



Gyanmanjari
Innovative University

Course Syllabus
Gyanmanjari Pharmacy College
Semester-5 (B. Pharm)

Subject: Pharmaceutical Biotechnology (BPHBP15322)

Type of course: Major

Prerequisite: NA

Rationale: 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.

Teaching and Examination Scheme:

| Teaching Scheme | | | Credits | Examination Marks | | | | | Total Marks |
|-----------------|---|---|---------|-------------------|-----|-----------------|---|-----|-------------|
| CI | T | P | C | Theory Marks | | Practical Marks | | CA | |
| | | | | ESE | MSE | V | P | ALA | |
| 3 | 1 | - | 4 | 75 | 25 | - | - | 50 | 150 |

Legends: CI-Classroom Instructions; T – Tutorial; P - Practical; C – Credit; ESE - End Semester Examination; MSE- Mid Semester Examination; V – Viva; CA - Continuous Assessment; ALA- Active Learning Activities.



Course Content:

| Unit No | Course content | Hrs. | Weightage % |
|----------------|---|-------------|--------------------|
| 1 | INTRODUCTION a) Brief introduction to Biotechnology with reference to Pharmaceutical Sciences. b) Enzyme Biotechnology- Methods of enzyme immobilization and applications. c) Biosensors- Working and applications of biosensors in Pharmaceutical Industries. d) Brief introduction to Protein Engineering. e) Use of microbes in industry. Production of Enzymes- General consideration - Amylase, Catalase, Peroxidase, Lipase, Protease, Penicillinase. f) Basic principles of genetic engineering. | 10 | 25 |
| 2 | RECOMBINANT DNA TECHNOLOGY a) Study of cloning vectors, restriction endonucleases and DNA ligase. b) Recombinant DNA technology. Application of genetic engineering in medicine. c) Application of r DNA technology and genetic engineering in the production of: i) Interferon ii) Vaccines- hepatitis- B iii) Hormones-Insulin. d) Brief introduction to PCR | 10 | 20 |
| 3 | IMMUNOLOGY Types of immunity- humoral immunity, cellular immunity a) Structure of Immunoglobulins b) Structure and Function of MHC c) Hypersensitivity reactions, Immune stimulation and Immune suppressions. d) General method of the preparation of bacterial vaccines, toxoids, viral vaccine, antitoxins, serum-immune blood derivatives and other products relative to immunity. e) Storage conditions and stability of official vaccines f) Hybridoma technology- Production, Purification and Applications g) Blood products and Plasma Substitutes. | 10 | 25 |
| 4 | BIOTECHNOLOGY ANALYTICAL TECHNIQUES a) Immuno blotting techniques- ELISA, Western blotting, Southern blotting. b) Genetic organization of Eukaryotes and Prokaryotes c) Microbial genetics including transformation, transduction, conjugation, plasmids and transposons. d) Introduction to Microbial biotransformation and applications. e) Mutation: Types of mutation/mutants | 8 | 15 |



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| 5 | PRODUCTION OF PHARMACEUTICAL PRODUCTS a) Fermentation methods and general requirements, study of media, equipments, sterilization methods, aeration process, stirring. b) large scale production fermenter design and its various controls. c) Study of the production of - penicillins, citric acid, Vitamin B12, Glutamic acid, Griseofulvin, d) Blood Products: Collection, Processing and Storage of whole human blood, dried human plasma, plasma Substitutes. | 7 | 15 |
|---|---|---|----|

Continuous Assessment:

| Sr. No | Active Learning Activities | Marks |
|--------|---|-------|
| 1 | GROUP DISCUSSION ON BIOTECHNOLOGY IN PHARMACEUTICAL Faculty will Divide students into small groups and assign each group a different biotechnological process used in pharmaceutical sciences (e.g., enzyme biotechnology, genetic engineering, recombinant DNA technology). Students will research their topic and hold a group discussion, sharing how the process contributes to the pharmaceutical industry, prepare a report to submit on the GMIU web portal. | 10 |
| 2 | ENZYME ACTIVITY AND IMMOBILIZATION CONCEPT MAP ACTIVITY Faculty will Ask students to create a concept map or flowchart that illustrates the different methods of enzyme immobilization and their applications (e.g., adsorption, entrapment, covalent bonding). The map should also include examples of enzymes used in the pharmaceutical industry, submit the report of finding on the GMIU web portal. | 10 |
| 3 | MINI-RESEARCH PROJECT ON IMMUNIZATION AND VACCINES Faculty will provide the name of the formulation and individual students need to formulate the formulation prepare a report take a pic with the final packing and submit both on GMIU web portal | 10 |
| 4 | ROLE-PLAYING IN GENETIC ENGINEERING Faculty will provide Assign students roles such as scientists, researchers, and medical professionals, and organize a role-play scenario where they must work together to solve a problem using genetic engineering (e.g., producing insulin via recombinant DNA technology). They can act out the steps in the process, such as gene selection, vector preparation, and transformation students need to prepare a poster, preset it and submit the photocopy of the poster on GMIU web portal. | 10 |



| | | |
|---|--|----|
| 5 | “Build-a-Biotech Start-up” Faculty will Organize the one session regarding biotech startup to help students understand key biotech concepts (like recombinant DNA technology, monoclonal antibodies, gene therapy, biosimilars, etc.) through a simulated real-world application. Students prepare the pitch presentation and submit the manuscript on GMIU web Portal | 10 |
|---|--|----|

Suggested Specification table with Marks (Theory):60

| Distribution of Theory Marks (Revised Bloom's Taxonomy) | | | | | | |
|---|--------------------|----------------------|--------------------|----------------|-----------------|---------------|
| Level | Remembrance (R) | Understanding (U) | Application (A) | Analyze (N) | Evaluate (E) | Create (C) |
| Weightage | 30% | 35% | 20% | 05% | 05% | 05% |

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

Course Outcome:

| | |
|--|--|
| After learning the course, the students should be able to: | |
| CO1 | Understand the importance of Immobilized enzymes in Pharmaceutical Industries. |
| CO2 | Evaluate engineering applications in relation to the production of pharmaceuticals |
| CO3 | Find the scope of Monoclonal antibodies in Industries |
| CO4 | Appreciate the use of microorganisms in fermentation technology |
| CO5 | Understand the processes of Fermentation |

Instructional Method:

The course delivery method will depend upon the requirement of content and need of students. The teacher in addition to conventional teaching method by black board, may also use any of tools such as demonstration, role play, Quiz, brainstorming, MOOCs etc.

Students will use supplementary resources such as online videos, NPTEL/SWAYAM videos, e-courses, Virtual Laboratory

The internal evaluation will be done on the basis of Active Learning Assignment
Practical/Viva examination will be conducted at the end of semester for evaluation of performance of students in laboratory.



Reference Books:

- [1] B.R. Glick and J.J. Pasternak: Molecular Biotechnology: Principles and Applications of Recombinant DNA: ASM Press Washington D.C.
- [2] RA Goldshy et. al., Kuby Immunology.
- [3] J.W. Goding: Monoclonal Antibodies.
- [4] J.M. Walker and E.B. Gingold: Molecular Biology and Biotechnology by Royal Society of Chemistry.
- [5] Zaborsky: Immobilized Enzymes, CRC Press, Degrand, Ohio.
- [6] S.B. Primrose: Molecular Biotechnology (Second Edition) Blackwell Scientific Publication.
- [7] Stanbury F., P., Whitakar A., and Hall J., S., Principles of fermentation technology, 2nd edition, Aditya books Ltd., New Delhi

