

# **MBTCR7181T: Microbial Biotechnology and Bioethics**

**Theory:** [CIA: 20 Marks; End-Sem: 80 Marks]

No.ofCredits	6
Theory/Composite	Theory
No.ofperiodsassigned	6Theory

## **Coursedescription/objective:**

1. This paper aims at giving the students a detailed idea of enzyme biotechnology and commercial applications of recombinant microorganisms.
2. The industrial production processes for different products of commercial importance will be elaborated in this paper.
3. Through this paper, students will be given ideas on some significant advanced biotechnological applications of bacteriophages and different microbes.
4. Also, students will be explained about the different aspects of Bioethics with regards to Microbial Biotechnology.

## **Module A: (35 Marks)**

**(2 Classes / Week)**

**UNIT I: Enzyme Biotechnology:** Enzyme immobilization - advantages; technology for immobilized enzymes (or whole cells); large scale applications of immobilized glucose isomerase and penicillin acylase

**UNIT II: Applications of microbes in industries:** Bioremediation; bioleaching; biofilm and quorum sensing; Type three secretion systems (TTSS); biosurfactant; biofertilizers and PGPRs; bioinsecticides, biofuel and biodiesel; biosensors; biotransformation; Probiotics; microbe-mediated jute processing; core genome pool, flexible genome pool; concept of pangenome and metagenome

**UNIT III: Recombinant microorganisms for commercial products:** Metabolic engineering for cloning and overexpression of heterologous genes; limitations in metabolic engineering; synthesis of commercial products like ascorbic acid, indigo, amino acids, antibiotics and biopolymers (xanthan gum, bioplastics)

## **Module B: (45 Marks)**

**(4 Classes / Week)**

### **UNIT IV: Industrial production processes:**

- a. Amino-acid (L-Lysine)
- b. Chemotherapeutic agent (Penicillin)
- c. Condiment (Soy sauce)
- d. Enzyme used in Molecular Biology (Taq DNA polymerase)
- e. Food (Bread, Cheese)
- f. Food additive (Nucleotides, Vitamin B<sub>12</sub>)
- g. Microbial biomass production (Baker's yeast, Mushrooms)
- h. Organic acid (Citric acid)
- i. Recombinant therapeutic protein (Human growth hormone, Human interferon)

### **UNIT V: Advanced biotechnological applications:**

- a. Bacteriophages as therapeutic agents

- b. Botox
- c. Gaseous fuel - biohydrogen
- d. Marine biotechnology
- e. Microbial electricity – bacterial batteries
- f. Microbial flavors and fragrances
- g. Therapeutics from gut bacteria

**UNIT VI: Bioethics:**

- a. Patenting of Microorganisms in Biotechnology
- b. Clinical Research and Drug Trials (FDA guidelines and Indian perspective)
- c. Drugs and Cosmetics Act (Schedule Y)
- d. The Drugs and Magic Remedies Act

**Texts & Reading/Reference Lists:**

1. Casida LE. (1991). Industrial Microbiology. 1st edition. Wiley Eastern Limited.
2. Crueger W and Crueger A. (2000). Biotechnology: A textbook of Industrial Microbiology. 2nd edition. Panima Publishing Co. New Delhi.
3. Das HK. (2005). Text Book of Biotechnology. 2<sup>nd</sup> edition. Wiley Dreamtech India (P) Ltd.
4. Dubey RC. (2010 Reprint Edition). A Text Book of Biotechnology. S. Chand & Company Ltd.
5. Ignacimuthu S. Bioethics.
6. Madigan MT, Martinko JM and Parker J. (2003). Brock Biology of Microorganisms. 10th edition. Pearson / Benjamin Cummings.
7. Patel AH. (1996). Industrial Microbiology. 1st edition, Macmillan India Limited.
8. Salle AJ. (1974). Fundamental Principles of Bacteriology. 7th edition, 2005 27<sup>th</sup> Reprint. Tata McGraw-Hill.
9. Stanbury PF, Whitaker A and Hall SJ. (2006). Principles of Fermentation Technology. 2<sup>nd</sup> edition, Elsevier Science Ltd.
10. Waites MJ, Morgan NL, Rockey JS, Highton G. (2001). Industrial Microbiology - An Introduction. 2002 Indian Reprint Edition. Blackwell Publishing.
11. Willey JM, Sherwood LM, and Woolverton CJ. (2008). Prescott, Harley and Klein's Microbiology. 7th edition. McGraw Hill Higher Education.
12. Relevant Review papers.

**Q.Paper Structure for End Sem Theory**

**Module A (35):**

- 2 questions of 15 marks (Any 2 from 3);
- 1 question of 5 marks (Any 1 from 2)

**Module B (45):**

- [2 questions of 15 marks (Any 2 from 3);
- 3 questions of 5 marks (Any 3 from 5)]

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