

**2<sup>nd</sup> SEMESTER  
MAJOR COURSE**

**BTG222J: BIOTECHNOLOGY (MICROBIOLOGY AND IMMUNOLOGY)**

**CREDITS: THEORY- 4, PRACTICAL -2**

***THEORY (4 CREDITS):***

**Unit –1; Introduction to Microbes:** General structure of Bacterial cell (cell wall – Gram +ve and Gram –ve, flagella, bacterial chromosome, plasmid, cell inclusions).

Gene transfer in bacteria (Transformation, conjugation, transduction).

General structure of viruses (Capsid symmetry, enveloped and non-enveloped viruses) viral classification (RNA & DNA, positive & negative stranded viruses). Bacteriophages - lambda phage life cycle).

**Unit –2; Microbial Growth:** Nutritional requirements, Bacterial nutritional types (photolitho-autotrophy, chemolithio-autotrophy, photoorgano-heterotrophy and chemoorgano-heterotrophy). Growth curve - its phases, Growth kinetics. Factors affecting growth (solute and water activity, pH, temperature, oxygen concentration, pressure), Measurement of bacterial growth. Control of microbial growth (physical, chemical and antibiotics).

**Unit–3; Immunology I:** Innate Immune system, (Anatomical and physiological barriers). Hematopoiesis, Cells of myeloid and lymphoid system (Basophils, Neutrophils, Eosinophils, monocytes, T cells, B cells, NK cells, dendritic cells, mast cells). Phagocytosis and respiratory burst, Inflammation (clinical signs, initiators and mediators),. Organs of immune system – primary (bone marrow, thymus) secondary (lymph node, spleen, MALT). Lymph and lymphatic system. Host-pathogen interaction, Toll like Receptors, Basic concept of cytokines. Complement system – pathways.

**Unit–4; Immunology II: Antigens:** Nature and properties of antigen, Structure and types of antibodies, Primary and secondary immune response. Antigen processing and presentation. Mechanism of humoral immune response, Significance of Co-Stimulation. Mechanism of cell mediated immune response. Monoclonal antibodies – uses. Basic concept of vaccines.

***PRACTICAL (2 CREDITS)***

1. Preparation and sterilization of culture media for bacterial cultivation.
2. Culture Techniques: Streaking, Spreading etc.
3. Gram staining
4. Blood Smear Preparation and Staining
5. Total and differential Leukocyte count.
6. Total RBC count.
7. Blood grouping.
8. Field trips/subject tour (labs, institutes, industrial visit etc.)

**BOOKS RECOMMENDED**

- General Microbiology: Stanier, R. Y., Ingraham, J. L., Wheelis, M. L. and Painter, P.R. – Macmillan Press Ltd., UK.
- Microbiology: An Introduction by Gerard Tortora, Berdell Funke, Christine Case, Derek Weber
- Microbiology: Pelczar, M. J., Chan, E. C. S. and Krieg, N. R.-McGraw-Hill.
- Kuby Immunology: Goldsby, R. A., Kindt, T. J., Osborne, B. A. and Kuby, J. - W.H.
- Cellular and Molecular Immunology by Abul Abbas, Andrew Lichtman, Shiv Pillai
- Textbook of Immunology: Seemi Farhat Basir, Prentice Hall India Learning Private Limited