

SEMESTER 1st

MAJOR / MINOR COURSE

MBY122M MICROBIOLOGY (FUNDAMENTALS OF MICROBIOLOGY)

CREDITS: THEORY: 4, PRACTICAL: 2

Course objectives:

- *The course has been designed to give a basic understanding of the fundamental aspects of microbiology from historical development of the branch of microbiology*
- *The students will be introduced to the microbial world, the structure and significance of bacteria, fungi, algae, protozoa and viruses*

THEORY (4 CREDITS)

UNIT-1: HISTORY AND SCOPE OF MICROBIOLOGY

- 1a. Historical development of Microbiology-Theory of spontaneous generation, Biogenesis and Abiogenesis
- 1b. Contributions of Antony van Leeuwenhoek, Louis Pasteur, Robert Koch, Joseph Lister and Edward Jenner
- 1c. Contributions of Alexander Fleming, Martinus Beijerinck, Sergei Winogradsky and Elie Metchnikoff
- 1d. Fields and scope of microbiology
- 1e. Golden era of microbiology

UNIT-2: PROKARYOTES

- 2a. Ultra-structure of prokaryotic cell: bacterial and archaeal - cell wall and cell membrane
- 2b. Components external to cell wall - capsule, slime, s-layer, pili, fimbriae, flagella; structure, motility, chemotaxis
- 2c. Cytoplasmic matrix - Cytoskeleton, ribosome, inclusion granules: Composition and function.
- 2c. Bacterial nuclear material and Extra Chromosomal material
- 2d. Reproduction in bacteria

UNIT-3: EUKARYOTES

- 3a. Ultra-structure of eukaryotic cell: Types of cells; Structure and function of organelles: cell wall, cell membrane, flagella, cytoplasmic matrix, cytoskeleton and endoplasmic reticulum
- 3b. Structure and function of organelles: Golgi complex, peroxisomes, lysosomes, vesicles, ribosomes, mitochondria, chloroplast and nucleus
- 3c. Structure, composition and reproduction of fungi.
- 3d. Structure, composition and reproduction of Algae
- 3e. Structure, composition and reproduction of Protozoa

UNIT-4: VIRUSES AND VIRUS-RELATED STRUCTURES

- 4a. Introduction to Virology
- 4b. General characteristics of viruses
- 4c. Structure and composition of viruses
- 4d. Replication of viruses (overview)
- 4e. Sub viral particles: Satellite Viruses, Virusoids, Viroids, and Prions

Learning outcome:

- *Students will be familiarized with the history of development of science of microbiology.*
- *The students will develop the concept of the basic microbiology including the occurrence, cell structure and reproduction of various microbes.*

RECOMMENDED BOOKS:

1. Brock Biology of Microorganisms by Madigan and Martinko, 14th edition, Pearson Education International.
2. Prescott's Microbiology by Joanne Willey, Linda Sherwood and Christopher J. Woolverton, 11th edition, McGraw Hill Publisher Companies, Inc.
3. Wilson and Walker's Principles and Techniques of Biochemistry and Molecular Biology by Andreas Hofmann, 8th edition, Cambridge University Press.
4. Microbiology by Michael J. Pelczar JR, E.C. S. Chan, Noel R. Krieg, 5th edition, McGraw Hill Publisher Companies, Inc.
5. The Cell: A Molecular Approach by Geoffrey M. Cooper, Robert E. Hausman, 6th edition, Sinauer Associates Inc.

LABORATORY COURSE (2 CREDITS)

Course objective:

- *This course is framed to acquaint students with basic lab practices and calculation needed for preparation of various reagents and buffers*
 - *This course will enable students to understand working principles of different laboratory equipment's*
 - *The students will learn different sterilization methods, preparation of culture media and pure culture techniques*
1. Biosafety levels in microbiology laboratory
 2. Understandings of biochemical calculations: molarity, normality, percent solution and ppm
 3. Preparation of buffers and pH measurements
 4. Study the parts, working principle and uses of Compound Microscope, Autoclaves and Hot air oven
 5. Study the parts, working principle and uses of Laminar air flow and Incubator
 6. Sterilization techniques: physical and chemical
 7. Culture media and their preparation
 8. Perform culture techniques: Streaking method, pour plate and spread plate method

Learning outcome:

- *Students will be able to perform various biochemical calculation, sterilization techniques and purification of microbial cultures*
- *Students will acquire knowledge about different microbiology laboratory equipment's and media preparations*

RECOMMENDED BOOKS:

1. Microbiology: A Laboratory Manual by James Cappuccino and Chad T. Welsh 11th Global Edition, Pearson Benjamin Cummings Publishers.
2. Practical Microbiology by D K Maheshwari and R C Dubey, 3rd edition, S Chand & Company Publishers.
3. Laboratory Fundamentals of Microbiology by Jeffrey C. Pommerville 12th edition, Jones and Bartlett Publishers.