

### Semester III

#### C6: General Microbiology (Theory MBTCR3062T; Practical MBTCR3062P)

**Theory: CIA: 10 Marks; End-Sem: 50 Marks**

**Practical: 40 Marks**

#### **Theory:**

##### **Module A: (38 marks)**

**(3 Classes per week)**

##### **UNIT I: Basic Introduction to Microbiology**

Fundamentals, History and Evolution of Microbiology; Classification of microorganisms: Microbial taxonomy, criteria used including molecular approaches, Microbial phylogeny and current classification of bacteria; Morphology and cell structure of major groups of microorganisms: e.g. bacteria, algae, fungi and protozoa.

##### **UNIT II: Nutrition and cultivation of microorganisms**

Nutritional categories of microorganisms; nutrients for bacteria; microbial culture: concept of pure culture, methods of isolation of pure culture (purification) and preservation.

##### **UNIT III: Growth and sporulation of microorganisms**

Microbial growth: Growth curve, Generation time, synchronous, batch, fed-batch and continuous cultures; factors affecting growth of bacteria; measurement of bacterial growth; Endospores and sporulation in bacteria.

##### **UNIT IV: Controlling microbial growth in the environment and in the body**

Control of microorganisms by physical, chemical and chemotherapeutic agents.

##### **UNIT V: Water and Food Microbiology**

###### **1. Water Microbiology**

Bacterial pollutants of water; coliforms and non-coliforms; sewage composition and its disposal.

###### **2. Food microbiology**

Important microorganisms in food microbiology: molds, yeasts and bacteria; major food-borne infections and intoxications; preservation of various types of foods; fermented foods.

##### **Module B: (12 marks)**

**(1class per week)**

##### **UNIT VI: Virology**

###### **Nature and Properties of Viruses**

*General Introduction* – definition, general properties, Ellis and Delbruck's experiment, virus assays, cultivation of viruses, detection

*Structure of viruses* – filamentous and isometric viruses, enveloped viruses, viruses with head-tail morphology

*Classification of viruses* – Baltimore's classification, satellites, viroids and prions (just mention)

###### **Bacteriophages**

*Process of Infection* - Attachment and entry of viral genomes (bacteriophage  $\lambda$ , M13) *Replication of viral genome* – rolling circle (bacteriophage  $\lambda$ ), looped rolling circle (M13), terminal redundancy and circular permutation – T-even bacteriophages

*Gene expression of viral genomes* – Bacteriophage  $\lambda$  - lytic and lysogenic cycles.

**Teachers involved:** Prof. Souvik Roy (Module A), Dr. Uma Siddhanta (Module B)

#### **Practicals**

1. Preparation of media & sterilization methods.
2. Cultivation of microorganisms in pure culture in broth and agar (slant, stab).
3. Methods of isolation of bacteria from natural sources (soil/food) by spread-plate and streak-plate methods.
4. Staining methods: simple staining, Gram staining, endospore staining, negative staining, fungus staining.
5. Enumeration of microorganisms - total & viable count.

**Teachers involved:** Prof. Souvik Roy, Dr. Dipankar Chakraborti

## **Texts & Reading/Reference Lists:**

### **Module A**

1. Alexopoulos CJ, Mims CW, and Blackwell M. (1996). Introductory Mycology. 4th edition. John and Sons, Inc.
2. Bauman RW. (2011). Microbiology: With Diseases by Taxonomy. 3<sup>rd</sup> edition. Pearson / Benjamin Cummings.
3. Jay JM, Loessner MJ and Golden DA. (2005). *Modern Food Microbiology*. 7<sup>th</sup> edition, CBS Publishers and Distributors, Delhi, India.
4. Kumar HD. (1990). Introductory Phycology. 2nd edition. Affiliated East Western Press.
5. Madigan MT, Martinko JM and Parker J. (2009). Brock Biology of Microorganisms. 12<sup>th</sup> edition. Pearson / Benjamin Cummings.
6. Pelczar MJ, Chan ECS and Krieg NR. (1993). Microbiology. 5th edition. McGraw Hill Book Company.
7. Stanier RY, Ingraham JL, Wheelis ML, and Painter PR. (2005). General Microbiology. 5<sup>th</sup> edition. McMillan.
8. Tortora GJ, Funke BR, and Case CL. (2008). Microbiology: An Introduction. 9th edition. Pearson Education.
9. Willey JM, Sherwood LM, and Woolverton CJ. (2008). Prescott, Harley and Klein's Microbiology. 7th edition. McGraw Hill Higher Education.

### **Module B**

1. Basic Virology - Wagner & Hewlett (2nd ed.) (Reference)
2. Biochemistry - Voet and Voet (3rd ed.)
3. Introduction to Modern Virology - Dimmock, Easton and Leppard (6th ed.)
4. Principles of Virology - Flint, Enquist, Racaniello & Skalka (3rd ed.). (Reference).

### **Practicals**

1. Experiments in Microbiology, Plant Pathology and Biotechnology – K. R. Aneja.
2. Microbiology: A Laboratory Manual - Cappuccino and Sherman.
3. Practical Microbiology – R. C. Dubey.