

**(B. Pharm)**  
**(Semester - VI)**

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<b>Course Code</b>	<b>BP605T</b>
<b>Course Title</b>	<b>Pharmaceutical Biotechnology – Theory</b>

**Scope:**

Biotechnology has a long promise to revolutionize the biological sciences and technology. Scientific application of biotechnology in the field of genetic engineering, medicine and fermentation technology makes the subject interesting. Biotechnology is leading to new biological revolutions in diagnosis, prevention and cure of diseases, new and cheaper pharmaceutical drugs. Biotechnology has already produced transgenic crops and animals and the future promises lot more. It is basically a research-based subject.

**Objectives:**

Upon completion of this course the student should be able to:

1. Understanding the importance of Immobilized enzymes in Pharmaceutical Industries.
2. Genetic engineering applications in relation to production of pharmaceuticals.
3. Importance of Monoclonal antibodies in Industries.
4. Appreciate the use of microorganisms in fermentation technology.

**Course Learning Outcomes (CLO):**

At the end of the course, students will be able to -

1. Relate microbial genetics with its applications
2. Understand importance of pharmaceutical biotechnology with its applications
3. Describe recombinant DNA technology with its applications
4. Discuss enzyme immobilization, biosensors, protein and genetic engineering
5. Explain fundamentals of immunology and preparation of immunological products
6. Recognize concepts of fermentation process, equipment and products

**Syllabus:**

**Teaching hours: 45 Hours**

**UNIT I**

**10 Hours**

**Introduction to Pharmaceutical Biotechnology and its Applications:**

Brief introduction to Biotechnology with reference to Pharmaceutical Sciences.

Enzyme Biotechnology- Methods of enzyme immobilization and applications.

Biosensors- Working and applications of biosensors in Pharmaceutical Industries.

Brief introduction to Protein Engineering.

Use of microbes in industry. Production of Enzymes- General consideration - Amylase, Catalase, Peroxidase, Lipase, Protease, Penicillinase.

Basic principles of genetic engineering

## **UNIT II**

**10 Hours**

### **Recombinant DNA Technology and its Applications:**

Study of cloning vectors, restriction endonucleases and DNA ligase.

Recombinant DNA technology. Application of genetic engineering in medicine.

Application of r DNA technology and genetic engineering in the production of: i) Interferon ii) Vaccines- hepatitis- B iii) Hormones-Insulin.

Brief introduction to PCR

## **UNIT III**

**10 Hours**

### **Immunology:**

Types of immunity- humoral immunity, cellular immunity

Structure of Immunoglobulins

Structure and Function of MHC

Hypersensitivity reactions, Immune stimulation and Immune suppressions.

General method of the preparation of bacterial vaccines, toxoids, viral vaccine, antitoxins, serum-immune blood derivatives and other products relative to immunity.

Storage conditions and stability of official vaccines

Hybridoma technology- Production, Purification and Applications

Blood products and Plasma Substitutes.

## **UNIT IV**

**08 Hours**

### **Microbial Genetics and Biotransformation:**

Immuno blotting techniques- ELISA, Western blotting, Southern blotting.

Genetic organization of Eukaryotes and Prokaryotes

Microbial genetics including transformation, transduction, conjugation, plasmids and transposons.

Introduction to Microbial biotransformation and applications.

Mutation: Types of mutation/mutants.

## **UNIT V**

**07 Hours**

### **Fermentation Technology:**

Fermentation methods and general requirements, study of media, equipments, sterilization methods, aeration process, stirring.

Large scale production fermenter design and its various controls.

Study of the production of - Penicillins, Citric acid, Vitamin B12, Glutamic acid, Griseofulvin.

Blood Products: Collection, Processing and Storage of whole human blood, dried human plasma, plasma Substitutes.

## **Tutorials**

**Teaching hours: 15 Hours**

Tutorials will be based on above syllabus

### **Suggested Readings**<sup>^</sup>: (Latest Edition)

1. Tortora, Gerard J; Funke, Berdell R; Case, Christine L., *Microbiology: An Introduction*, USA: Pearson Education Inc.

2. Carter, S. J., *Cooper and Gunn's Tutorial Pharmacy*, India: C. B. S. Publishers & Distributors.
3. Prescott and Dunn., *Industrial Microbiology*, India: CBS Publishers & Distributors.
4. Vyas, S. P., *Pharmaceutical Biotechnology*, India: CBS Publishers & Distributors.
5. El-Mansi, Mansi, *Fermentation Microbiology and Biotechnology*, USA: Taylor & Francis.
6. Stanbury F., P., Whitakar A., and Hall J., S., *Principles of fermentation technology*, India: Aditya books Ltd.
7. Glick B.R. and Pasternak J.J., *Molecular Biotechnology: Principles and Applications of Recombinant DNA*, USA: ASM Press.
8. Goding J.W., *Monoclonal Antibodies*, London: Academic Press Limited.
9. Walker J.M. and Rapley R., *Molecular Biology and Biotechnology*, UK: RSC Publication.
10. Zaborsky, *Immobilized Enzymes*, USA: CRC Press.
11. Primrose S.B., *Molecular Biotechnology*, USA: Blackwell Scientific Publication.

L= Lecture, T= Tutorial, P= Practical, C= Credit

^this is not an exhaustive list

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