Gujarat University
B.Sc. Microbiology Syllabus
First Year B. Sc. Semester II, Microbiology
(Discipline Specific Course – Core)
Effective from June-2023

Learning Outcomes

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

- Know in detail about the overall structure of a bacterial cell
- Understand how to cultivate bacteria in the laboratory
- Understand how to isolate bacteria in pure form in the laboratory
- Observe microscopically, the bacteria and their cellular structures by differential and special staining techniques

Paper code: DSC-C-MIC-121T (Theory)
Paper name: Vedic Microbiology & Basic Bacteriology
Credits: 04 (04 hrs/week, Total: 60 hrs)

Unit-1 Introduction to Vedic Microbiology **Teaching hrs: 15**

1.1 Contribution of Rishi – Kanva, Sushruta and Charak
1.2 Microbial diversity based on pH, temperature, oxygen and hydrostatic pressure
1.3 Occurrence of krimis in the environment
(a) Prevalence of krimis in water
(b) Prevalence of krimis in milk, whey and food
(c) Prevalence of krimis on/in human body
1.4 Method of counting the number of krimis
1.5 Shape and color of krimis

Unit-2 Structural Organization of a Bacterial cell **Teaching hrs: 15**

2.1 Surface appendages
(a) Flagella
(b) Pili and Fimbriae
(c) Prosthecae and Stalks
2.2 Surface layers
(a) Capsule and Slime layer
(b) Cell wall, Differential staining – Gram staining and Acid-fast staining
(c) Cytoplasmic membrane and Mesosomes
2.3 Cytoplasm and cell organelles
(a) Cytoplasm
(b) Ribosomes
(c) Nuclear material and Plasmid
(d) Cellular reserve food material
(e) Bacterial Endospore – structure, sporulation and germination

Unit-3 Nutrition and Cultivation of Bacteria **Teaching hrs: 15**

3.1 Nutritional and chemical requirements of bacteria: Carbon, Oxygen, Nitrogen, Sulfur, Phosphorus, Trace elements, Vitamins, Growth factors, water **[EC]**

3.2 Nutritional diversities in bacteria

(a) Based on source of energy: Phototrophs, Chemotrophs

(b) Based on source of electro donor: Lithotrophs, Organotrophs

(c) Based on source of carbon: Autotrophs, Heterotrophs, Mixotrophs, Obligate parasites

3.3 Culture media: Media ingredients, Preparation of media, General cultivation media (N-broth and N-agar) **[EC]**

3.4 Cultivation of anaerobic bacteria

Unit-4 Pure Culture Techniques **Teaching hrs: 15**

4.1 Pure culture, mixed culture, Selective methods to obtain pure cultures: Chemical, Physical, and Biological Methods

4.2 Isolation methods of pure culture: Aseptic technique **[EC]**, Streak plate **[EC]**, Spread plate and Pour plate techniques

4.3 Cultural characteristics: Colony characteristics **[EC]**, Characteristics of broth cultures

4.4 Maintenance and preservation of pure cultures **[EC]**

4.5 Culture collection centers

References:

1. **Microbiology,** Pelczar JR., Chan ECS, Krieg NR, 5th Edition (1993), McGraw-Hill Book Company, NY.
2. **Principles of Microbiology**, R. M. Atlas, 2nd Edition (Indian Edition) (2015) McGraw Hill Education (India) Private Limited, New Delhi, India.
3. **Vedic Microbiology – A Scientific Approach,** Dr. R. C. Dubey, 1st Edition (2021), Motilal Banarsidass International, Delhi, India.

URLs/Weblinks for E-content

3	Gram +ve and Gram -ve bacterial cell wall	https://youtu.be/eM-bXU1UO0Q https://youtu.be/roX0inhEdgA
4.	Gram stain	https://youtu.be/pgr-HeVNbOY https://youtu.be/sxa46xKfIOY
5.	Acid-fast staining	https://youtu.be/s1uWm6rqGpA
6.	Bacterial flagellum	https://youtu.be/B7PMf7bBczQ https://youtu.be/eKnFlbrLNOw
7.	Bacterial cell membrane	https://youtu.be/Kqa8oNDezdM
8.	Bacterial ribosomes	https://youtu.be/BEmXTs2hF-A
9.	Bacterial spores	https://youtu.be/VbDHV7j5-PQ

		https://youtu.be/oGSmpKUIdS8
10.	Nutritional and chemical requirements of bacteria	https://youtu.be/qMNFdmbj20Y
11.	Preparation of nutrient agar	https://youtu.be/56rl5QO1qLE
12.	Aseptic technique	https://youtu.be/bRadiLXkqoU
13.	Streak plate method	https://youtu.be/_1KP9zOtjXk https://youtu.be/pfrjpyZ-Wuw
14.	Colony characteristics	https://youtu.be/4JZAFUPckUg https://youtu.be/R0T-nplMCzo
15.	Lyophilization of bacterial culture	https://youtu.be/tpoWoMtJGac?list=RDCMUCffPoweUePIq8G-i0JjLUZQ

Gujarat University
B.Sc. Microbiology Syllabus
First Year B. Sc. Semester II, Microbiology
(Discipline Specific Course – Core)
Effective from June-2023
Practicals based on theory paper in Semester-II

Paper Code: DSC-C-MIC-122P (Practicals)
Paper Name: Microbiology Practicals
Credits: 04 (04 hrs/week Total: 60 hrs)

1. Differential staining of bacteria: Gram stain method

2. Structural and special staining techniques
(a) Endospore staining by Dorner's method
(b) Cell wall staining by Dyar's method
(c) Capsule staining by Hiss's method
(d) Metachromatic granule staining by Albert's method
(e) *Spirochaetes* staining by Fontana's method

3. Preparation of bacteriological media: Nutrient broth and Nutrient agar

4. Cultivation and isolation of bacteria
(a) Broth culture method
(b) Agar plate methods
   I. Streak plate method
   II. Pour plate method
   III. Spread plate method
   [Method: Gram stain of mixed bacterial culture, Isolation of bacteria, Colony (Cultural) characteristics, Morphological characteristics (Gram stain)]
(c) Agar slant (slope) method for pure culture

5. Preservation of microbial cultures
(a) Periodic sub culturing and storage at refrigeration temperature
(b) Preservation of bacteria in soil (Nitrogen fixers)

6. Study of pigmented bacteria
(a) Staphylococcus aureus
(b) Micrococcus luteus
(c) Serratia marcescens
(d) Pseudomonas aeruginosa

7. Cultivation of anaerobic bacteria by use of …
(a) Robertson's cooked meat medium
(b) Thioglycolate broth
(c) Anaerobic jar (Demonstration)