

DEPARTMENT OF MICROBIOLOGY

HOOGHLY WOMEN'S COLLEGE

BSc. Hons. in Microbiology

&

BSc. Major Microbiology

SESSION: 2024-25

COURSE OUTCOME (CO)

CO-1: Introduction and scope of Microbiology and Biomolecules

- a. History and development
- b. To study the diversity of Microorganisms
- c. Knowledge about microscopy.
- d. Introduction to biomolecules like carbohydrates, lipids, amino acids and proteins and nucleic acids
- e. Knowledge about some fungi, bacteria and protozoa.
- f. Gain knowledge about different instruments used in microbiology laboratory; have an idea of different types of media used for microbial cultures and study of identification of different species.

CO-2: Microbiological analysis of Air and Water

- a. Understanding aero-microbiology, sample collection, analysis and control measures
- b. Understanding water microbiology, sample collection, analysis and control measures
- c. Students will acquire basic fundamental theoretical concepts regarding microbiological analytical methods, tools and techniques for detection of pathogenic microorganisms from clinical samples using microscopic staining based techniques, based on culture dependent biochemical reactions and finally serological and molecular methods.
- d. The course also aims to teach students how to control microorganisms using antibiotics.
- e. Students will also learn basic standard techniques for microbiological examination of water and infer its quality.

CO-3: Bacteriology

- a. Detailed knowledge of bacterial cell structure and cell organization
- b. Knowledge about different techniques used in bacteriological study
- c. Study of different nutritional modes of bacteria
- d. Gain knowledge about different methods of control of microorganisms
- e. Study of growth and reproduction in bacteria
- f. Gain a detailed knowledge of classification used in bacterial systemics

- g. Gather practical knowledge of isolating pure cultures and also classifying bacteria through different staining techniques

CO-4: Biofertilizers and Biopesticides

- a. Gain knowledge of different types of biofertilizers like symbiotic and non-symbiotic nitrogen fixers, phosphate solubilizers and mycorrhiza
- b. Gain idea about biopesticides and bioinsecticides
- c. Students will acquire basic fundamental concepts on microorganism based bio-fertilizers and bio-pesticides.
- d. This includes knowledge on symbiotic and non-symbiotic Nitrogen fixing, phosphate solubilizing microorganisms and mycorrhizal based bio-fertilizers, their utility and field applications.

CO-5: Chemistry of Biomolecules

- a. Students will learn basic fundamental concepts of biochemistry, in relation to biomolecules and about enzyme functions how do they work, their types, classification, mechanism of action and inhibition types.
- b. Through practical they will learn quantitative estimation of carbohydrates, amino acids, organic acid as well as nucleic acids.
- c. They will also study how to assay an enzyme and will study effect of different factors on the activity of enzyme (through amylase as case study).

CO- 6: Biophysical Chemistry

- a. Students will learn the basic concepts of biophysical chemistry, which starts with understanding the properties of water and its structure –function correlation;
- b. Concepts of buffers and ways they regulate concentration of hydrogen as well as hydroxyl ions.
- c. Concepts of bioenergetics and the way they govern or regulate biochemical processes, pathways etc.
- d. Basic concepts of spectrophotometry, radioactivity, chromatography and electrophoresis will be inculcated.
- e. Practical skills for separation of mixture of amino acids (by TLC), proteins (by PAGE & chromatography techniques) and other analytes by centrifugation will be inculcated.
- f. Moreover, basic concept of pH, buffers etc. will be inculcated through hands on preparatory experiments

CO-7: Food Fermentation Techniques

- a. Students will learn different types of fermented foods, their advantages and health benefits; b. Production process for milk based, grain based, and vegetable based fermented foods (pickles and sauerkraut); fermented meat and fish; probiotic foods.
- c. They will also learn practical skills to perform experiments to determine oxidative/fermentative reaction of microorganisms, isolation of microbes from Dahi,
- d. Study of microbes in fermented rice
- e. Preparation of fermented milk products and wine.

CO- 8: Eukaryotic Microbiology & Plant Pathology

- a. The students will acquire knowledge on eukaryotic microorganisms and plant pathology. This includes study of general characteristics and diversity of Algae, fungi and protozoa: their classifications, diversity in morphological forms and reproductive processes.
- b. They will learn basic concepts related to host –pathogen interactions, development and progression of disease in host and different factors affecting host-pathogen interactions.
- c. Case study of disease of economically important plants (from this geographical region).
- d. Students will also acquire practical skills related to identification of algae, fungi and protozoa.
- e. Understanding Koch's postulates and study of plant pathogens, as well as plant disease samples through microscopic examination and permanent slides.

CO-9: Cell Biology

- a. Gain a detailed knowledge of prokaryotic and eukaryotic cell and cell organelles
- b. Gain knowledge of cellular signalling and cell interaction
- c. Gain knowledge about cell cycling and cancer
- d. Gain practical knowledge of cell division and study of chromosomal changes during cell division
- e. Identification of different types of cells and gather practical knowledge about polyploidy

CO-10: Virology

- a. Gain knowledge about discovery of viruses; Study of viral structure and viral taxonomy
- b. Study of bacteriophages with special emphasis to lytic and lysogenic cycle
- c. Study of different viral diseases, their prevention and control
- d. Gain knowledge about application of virology and gene therapy
- e. Gather practical knowledge about different viral infections, its isolation, enumeration and study of viral growth

f. A visit programme to microbiological industry or institute to gain hand on practical knowledge

CO-11: Industrial Microbiology

- a. Gain knowledge about history and development of industrial microbiology
- b. Familiar with the industrially important strains, fermentation media, bioreactors and other upstream processes
- c. Study of different downstream processes and fermentative production of organic acids, antibiotics and beverages
- d. Gain practical experience upon microbial production and estimation of enzymes, amino acids, organic acids and alcohol

CO-12: Immunology

- a. Understanding types of immunity, antigens, antibodies and their properties
- b. Understanding immune mechanisms in disease control, vaccination and process of immune interactions
- c. Gather practical knowledge of lymphoid tissues, blood cell morphology, histochemical analysis
- d. Practical knowledge on blood grouping, leucocyte count and serum separation
- e. Study of different immunological techniques like ELISA, Western Blotting, Ouchterlony test etc.

CO-13: Medical Microbiology

- a. Study of the importance of the normal microflora of the human body and host pathogen interaction
- b. Idea about methods of collection of samples its transport and diagnosis (PCR, DNA probe)
- c. Study of different bacterial, viral, fungal and protozoal diseases
- d. General idea of antimicrobial agents, their source, characteristics and mode of action
- e. Gain practical knowledge to identify bacteria through different biochemical tests
- f. Having hand on knowledge on antibiotic sensitivity test

CO-14: Recombinant DNA Technology

- a. Gain idea about genetic engineering and molecular cloning
- b. Gather practical idea of bacterial transformation
- c. Idea about Southern blotting and DNA amplification
- d. Gain knowledge about application of RDT in human therapeutic interest

CO-15: Microbes in Sustainable Agriculture

- a. Gain idea about soil microbiology, green house gases and phytostimulation
- b. Gather knowledge about secondary agricultural biotechnology like biotech feed, silage, biofuel, biomanure etc.
- c. Idea about genetically modified crops like Bt cotton and Golden rice

- d. Gain practical knowledge about preparation of inoculum for soil conditioning, study of bacterial load in soil
- e. Gather information about biotransformation and product recovery
- f. Gain practical knowledge about cultivation of edible mushroom
- g. Gather hand on experience on enzyme immobilization and isolation

CO-16: Bioinformatics

- a. Knowledge about computer fundamentals, bioinformatics and biological database
- b. Gain knowledge about sequence alignments, phylogeny and phylogenetic trees
- c. Study of genome organization and analysis using software like Genscan, protein structure prediction
- d. Gain practical knowledge about different operating systems like LINUX and WINDOWS

CO-17: Instrumentation and Biotechniques

- a. Study of different biotechniques like microscopy, chromatography, electrophoresis, spectrophotometry and centrifugation
- b. Gain practical experience of separation of different biomolecules using biotechniques

CO-18: Microbial Biotechnology

- a. Gain knowledge about application of microbial biotechnology in human therapeutics, agriculture and food technology
- b. Gather information about biotransformation and product recovery
- c. Gain practical knowledge about cultivation of edible mushroom
- d. Gather hand on experience on enzyme immobilization and isolation

CO-19: Advances in Microbiology

- a. Study of evolution of microbial genome and metagenomics
- b. Gain knowledge about system and synthetic biology
- c. Gain practical experience on extraction and amplification of DNA

CO-20: Biosafety and Intellectual Property Rights

- a. Understanding biosafety guidelines and regulations
- b. Gain knowledge about guidelines for using radioisotopes in laboratories
- c. Have an idea about patents, trademarks, copyrights etc.
- d. Gain knowledge about agreements and treaties
- e. Gain practical knowledge about designing laboratories, patent processing etc
- f. Gather idea about biological database like NCBI, PDB