Dr. Rafiq Zakaria Campus
Maulana Azad Educational Trust's
Y. B. CHAVAN COLLEGE OF PHARMACY
(B. Pharm, M. Pharm & Research Centre)
ISO 21001:2018 & ISO 14001:2015 CERTIFIED | NIRF-2022 ALL INDIA RANK 65TH
NAAC ACCREDITATION "A" GRADE WITH 3.23 CGPA SCORE

COURSE MODULE

Program Title	B. Pharmacy
Department	Pharmaceutics
Course Title	Biotechnology

1. **NAME OF INSTITUTION** : Y. B. CHAVAN COLLEGE OF PHARMACY, AURANGABAD

2. **AFFILIATED UNIVERSITY** : DR. BABASAHEB AMBEDKAR MARATHWADA UNIVERSITY, AURANGABAD

3. **DEPARTMENT** : **PHARMACEUTICS**

4. **PROGRAM TITLE** : B. PHARM.

4.1. Program Outcomes (PO):

PO 01:Pharmacy Knowledge: Possess knowledge and comprehension of the core and basic knowledge associated with the profession of pharmacy, including biomedical sciences; pharmaceutical sciences; behavioral, social, and administrative pharmacy sciences; and manufacturing practices.

PO 02: Planning Abilities: Demonstrate effective planning abilities including time management, resource management, delegation skills and organizational skills. Develop and implement plans and organize work to meet deadlines.

PO 03: Problem analysis: Utilize the principles of scientific enquiry, thinking analytically, clearly and critically, while solving problems and making decisions during daily practice. Find, analyze, evaluate and apply information systematically and shall make defensible decisions.

PO 04: Modern tool usage: Learn, select, and apply appropriate methods and procedures, resources, and modern pharmacy-related computing tools with an understanding of the limitations.

PO 05: Leadership skills: Understand and consider the human reaction to change, motivation issues, leadership and team-building when planning changes required for fulfillment of practice, professional and societal responsibilities. Assume participatory roles as responsible

citizens or leadership roles when appropriate to facilitate improvement in health and wellbeing.

PO 06: Professional Identity: Understand, analyze and communicate the value of their professional roles in society (e.g. health care professionals, promoters of health, educators, managers, employers, employees).

PO 07: Pharmaceutical Ethics: Honour personal values and apply ethical principles in professional and social contexts. Demonstrate behavior that recognizes cultural and personal variability in values, communication and lifestyles. Use ethical frameworks; apply ethical principles while making decisions and take responsibility for the outcomes associated with the decisions.

PO 08: Communication: Communicate effectively with the pharmacy community and with society at large, such as, being able to comprehend and write effective reports, make effective presentations and documentation, and give and receive clear instructions.

PO 09: The Pharmacist and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety and legal issues and the consequent responsibilities relevant to the professional pharmacy practice.

PO 10: Environment and sustainability: Understand the impact of the professional pharmacy solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

PO 11: Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change. Self-assess and use feedback effectively from others to identify learning needs and to satisfy these needs on an ongoing basis.

5. COURSE SPECIFICATION :

5.1.Course Identification and General Information

a. Course Title:	Biotechnology

b. Course Number/Code	BP605T	
c. Credit Hours	Theory	Practical
	45(3 Hrs/Week	60 (4Hrs. / Week)
d. Study level/semester at which this course is offered	Sem VI	
e. Pre-requisite	Microbiology, Physical Pharmaceutics II, Pharmaceutics I	
f. Co-requisite	N/A	
g. Program in which the course is offered	B Pharm	
h. Language of teaching the course	English	
i. Prepared by	Chishti Nahid Anjum Hafizuddin	
j. Approved by HOD	Dr.S.R.Lahoti	

5.2.Course Description:

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.

5.3.Course Objectives:

1. To establish relationship between Microbiology and reaction occurring within microorganism in order to produce a useful product.
2. To understand importance of plant tissue culture and animal tissue culture.
3. To develop the concepts of applying knowledge of Recombinant DNA technology in today's era for attaining production of different recombinant products.
4. To train students about different techniques of Isolation of Plasmid DNA, Enzymes, Secondary metabolites like penicillin, Estimation of DNA and Enzymes.
5. To train students on use of methods used to isolate DNA, RNA and Protein.
6. To introduce students about importance of Biotechnology in today's world in field of Plant and Animal cell culture.

6.0.Course Outcomes (COs) : (Min. 4 and Max. 6)

(Use Bloom's Taxonomy words)

CO Code	Course outcome

CO 605.01	• Explain the basic principles and, the tools and techniques of Genetic engineering and its applications.
CO 605.02	• Describe the applications of genetic engineering in various fields.
CO 605.03	• Illustrate the various aspects of Biotechnological applications in Fermentation Industries.
CO 605.04	• Integrate scientific and technological knowledge on the use of bioprocesses for industrial products
CO 605.05	• Describe the importance of engineering animal cells for the production of therapeutic proteins

6.1. Knowledge and Understanding

(Alignment of POs to COs)

CO Code	**Program Outcome (PO)**										
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO 605.01	**3**	--	**3**	**3**	---	---	**1**	**2**	----	**2**	**3**
CO 605.02	**3**	--	**3**	**3**	----	---	**1**	**2**	----	**3**	**3**
CO 605.03	**3**	--	**3**	**1**	--	--	--	**3**	**3**	**3**	**1**
CO 605.04	**3**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**
CO 605.05	**3**	--	**3**	**3**	--	--	--	--	**1**	**3**	**1**

Correlation levels 1, 2 or 3 as defined below:

1: Slig3t

(Low); 2: Moderate (Medium); 3: Substantial (3ig3); If t3ere is no correlation, put '-'

6.2.Teaching and Assessment Methods for achieving learning outcome:

Teaching Strategies(met3ods)/Tools used	Methods of Assessment

Lectures (Constructivist learning) **Collaborative learning (Discussion)** **Project based Learning** **Blended learning** **Inquiry based learning** **Flash cards** **Video** **Equipment models**	**Formative Assessment** **Case study** **Class test** **Multiple choice questions** **Assignments** **Seminar** **Viva Voce** **Synopsis** **Tutorials** **Summative Assessment**

6.3.Tools for the Teaching and learning

Theory subjects	Practical Subjects
• **PowerPoints presentation** • **Videos** • **Flash Card** • **Models** • **Software** • **Charts** • **Smart Boards** • **White boards** • **Online Platform**	• **White boards** • **Glassware** • **Chemicals** • **Instruments** • **Equipment** • **Software** • **Models** • **Plants/Crude Drugs** • **Animal**

6.4.COURSE CONTENT

6.1. Theoretical Aspect:

Order	Topic list/units	Subtopics list	Number of Weeks	Contact 3ours
01	**UNIT-I**	a) Brief introduction to Biotechnology with reference to Pharmaceutical Sciences. b) Enzyme Biotechnology- Methods of enzyme immobilization and applications. c) Biosensors-	**$3^{1/3}$**	**10**

		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.		
02	**UNIT-II**	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 products: d) Interferon b) Vaccines- hepatitis- B c) Hormones- Insulin. e) Brief introduction to PCR Types of immunity- humoral immunity, cellular immunity	**$3^{1/3}$**	**10**
03	**UNIT-III**	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	**$3^{1/3}$**	**10**
04	**UNIT-IV**	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.	**$3^{1/3}$**	**8**
05	**UNIT-V**	Types of mutation/mutants b) Fermentation methods and general requirements, study of media, equipments, sterilization methods, aeration process, stirring. c) Large scale production fermenter design and its various controls. d) Study of the production of - penicillins, citric acid, Vitamin B12, Glutamic acid, Griseofulvin,.	**$2^{1/3}$**	**7**
	Total		**15**	**45**

1.2 Practical Aspect (If Any):

7.0. ASSESSMENT MECHANISM :

Sr.	Assessment Mechanism	Week due	Marks	Proportion of Final

No.				Assessment
1	Assignments, Exercises & Home works	2nd week of every month	10	10%
2	Sessional (Internal Theory exam)	As per scheduled examination	15	15%
3	Final exam (theory)	As per University at end of course	75	75%
Total			100	**100%**

8.0.STUDENT SUPPORT:

Office hours/week	Other procedures
Two hours minimum	

9.0.TEACHER'S AVAILABILITY FOR STUDENT SUPPORT:

Days	Monday	Tuesday	Wednesday	T3ursday	Friday	Saturday
Time	**1:00-2:00**	**1:00-2:00**	**1:00-2:00**	**1:00-2:00**	**1:00-2:00**	**1:00-2:00**

10.0.

LEARNING RESOURCES:

Sr.No.	Title of Learning Material	Details
1	Text books	**B.R. Glick and J.J. Pasternak: Molecular Biotechnology: Principles and Applications of RecombinantDNA: 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, Degraland, 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**
2	Essential references (as per syllabus)	**Govt. of India, Indian Pharmacopoeia, TheController of Publication** **B.P.Comission, British Pharmacopoeia, H.M.S.O.London** **LeonLachman, Leiberman, Pharmaceutical Dosage Form: Tablet ChurchillLivingston** **AlfonsaGennara, Remingtons,The Science Practice of Pharmacy, Lippincott** **Bankar Gilbert, Cristofer T.Rhods, Modern Pharmaceutics, MarcelDekker** **Keneth E.A, Leon L., Herbert A. L., Pharmaceutical dosage forms: parenteral medications , Marcell dekker.**
3	Reference material	
4	E-materials and websites	Soft copies (word/Pdf files), PPT's.
5	Other learning material	

11.0. FACILITIES REQUIRED:

Sr. No.	Particular of Facility Required
01	Lecture Rooms (capacity for 60 students)
02	Laboratory (capacity for 20 students)
03	Computing resources: P-IV-PCs with recent hardware/ utilization of open source and licensed application software
04	Other resources: Appropriate laboratory tools, Chemicals, Glass ware, Apparatus, Instrumentation

12.0. COURSE IMPROVEMENT PROCESSES:

12.1. Strategies for obtaining student feedback on effectiveness of teaching:

Course delivery evaluation by students using: Questionnaire forms and online questionnaires

12.2. Other strategies for evaluation of teaching by the instructor or by the department:

Periodic review by Academic Planning & Monitoring Committee and departmental review committee, Observations and assistance of colleagues, External assessments by advisors/ examiners and auditors.

12.3. Process for improvement of teac3ing:

Use of ICT tools, teaching aids, Simultaneous practical orientation and theory classes (SPOT), Adoption of reflective teaching.

12.4. Describe the planning procedures for periodically reviewing of course effectiveness and planning for improvement:

Periodic review by departmental meeting , Review of course delivery and outcome through assessment and feedback from all stake holders.

12.5. Course development plans:

Provide inputs for course improvement and update to University Course development Committees (Board of Studies)

13.0. INFORMATION ABOUT FACULTY MEMBER RESPONSIBLE FOR T3E COURSE:

Name	Chisthi Nahid Anjum Hafizuddin
Location	Third Floor (Faculty Room)
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Office 3ours	10:00 AM to 5:00 PM