



TECHNO INDIA UNIVERSITY
WESTBENGAL

Proposed Syllabus for 4-year B.Sc (Honours with or without research) (NEP)

2023

MICROBIOLOGY



Department of Microbiology

**Techno India University, West Bengal
EM-4, EM Block, Sector V, Bidhannagar,
Kolkata, West Bengal 700091**



Semester II

Core Subject:

Course Name : BACTERIOLOGY

Course Code:

Course Details:

Unit I: Cell organization
Cell size, shape and arrangement, glycocalyx, capsule, flagella, endoflagella, fimbriae, and pili. Cell wall: Composition and detailed structure of Gram-positive and Gram-negative cell walls, Archaeobacterial cell wall, Gram and acid-fast staining mechanisms, lipopolysaccharide (LPS), spheroplasts, protoplasts, and L-forms. Effect of antibiotics and enzymes on the cell wall. Cell Membrane: Structure, function, and chemical composition of bacterial and archaeal cell membranes. Cytoplasm: Ribosomes, mesosomes, inclusion bodies, nucleoids, chromosomes, and plasmids Endospore: Structure, formation, stages of sporulation.
Unit 2: Bacteriological Techniques
Pure culture isolation: Streaking, serial dilution, and plating methods; cultivation, maintenance, and preservation/stocking of pure cultures; cultivation of anaerobic bacteria, and accessing non-culturable bacteria.
Unit 3: Stains and staining techniques
Definition of auxochrome; chromophores; acidic and basic dyes; classification of stains; simple and differential staining; theories of staining, mordant and its function; Gram staining; acid fast staining; endospore staining; negative staining ; capsule staining; flagella staining; mechanism of Gram staining.
Unit 4: Microscopy
Bright Field Microscope, Dark Field Microscope, Phase Contrast Microscope, Fluorescence Microscope, Confocal microscopy, Scanning and Transmission Electron Microscope
Unit 5: Growth and Nutrition
Nutritional requirements in bacteria and nutritional categories; Culture media: components of media, natural and synthetic media, chemically defined media, complex media, selective, differential, indicator, enriched and enrichment media Physical methods of microbial control: heat, low temperature, high pressure, filtration, desiccation, osmotic pressure, radiation Chemical methods of microbial control: disinfectants, types, and mode of action
Unit 6: Reproduction in Bacteria
Asexual methods of reproduction, logarithmic representation of bacterial populations, phases of growth, calculation of generation time, and specific growth rate
Unit 7: Important archaeal and eubacterial groups



Aim and basic principles of classification, systematics, and taxonomy, the concept of species, taxa, strain; Archaeobacteria: General characteristics, phylogenetic overview, genera belonging to Nanoarchaeota (Nanoarchaeum), Crenarchaeota (Sulfolobus, Thermoproteus) and Euryarchaeota [Methanogens (Methanobacterium, Methanocaldococcus), thermophiles (Thermococcus, Pyrococcus, Thermoplasma), and Halophiles (Halobacterium, Halococcus)] Eubacteria: Introduction and importance of following groups: Gram Negative: Non-proteobacteria: General characteristics with suitable examples Alpha proteobacteria: General characteristics with suitable examples Beta proteobacteria: General characteristics with suitable examples Gamma proteobacteria: General characteristics with suitable examples, Delta proteobacteria: General characteristics with suitable examples, Epsilon proteobacteria: General characteristics with suitable examples Zeta proteobacteria: General characteristics with suitable examples
Gram Positive: Low G+ C (Firmicutes): General characteristics with suitable examples High G+C (Actinobacteria): General characteristics with suitable examples Cyanobacteria: An Introduction

Course Name : Bacteriology (Practical)

Course Code:

Course Details:

1. Preparation of different media: synthetic media CzapekDox media and /or BG-11, Complex media-Nutrient agar, McConkey agar, EMB agar.
2. Simple staining
3. Negative staining
4. Gram's staining
5. Capsule staining
6. Endospore staining.
7. Isolation of pure cultures of bacteria by the streaking methods.
8. Preservation of bacterial cultures by various techniques.
9. Estimation of CFU count by spread plate method/pour plate method.

Skill Enhancement

Course Name : Food Fermentation Techniques and Packaging (Theory)

Course Code:

Course Details:

Unit 1 Fermented Foods

Definition, types, advantages, and health benefits

Unit 2 Milk Based Fermented Foods

Dairy starter cultures, Dahi, Yogurt, Buttermilk (Chach), acidophilus milk, kumiss, kefir, and cheese: Preparation of inoculums, types of microorganisms, and production process

Unit 3 Grain-Based Fermented Foods

Idli, Dosa, Bread, Soy sauce, tampeh: Microorganisms and production process

Unit 4 Vegetable-Based Fermented Foods



Pickle, Saeurkraut: Microorganisms and production process
Unit 5 Fermented Meat and Fish
Types, microorganisms involved, fermentation process
Unit 6 Probiotics
Probiotics: Health benefits, types of microorganisms used, probiotic foods available in the market.
Unit 7 Controlling the Microbiological Quality of Foods
Quality Control using Microbiological Criteria, Control at Source (Training, Facilities and Operations, Equipment, Cleaning, and Disinfection), Codes of Good Manufacturing Practice (HACCP), Identification of Critical Control Points, Quality Systems: FSSAI, BSI and their importance
Unit 8 Food Packaging Techniques
Basic principle of food packaging, importance, techniques in practice, merits and demerits of food packaging techniques
SUGGESTED READING
<ol style="list-style-type: none">1. Adams MR and Moss MO. (1995). Food Microbiology. 4th edition, New Age International (P) Limited Publishers, New Delhi, India.2. Banwart JM. (1987). Basic Food Microbiology. 1st edition. CBS Publishers and Distributors, Delhi, India.3. Davidson PM and Brannen AL. (1993). Antimicrobials in Foods. Marcel Dekker, New York.4. Dillion VM and Board RG. (1996). Natural Antimicrobial Systems and Food Preservation. CAB International, Wallingford, Oxon.5. Frazier WC and Westhoff DC. (1992). Food Microbiology. 3rd edition. Tata McGraw-Hill Publishing Company Ltd, New Delhi, India.6. Gould GW. (1995). New Methods of Food Preservation. Blackie Academic and Professional, London.7. Jay JM, Loessner MJ and Golden DA. (2005). Modern Food Microbiology. 7th edition, CBS Publishers and Distributors, Delhi, India.8. Lund BM, Baird Parker AC, and Gould GW. (2000). The Microbiological Safety and Quality of Foods. Vol. 1-2, ASPEN Publication, Gaithersberg, MD.

Course Name : Food Fermentation Techniques and Packaging (Practical)

Course Code:

Course Details:

Evaluation will be done internally on assignment and powerpoint presentation.