

BACHELORS WITH BIOCHEMISTRY AS MAJOR
6th SEMESTER

BCH622J3: BIOCHEMISTRY _ BIOLOGY OF MICROBES

CREDITS: THEORY-4; PRACTICAL-2

THEORY (4 CREDITS: 60 HOURS)

OBJECTIVES/EXPECTED LEARNING OUTCOMES:

This Syllabus focuses on studying the unicellular and clusters of microscopic animals, viruses, and bacteria. The aim of course is to teach the effects of these organisms on the human body and the environment. This syllabus also contains the information on different types of viruses and bacteria, their structures and how they affect human cells and hence causing different diseases. At the end of this course students should be able to demonstrate the clear understanding of the facts and the basic concepts of microbiology and related disease and their prevention.

UNIT-1: INTRODUCTION AND DIVERSITY OF MICROORGANISMS (15 HOURS)

Concept of binomial nomenclature and rules, Whittaker's five kingdom and Carl Woese's three kingdom classification systems.

Characteristics of different groups: cellular microorganisms (protozoa, mycoplasma, bacteria, algae and fungi) and acellular microorganisms (viruses, viroids, virusoids, prions) and with emphasis on distribution and occurrence.

General account of morphology and ultra-structure of protozoa, bacteria and virus.

UNIT-2: MICROBIAL NUTRITION AND GROWTH (15 HOURS)

Nutritional requirements in microorganisms: Modes of nutrition-phototrophy, chemotrophy, methylotrophy, organotrophy, mixotrophy, and saprophytic, symbiotic and parasitic mode of nutrition.

Microbial growth: Different phases of microbial growth, Growth kinetics, Measurement of Microbial Growth, Factors affecting microbial growth. Sterilization methods

Antimicrobial agents: Characteristics, classification and mode of action, Antimicrobial Resistance (AMR).

UNIT-3: HOST MICROBE INTERACTIONS (15 HOURS)

Overview of host-microbe relationships, infection, colonization, pathogenicity, virulence and its determinants (adhesion, enzymes, toxins – exotoxins and endotoxins), transmission (direct and indirect) of infectious diseases, types of infections (acute, latent, chronic), opportunistic and nosocomial infections, reservoir and source of infection.

Microbial associations with plants and other microorganisms, normal resident microflora of human body and their role.

Symptoms and mode of transmission of infectious diseases- bacterial: tuberculosis, tetanus, anthrax; viral: COVID-19, AIDS, dengue; fungal: athlete's foot, candidiasis; protozoan: malaria, amoebiasis.

UNIT-4: METHODS FOR STUDYING MICROORGANISMS (15 HOURS)

Inoculation, incubation, isolation, inspection and identification of microorganisms.

Staining: gram staining, negative staining and acid-fast staining (permanent mount), Endospore staining using malachite green.

Microscopy: concept of lens and light, magnification and resolution, preparation and staining of specimens, light microscopes: bright field and dark field microscopy- principle and functions, applications of microscopy.

PRACTICALS (2 CREDITS: 1 HOURS)

1. Sterilization techniques and handling of laboratory equipments.
2. Methods of Bacterial culture.
3. Preparation of competent cells by calcium chloride method.
4. Gram Staining of bacteria and Microscopy.

BOOKS RECOMMENDED:

1. Wiley JM, Sherwood LM and Woolverton CJ. Prescott's Microbiology. McGrawHill International.
2. Tortora GJ, Funke BR and Case CL. Microbiology: An Introduction. Pearson Edition.
3. Modi H.A, Elementary Microbiology Vol I, Fundamentals of Microbiology.
4. Microbial Research: By Vinita Katiyar & Anubha Joshi
5. Principles of virology: Molecular Biology, Pathogenesis and Control of Animal Viruses by S.J. Flint, L.W. Enquist, V.R. Racaniello, A.M Shalka.