

# **Department of Microbiology**

(SEMESTER-II)

**Open Elective: Microbes and Environment**  
**Course Code - 18MCBO1**

**Theory Marks: 80**  
**Internal assessment: 20**  
**Time: 3 hours**

## **Course Outcomes**

On the completion of this course students are able to learn the following:

**CO1:** To learn about the basic instrumentation in microbiology and historical details about the development of microbiology

**CO2:** To learn the characteristics of bacteria, fungi and viruses and details about classification of these

**CO3:** To understand about the scope of microbiology in different diversified areas

**Note: The question paper will consist of 9 questions. Students will have to attempt 5 questions in total - Question no. 1 will comprise of short answer questions covering the entire syllabus and will be compulsory. Two questions to be set from each Unit and students will have to attempt one from each Unit.**

## **Unit – I**

Systematics & Biodiversity: Classification and nomenclature of microorganism. Salient features of different groups: Acellular microorganisms (Viruses, Viroids, Prions) and Cellular microorganisms (Bacteria, Algae, Fungi and Protozoa) in reference to their distribution and occurrence, morphology, mode of reproduction and economic importance.

## **Unit – II**

Characteristics of extremophiles: Thermophiles, Methanophiles, Alkalophiles, Acidophiles, Halophiles and Barophiles: Classification, habitats, ecological aspects and applications.

## **Unit – III**

Microbiological techniques: Preparation of culture media, Pure culture isolation; cultivation, maintenance and preservation/stocking of pure cultures; cultivation of anaerobic bacteria, and accessing non-culturable bacteria. Physical and Chemical methods for the control of microorganisms

## **Unit – IV**

Scope of Microbiology: Role of microorganisms in Food industry, Pharmaceutical industry, Production of Industrial enzymes, Agriculture: bio-fertilizers, bio-pesticides. Environment: bioremediation, bioleaching

## **Suggested readings:**

1. Brock TD., Milestones in Microbiology, Infinity Books.
2. Pelczar M.J., Chan E.C.S. & Kreig N.R., Microbiology: Concepts and Application.,Tata McGraw Hill.
3. Stainier RY, Ingraham JL, Wheelis ML & Painter PR General Microbiology, Publisher: MacMillan.
4. Madigan M.T., Martinko J.M. and Parker J., Brock Biology of Microorganisms: Prentice-Hall , Inc USA.
5. Atlas R.M., Principles of Microbiology, Wm C. Brown Publishers.
6. Vandemark P.V. and Batzing B.L., The Microbes – An Introduction to their nature and Importance: Benjamin Cummings. Microbiology

**(SEMESTER-III)**  
**Open Elective: Microbes for health and wealth**  
**Course Code - 18MCBO2**

**Theory Marks: 80**  
**Internal assessment: 20**  
**Time: 3 hours**

**Course Outcomes**

On completion of the course, students are able to understand:

**CO1:** About commercial microbial products produced by various bioprocesses

**CO2:** Methods of preservation and improvement of industrially important microorganisms

**CO3:** Students will also learn methods of strain development by mutagenesis, protoplast fusion and Genetic engineering.

**CO4:** For commercial production students will understand raw materials and media formulation for microbial cultures

**CO5:** They will understand what is Good Lab Practices (GLP) and Good Manufacturing Practices (GMP).

Students will be taught about the IPR and entrepreneurship; factors necessary for entrepreneurship.

**Note: The question paper will consist of 9 questions. Students will have to attempt 5 questions in total - Question no. 1 will comprise of short answer questions covering the entire syllabus and will be compulsory. Two questions to be set from each Unit and students will have to attempt one from each Unit.**

**Unit I**

Commercial Microbial Products; Introduction to bioprocess development- upstream development, downstream process, Preservation and improvement of industrially important microorganisms, Strain development by mutagenesis, protoplast fusion and Genetic engineering.

**Unit II**

Raw materials and media formulation for microbial culture; batch, fed batch and continuous mode of bioprocess, Types of Bioreactors and their applications: Stirred tank bioreactor & Specialized bioreactors.

**Unit III**

Downstream process, Choice of bioprocess plant location; Methods of estimation of Capital Cost and Operational costs of bioprocess plant, Good Lab Practices (GLP) and Good Manufacturing Practices (GMP).

**Unit IV**

Introduction to Bioentrepreneurship; Factors necessary for Entrepreneurship; Attributes in an Entrepreneur; Market Assessments; Managing Technology transfer and Intellectual property in biotechnology in India, Licensing of Biotechnological invention, Funding agencies in India, Basics of Patents- Types of patents; Filing of a patent application.

**Suggested readings:**

1. Handbook of Bioentrepreneurship by **Patzelt**, Holger, **Brenner**, Thomas (Eds.) Publisher:
2. SpringerBiotechnology. A Textbook of Industrial Microbiology, by W. Crueger and A. Crueger. Publisher: Sinauer Associates.
3. Industrial microbiology by G. Reed, Publishers: CBS
4. Bioprocess Engineering Principles by P. Doran. Publisher: Academic Press.
5. Biochemical Engineering Fundamentals by J.E. Baily and D.F. Ollis. Publisher: McGraw Hill.