



**B.SC. MICROBIOLOGY SYLLABUS**  
**SUBJECT: - Microbiology**  
**First Year B. Sc. Semester I, Microbiology**  
**(Discipline Specific Course - Core)**  
**Effective from June-2023**

**Learning Outcomes**

**By the end of the course, the students will be able to:**

- Know about Microorganisms in various environments their evolution and history
- Understand basic instrumentation used in Microbiology laboratories.
- Understand the distinguishing Branches of microbiology
- Be able to perform the basic practical and handling of Microbes.

**Paper number: DSC-C-MIC-111T (Theory-4 credit)**  
**Paper name: Introduction to Microbiology**

**Unit 1: The Microbial World**

**Teaching Hours: 10**

- Introduction: Microbes in our lives
- Classification of Microorganisms
  - Binomial system of nomenclature
  - Difference between prokaryotic and eukaryotic microorganisms
  - Whittaker's five kingdom concept of classification [EC]
  - Carl Woese's three kingdom classification system [EC]
- Major Groups of Microorganism
  - Prokaryotic microbes: Eubacteria and Archaeobacteria
  - Eukaryotic microbes: Fungi (Yeasts & Molds), Protozoa, Algae [EC]
  - Acellular microbes: Viruses
- Distribution of Microorganisms in Nature

## **Unit 2: The History of Microbiology**

**Teaching Hours: 10**

- The Discovery of Microorganisms
  - Microbiology and the origin of life
  - Contribution of A. v. Leeuwenhoek in the discovery of microscope [EC]
  - Spontaneous generation vs. biogenesis
- The Golden Age of Microbiology
  - Germ theory of fermentation
  - Germ theory of disease [EC]
  - Pure culture technique and Koch's Postulates
  - Contribution of Joseph Lister in Antisepsis
  - Contribution of Edward Jenner & Louis Pasteur in Immunology
  - The Birth of Modern Chemotherapy: Contribution of Paul Ehrlich, Alexander Fleming and Selman A. Waksman

## **Unit 3: The Development of Microbiology**

**Teaching Hours: 10**

- Medical Microbiology: Discovery of phagocytosis, bacterial toxins and antitoxins, types of immunity and interferon
- Agricultural Microbiology
  - Soil Microbiology: Contributions of Sergei N. Winogradsky [EC] and Martinus W. Beijerinck and development of enrichment culture technique
  - Plant Pathology: 'Fire Blight' of pears, 'Peach Yellows', transmission of the viral diseases of plants by insects, discovery of TMV [EC]
- Microbial Genetics and Molecular Biology
  - One Gene - One Enzyme Hypothesis: Contributions of George Beadle and Edward Tatum [EC]
  - DNA as Hereditary Molecule: Contributions of Frederick Griffith, Oswald Avery, Colin MacLeod and Maclyn McCarty
- Microbiology As a Field of Biology
- Microbiology As a Science: Basic and Applied Microbiology

## **Unit-4 The Microscopic Examination of Microorganisms**

**Teaching Hours: 10**

- Light Microscopy
  - Principle of bright-field microscopy: resolving power, numerical aperture, limit of resolution and magnification
  - Component parts of the compound light microscope [EC]
  - Principle and applications of dark-field, fluorescence, and phase-contrast microscopy
- Preparation of Specimens for Light Microscopy
  - The wet-mount and hanging-drop techniques [EC]
  - Microbiological stains: acidic, basic, and neutral dyes
  - Smear preparation, fixation, use of mordents, intensifiers, decolorizers
  - Simple staining of the smear: positive [EC] and negative staining

- Electron Microscopy: Principle and applications of transmission & scanning electron microscopy

### **REFERENCE**

| No. | Name  | Author   |
|-----|---|--|
| 1.  | Microbiology: An Introduction               | G. J. Tortora, B. R. Funke, C. L. Case, 11th Edition (Indian Edition) (2016). Pearson India Education Services Pvt. Ltd., Noida (UP), India. |
| 2.  | Microbiology                                | Pelczar JR., Chan ECS, Krieg NR, 5th Edition (1993), McGraw-Hill Book Company, NY.   |
| 3.  | Microbiology: An Application Based Approach | Pelczar JR., Chan ECS, Krieg NR, 3rd Reprint (2011), Tata McGraw Hill Education Private Limited, New Delhi, India                            |
| 4.  | Principles of Microbiology                  | R. M. Atlas, 2nd Edition (Indian Edition) (2015) McGraw Hill Education (India) Private Limited, New Delhi, India                             |

### **URLs/Weblinks for E-content**

1. Whittaker's five kingdom concept of classification <https://youtu.be/hiQCCN5oisw>
2. Carl Woese's three kingdom classification system <https://youtu.be/ZUyK3iFptFY>
3. Eukaryotic microbes:
  - Fungi [https://youtu.be/VVuYGkk\\_I8s](https://youtu.be/VVuYGkk_I8s)
  - Protozoa <https://youtu.be/B1CFVuQVG2U>
  - Algae <https://youtu.be/j5W0apM8bxc>
4. Contribution of A. v. Leeuwenhoek in the discovery of microscope <https://youtu.be/qLTKU0nbzLo>
5. Germ theory of disease <https://youtu.be/97sEcWeb3Iw>
6. Contributions of Sergei N. Winogradsky <https://youtu.be/3xDexh8vJv0>  
<https://youtu.be/9I96690AVGE>  
<https://www.sumanasinc.com/webcontent/animations/content/winogradsky.mp4>
7. Discovery of TMV <https://youtu.be/vOX1MHPw8g0>
8. One Gene - One Enzyme Hypothesis [https://youtu.be/cETqxisB\\_Bw](https://youtu.be/cETqxisB_Bw)  
<https://youtu.be/fXASTY-YoRQ>
9. Component parts of the compound light microscope [https://youtu.be/RKA8\\_mif6-E](https://youtu.be/RKA8_mif6-E)  
<https://youtu.be/bdxzcoJllyE>
10. Hanging-drop techniques <https://youtu.be/ujzSmsg7ok>
11. Simple staining (Positive Staining) <https://youtu.be/80DeT9DLHKI>

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**Practicals based on the theory paper in semester-1**

**Paper number: DSC-C-MIC-112P (Practicals-4 credit)**

**Paper name: MICROBIOLOGY PRACTICALS**

**DSC-C-MIC-112P: MICROBIOLOGY PRACTICALS**

1. Microbiology Good Laboratory Practices (GLP): Rules and Safety
2. Study of principle, component parts and operation of the compound light microscope
3. Study of principles and working of laboratory instruments: Autoclave, Hot air oven, Incubator, Water bath, Bacteriological Filters, Centrifuge, Rotary shaker, pH meter, Colorimeter
4. Introduction to size, shape, labeling (if required) and uses of laboratory glass wares/plastic wares: Test tube, Pipette, Conical flask, Petri dish, Measuring cylinder, Coplin Jar, Burette, Beaker, Glass spreader
5. Cleaning and preparation of glassware for sterilization
6. pH adjustment of solution by use of pH strip and pH meter
7. Disposal of laboratory waste and cultures
8. Study of curd sample by wet mount (temporary mount)
9. Study of hay infusion by hanging drop method
10. Simple staining of bacteria: positive staining & negative staining
11. Study of permanent slides/photomicrographs of different groups of microorganisms
  - a) Permanent slides of prokaryotic microbes (bacteria): *Staphylococci, Bacilli, Spirochetes, Actinomycetes*
  - b) Permanent slides of eukaryotic microbes:
    - Fungi: *Yeast, Mucor, Penicillium*
    - Algae: *Diatoms, Spirogyra, Chlamydomonas*
    - Protozoa: *Amoeba, Paramecium, Euglena*
  - c) Photomicrographs of acellular microbes (viruses): HIV, TMV, Bacteriophage T2