



# SHREE H. N. SHUKLACOLLEGE OF SCIENCE

(AFFILIATED TO SAURASHTRA UNIVERSITY)

Shree H.N. Shukla College Campus Nr. Lalpari lake, Behind old Marketing Yard,  
Amargadh, Bhichari, Rajkot-360001, Ph. No-9727753360

## SAURASHTRA UNIVERSITY, RAJKOT SYLLABUS FOR MICROBIOLOGY SEMESTER - I (With effect from June 2019) MB-101- FUNDAMENTALS OF MICROBIOLOGY (THEORY)

### UNIT 1: SCOPE AND HISTORY OF MICROBIOLOGY

(Credit-0.8, Teaching Hours-12, Marks-14)

- 1.1 Microbiology as a field of Biology
- 1.2 Historical developments in Microbiology
- 1.3 The Place of Microorganisms in the living world: Groups of Microorganisms and their distribution in Nature
- 1.4 Spontaneous generation versus Biogenesis: germ Theory of diseases
- 1.5 Applied areas of Microbiology

#### REFERENCE BOOKS (SEMESTER 1 UNIT 1)

1. Pelczar, M.J., Chan E.C.S., Krieg, N.R., Microbiology, 5 Edition. Tata McGraw Hill Publication Co. Ltd. New Delhi.
2. Modi, H.A. Elementary Microbiology - Vol -I & II, Akta Prakashan, Nadiyad.
3. Powar and Dagainawala, General Microbiology Vol-II. Himalaya Publishing House, Mumbai.
4. Stanier, R.Y., Ingraham, J.L., Wheelis, M.L., Painter, R.K. General Microbiology, 5th Edition. MacMillan Press Ltd., London.
5. Purohit, S.S., Microbiology-Fundamentals and Applications-6th Edition, Agrobios Publications, Delhi.

### UNIT 2: MICROSCOPY AND STAINING

(Credit-0.8, Teaching Hours-12, Marks-14)

- 2.1 Microscopy: Introduction and Types
- 2.2 Principle, Construction and working of : Bright field Microscopy, Dark field Microscopy, Fluorescent Microscopy, Phase Contrast Microscopy
- 2.3 Introduction to Advanced Microscopic techniques: Confocal Microscopy, Electron Microscopy, Preparation of sample for Electron Microscopy
- 2.4 Introduction to Stains: Natural, Acidic & Basic Stains, Chromophore & Auxochrome groups, Leuco compounds
- 2.5 Theories and types of Staining

#### REFERENCE BOOKS (SEMESTER 1 UNIT 2)

1. Pelczar, M.J., Chan E.C.S., Krieg, N.R., Microbiology, 5 Edition. Tata McGraw Hill Publication Co. Ltd. New Delhi.
2. Salle, S.J. (1974). Fundamental Principles of Bacteriology, Tata McGraw Hill Publication Co. Ltd. New Delhi.
3. Purohit, S.S., Microbiology-Fundamentals and Applications-6th Edition, Agrobios Publications, Delhi.

### UNIT 3: MORPHOLOGY OF BACTERIA

- 3.1 Size, Shape and Arrangement of Bacteria
- 3.2 Bacterial Structures – External to Cell Wall: Capsule, Flagella, Pili, Prostheca, Sheath & Stalk
- 3.3 The cell walls of Bacteria – Structure and chemical composition of Gram negative and Gram positive Bacterial cell wall
- 3.4 Bacterial Structures – Internal to Cell Wall : Cell Membrane, Protoplast, Spheroplast, Membranous intrusions and intracellular membrane system, Cytoplasm, Cytoplasmic inclusions and Vacuoles, Nuclear Material
- 3.5 Bacterial Spores and Cyst – Types of spore, Structure and formation of Endospores (Sporogenesis).



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## REFERENCE BOOKS (SEMESTER 1 UNIT 3)

1. Pelczar, M.J., Chan E.C.S., Krieg, N.R., Microbiology, 5 Edition. Tata McGraw Hill Publication Co. Ltd. New Delhi.
2. Modi, H.A. Elementary Microbiology - Vol –I & II, Akta Prakashan, Nadiyad.
3. Tortora, Funke & Case. Microbiology-An Introduction, 8 Edition, Pearson Education, Delhi.
4. Powar and Daginawala, General Microbiology Vol-II. Himalaya Publishing House, Mumbai.

## UNIT 4: CULTIVATION OF BACTERIA

- 4.1 Nutritional requirements and types of Bacteria,
- 4.2 Chemical and Physical requirement of Growth – Bacteriological Media & their Types, Air, pH & Temperature, Cultivation of Anaerobes
- 4.3 Natural Microbial Population ( Mixed Cultures), Selective methods to obtain Pure Cultures
- 4.4 Isolation and Preservation of pure cultures
- 4.5 Cultural Characteristics

## REFERENCE BOOKS (SEMESTER 1 UNIT 4)

- 1 Pelczar, M.J., Chan E.C.S., Krieg, N.R., Microbiology, 5 Edition. Tata McGraw Hill Publication Co. Ltd. New Delhi.
- 2 Tortora, Funke & Case. Microbiology-An Introduction, 8 Edition, Pearson Education, Delhi.
- 3 Powar and Daginawala, General Microbiology Vol-II. Himalaya Publishing House, Mumbai.
- 4 Stanier, R.Y., Ingraham, J.L., Wheelis, M.L., Painter, R.K. General Microbiology, 5th Edition. MacMillan Press Ltd., London.
- 5 Purohit, S.S., Microbiology-Fundamentals and Applications-6th Edition, Agrobios Publications, Delhi.

## UNIT 5: REPRODUCTION AND GROWTH OF BACTERIA

- 5.1 Introduction and Definition of Growth, Modes of Cell division in prokaryotes
- 5.2 Septum Formation
- 5.3 Bacterial Growth Curve
- 5.4 Synchronous culture & Continuous Growth of Bacteria
- 5.5 Measurement of Bacterial Growth

## REFERENCE BOOKS (SEMESTER 1 UNIT 5)

1. Pelczar, M.J., Chan E.C.S., Krieg, N.R., Microbiology, 5th Edition. Tata McGraw Hill Publication Co. Ltd. New Delhi.
2. Frobisher M., Hinsdill, Crabtree and Goodherat Fundamentals of Microbiology, 9th Edition. W.B Saunders Co. USA.
3. Purohit, S.S., Microbiology-Fundamentals and Applications-6th Edition, Agrobios Publications, Delhi.
4. Mani, A., Selwaraj, A.M., Narayanan L.M., and Arumngam, N., Microbiology, Saras Publication, Delhi

## MB-101- FUNDAMENTALS OF MICROBIOLOGY (PRACTICAL)

**Practical Hours – 3hrs/day for 2 days/Week Total Credit – 3 Total 6 hours/Week**

- 1) Principles, working and uses of the following laboratory instruments :
  - a) Microscope b) Incubator
  - c) pH meter d) Refrigerator
  - e) Colorimeter f) Colony counter
- 2) Principles, working and uses of the following sterilizers:
  - a) Autoclave b) Hot air oven
  - c) Steam sterilizer d) Inspissator
  - e) Bacteriological filters.
- 3) Preparation of glassware for sterilization and disposal of laboratory media and cultures.
- 4) Preparation of Stains and Staining Reagents.
- 5) Study of Permanent Slides of Bacteria, Fungi, Algae and Protozoa.
- 6) Study of bacterial motility by hanging drop method.
- 7) Monochrome Staining:
  - a) Negative Staining

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- b) Positive Staining
- 8) Differential Staining : Gram's Staining
- 9) Special staining of bacteria:
  - a) Capsule staining – Hiss's method
  - b) Cell wall staining – Webb's method
  - c) Spore staining – Schaeffer's method
  - d) Metachromatic granule staining – Albert's method
  - e) Spirochete staining – Harrie's method
- 10) Isolation of bacteria by streak plate/pour plate and spread plate technique
- 11) Study of liquid/solidified culture media
- 12) Enumeration of bacterial number by viable count technique.
- 13) Total count of yeast by microscopic method using Haemocytometer
- 14) Measurement of size of microorganisms by Micrometry (Demonstration)
- 15) Growth curve of Bacteria by colorimetric method and determination of Generation time and Growth rate of *E. coli* by colorimetric method.

