

As Per NEP 2020

University of Mumbai



Syllabus for Basket of OE	
Board of Studies in Biotechnology	
UG First Year Programme	
Semester – II	
Title of Paper	Credits 2/ 4
I) OE: Biotechnology- Industry 4.0	2
II)	
From the Academic Year (2023-24 Progressively)	

OE

Name of the Course: **Biotechnology- Industry 4.0**

Sr. No.	Heading	Particulars
1	Description the course : Including but Not limited to :	This course introduces the Indian Biotechnology Industry, covering regulatory frameworks, funding sources, and market analysis. Learners will learn to develop business plans for biotech startups and analyze successful case studies, offering valuable insights for industry relevance and career prospects.
2	Vertical :	Open Elective
3	Type :	Theory
4	Credit:	2 credits
5	Hours Allotted :	30 Hours
6	Marks Allotted:	50 Marks
7	Course Objectives(CO): CO 1. Identify the different types of biotechnology, including industrial, pharmaceutical, and agricultural biotechnology CO 2. Describe the latest techniques used in biotechnology to develop new products and processes that improve our lives CO 3. Understand the role of entrepreneurship in biotechnology and how to identify valuable opportunities for innovation CO 4. Understand the importance of communication skills in biotechnology and learn how to effectively communicate scientific concepts to diverse audiences.	
8	Course Outcomes: Learner will be able to OC 1. categorize different types of biotechnology, including industrial, pharmaceutical, and agricultural biotechnology, and provide examples of each. OC 2. describe the latest techniques used in biotechnology, such as gene editing, synthetic biology, and metabolic engineering OC 3. analyze the role of entrepreneurship in biotechnology, identify potential opportunities for innovation, and develop a business plan for a new biotechnology product or process. OC 4. effectively communicate scientific concepts related to biotechnology to diverse audiences	

9	Modules:-
	Module 1: Biotechnology Industry overview
	1. Introduction to Biotechnology, Indian Biotechnology Industry & opportunities available in the biotechnology industry, such as drug discovery, agricultural biotechnology, and bioinformatics. 2. Regulatory Framework: Understand the regulatory framework governing the biotechnology industry in India, including intellectual property rights, patents, FDA and clinical trials. 3. Funding and Investment: Discuss the sources of funding available for biotechnology startups in India, including venture capital, angel investors, and government grants.
	Module 2: Market Analysis of Biotechnology Industry
	1. Market Analysis: Conduct a market analysis of the biotechnology industry in India, including the target market, competition, and potential growth opportunities. 2. Business Plan Development: Learn how to develop a business plan for a biotechnology startup, including market research, financial projections, and risk assessment. 3. Case Studies: Analyse successful biotechnology startups in India and discuss the factors that contributed to their success.
10	Text Books: 1. Dubey, R. C. (1993). A textbook of Biotechnology. S. Chand Publishing. 2. Dubey, R. C. (2014). Advanced biotechnology. S. Chand Publishing 3. Singh, B. D., & Singh, B. D. (2007). Biotechnology expanding horizons. Kalyani publishers.

11	Reference Books: 1. Managing Biotechnology From Science to Market in the Digital Age - Francoise Simon, Glen Giovannetti 2. Biotechnology Entrepreneurship Starting, Managing, and Leading Biotech Companies - Craig Shimasaki - Academic Press 3. Concepts in Biotechnology - History, Science and Business by Klaus Buchholz and John Collins - Wiley 4. Biotechnology Business - Concept to Delivery - Arpita Saxena, Editor - Springer 5. National Biotechnology Development Strategy [2020-2025] Knowledge And Innovation Driven Bio-Economy Department of Biotechnology Ministry of Science and Technology Government of India 6. BIOTECHNOLOGY INDUSTRY REPORT Dec, 2023, India Brand Equity Foundation (IBEF)
----	---

12	Internal Continuous Assessment: 40%	External, Semester End Examination : 60% Individual Passing in Internal and External Examination
13	Continuous Evaluation through: Quizzes, Class Tests, presentation, project, role play, creative writing, assignment etc. (at least 3)	
14	Format of Question Paper: Semester End Examination theory - 50 Marks	

**Sign of the BOS
Chairman
Dr. Varsha Kelkar-Mane
Ad-hoc BoS
(Biotechnology)**

**Sign of the
Offg. Associate Dean
Dr. Madhav R. Rajwade
Faculty of Science &
Technology**

**Sign of the
Offg. Dean
Prof. Shivram S. Garje
Faculty of Science &
Technology**