate bacteria using different isolation techniques
- To handle the microbial culture individually
- Produce and analyze the microbes in relevant media
- Perform individual blood group determination
- Perform Widal and Elisa tests

Practical Syllabus

1. Demonstration, use and care of microbiological equipment.
2. Preparation of media, sterilization and isolation of bacteria.
3. Demonstration of motility of Bacteria.
4. Simple staining of bacteria.
5. Gram staining of Bacteria.
6. Isolation of pure culture by pour plate, spread plate and streak plate methods.
7. Antigen-antibody reaction: Determination of Blood group.
8. Widal test.
9. ELISA test