

DETAILED SYLLABUS**SEMESTER – I****MB – 01 FUNDAMENTALS OF MICROBIOLOGY 4 Credits (60 Hours)****Unit : I History of Microbiology (15 Hours)**

- 1.1 Discovery of Microbial World : Theories of Biogenesis and Abiogenesis;
Discovery of viruses
- 1.2 Contributions of scientists in the field of microbiology : Anton van Leeuwenhoek, Edward Jenner, Robert Koch, Louis Pasteur, Iwanowsky, Winogradsky, Beijerinck, Alexander Fleming, Selman Waksman, Paul Ehrlich
- 1.3 Importance and applications of Microbiology in various fields
- 1.4 Golden era of Microbiology

Unit : 2 Microbiological Techniques - I (15 Hours)

- 2.1 Sterilization and disinfection techniques : Principles and methods of sterilization
- 2.2 Physical : Hot Air Oven, Pressure Cooker, Autoclave, Laminar Air Flow,
- 2.3 Chemical : Alcohol, Aldehyde, Phenol, Halogen, Hypochlorite, Fumigants, phenol coefficient
- 2.4 Radiation methods : UV rays, gamma rays, ultrasonic methods

Unit : 3 Microbiological Techniques - II (15 Hours)

- 3.1 Types of Stains & Staining techniques: Simple, Differential, Negative, Structural stains (Spore, Capsule, Flagella, Cell Wall, Metachromatic etc.);
- 3.2 Principles of Microscopy: simple & compound
- 3.3 Bright field, Dark field, Phase contrast & Fluorescence Microscopy , Scanning and Transmission Electron Microscopy

Unit : 4 Pure culture Isolation and Preservation of Cultures (15 Hours)

- 4.1 Pure culture techniques – Enrichment culture, dilution plating, streak plate, spread plate and pour plate techniques, Micromanipulator
- 4.2 Preservation : Sub culturing, Oil overlay, Sand cultures, Storage at low temperature, Lyophilization, Liquid Nitrogen
- 4.3 Microbiological Media : Simple, Complex, Defined, Differential, Selective, Special

LAB – 1: (B. Sc. Sem. – I)**Fundamentals of Microbiology (Practical) :****2 Credits****30 Hours**

1. Safety precautions to work in Microbiology Laboratory.
2. Preparation of culture media : Solid & Liquid
3. Sterilization techniques : Autoclaving, hot air oven and filtration
4. Isolation of single colony on solid media
5. Enumeration of bacterial numbers by serial dilution and plating
6. Light & compound microscopes and their handling
7. Microscopic observation of bacteria for Morphological characters
8. Calibrations of microscopic measurements (Ocular & stage micrometers)
9. Simple and differential staining (Gram staining), negative staining
10. Preservation of bacterial cultures

SEMESTER – II**MB – 02 FUNDAMENTALS OF BACTERIOLOGY 4 Credits (60 Hours)****Unit : I Prokaryotic Cell Organization (15 Hours)**

- 1.1 Shape, size and arrangement of bacterial cell
- 1.2 Structure of bacterial cell :
 - 1.1.1 Surface appendages of bacteria : General nature, arrangement, structure and role of flagella, General nature and significance of pili, prosthecae and stalks
 - 1.1.2 Surface layers of bacteria : General nature and significance of capsule and slime layer, cell wall, cell membrane and Mesosomes
 - 1.1.3 Bacterial cytoplasm and cell organelles : Cytoplasm, cytoplasmic inclusions, nuclear material
- 1.3 Bacterial endospore : Spore structure, sporulation and spore germination

Unit : 2 Introduction to Bacterial Nutrition & Growth (15 Hours)

- 2.1 Nutritional diversities in bacteria
- 2.2 Nutritional requirements of bacteria
- 2.3 Composition and nutritional value of ingredients of growth media
- 2.4 Cultivation methods of bacteria, characteristics of growth, modes of cell division

Unit : 3 Principles of Microbial Control (15 Hours)

- 3.1 General principles : Control by killing, inhibition and removal
- 3.2 Physical agents of microbial control : Osmotic Pressure, Filtration(HEPA filters)
- 3.3 Chemical agents of microbial control : Ideal antimicrobial chemical agent, Major groups of antimicrobial agents : Phenolics, Phenol coefficient, Halogens, Surfactants, Alcohols, Dyes, Heavy metals and gaseous agents, antibiotics

Unit : 4 Introduction to Bacterial Taxonomy and Nomenclature (15 Hours)

- 4.1 Basic principles of Bacterial Taxonomy & Nomenclature

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- 4.2 Introduction to different systems of bacterial classification, modern systems
 - 4.3 Introduction to Bergey's Manual of Systematic Bacteriology

LAB – 2: (B. Sc. Sem. – II)

1. Cultivation of different groups of bacteria
2. Study of pigmented bacteria : *S. aureus*, *S. epidermidis*, *M. luteus*, *S. marcescens*,
P. aeruginosa
3. Study of bacterial structure by structural staining : Spore, Capsule, Cell Wall
4. Special staining : Spirochete by Fontana's method
5. Growth Curve of *E. coli*
6. Effect of temperature and pH on growth of bacteria
7. Study of effect (Bacteriostatic & Bactericidal) of chemicals on bacterial growth : heavy metals, phenol, mercuric chloride, crystal violet, antibiotics by different methods : strip method, agar ditch method, agar cup method.
8. Morphological and biochemical characteristics of selected bacterial genera : *Escherichia*, *Bacillus*, *Pseudomonas*, etc.

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