AC – 20/04/2024
Item No. – 6.7 Sem. II (8a)

As Per NEP 2020

University of Mumbai

Syllabus for Basket of Minor	
Board of Studies in Biotechnology	
UG First Year Programme	
Semester – II	
Title of Paper	**Credits 2/ 4**
I) Biotechnology and its Applications	**2**
II)	**2**
III)	
From the Academic Year (2023-24 Progressively)	

Minor

Name of the Course: Biotechnology and its Applications

Sr. No.	Heading	Particulars
1	**Description the course :** **Including but Not limited to :**	This Course Aims to introduce biotechnology for human welfare, covering Industry, environment and forensic. The course also explores biotechnological applications of microbes as biofertilizers in agriculture, organic farming, and human health welfare, and their solutions. This will develop learners to gain competencies in the vast field of applied biotechnology and understand the approach to designing solutions.
2	**Vertical :**	Minor
3	**Type :**	Theory
4	**Credit**:	2 credits
5	**Hours Allotted :**	30 Hours
6	**Marks Allotted**:	50 Marks
7	**Course Objectives(CO):** CO 1. Understand the history and introduction of various branches of biotechnology. CO 2. Explore various biotechnological applications of microbes, from biofertilizers and organic farming. CO 3. Develop skills in various composting techniques and recycling of agricultural and industrial wastes. CO 4. Understand the role of biotechnology in agriculture, farming and human welfare, emphasizing real-world applications in industry. CO 5. Understand the basics input of biotechnology in forensic investigation of crime cases and claiming of parentage.	
8	**Course Outcomes**: Learner will be able to OC 1.grasp the principles of DNA analysis, showcasing a conceptual understanding of genetic marker in investigation tools of criminal and forensic case. OC 2. analyze the beneficial role of microbes in farming, pollutant degradation, challenges in agriculture, health, and the environment. OC 3. emphasizing the forensic significance of DNA typing, role of DNA typing in parentage testing. OC 4.acquire an understanding of the biotechnology's role in industry, agricultural practices, and in human health area aspects.	

9	**Modules**:- **Module 1: Introduction to Biotechnology and its application-I**

	1.Introduction to Biotechnology: History & Introduction to Biotechnology What is Biotechnology? Definition of Biotechnology, Traditional and Modern Biotechnology, Branches of Biotechnology-Plant, Animal Biotechnology, Marine Biotechnology, Agriculture, Healthcare, Industrial Biotechnology, Pharmaceutical Biotechnology and Environmental Biotechnology. **(5 Lectures)** **2. Agriculture:** Introduction of Biotechnology for qualitative improvement of seeds. Jumping genes, Nitrogen cycle and Nitrogen fixation **(3 Lectures)** **3.. Organic farming**: Green manuring and organic fertilizers, Recycling of biodegradable municipal, agricultural and Industrial wastes – biocompost making methods, types and method of vermicomposting. **(3 Lectures)** **4. Biofertilizers:** Microbes used as biofertilizer – Rhizobium, Azospirillum, Cyanobacteria (blue green algae), Azolla and Anabaena, Mycorrhizal association, types of mycorrhizal association and distribution, colonization of VAM. **(4 Lectures)**
	Module 2: Introduction to Biotechnology and its application-II **1. Industry:** Acetone, butanol and ethanol (ABE) fermentation by Chaim Weizman. Method of Penicillin production. **(3 Lectures)** **2. Forensic Science:** Basic Principles DNA as biological blueprint of life. Extraction and quantation of DNA for analysis. Solving claims of paternity and theft. Restriction fragment length polymorphism- genetic markers used in-RFLP. **(5 Lectures)** **3. Health:** Development of non-toxic therapeutic agents, recombinant live vaccines, gene therapy, diagnostics, production of monoclonal antibodies in *E. coli*, human genome project. **(4 Lectures)** **4. Nutraceutical and functional foods:** Role of nutraceuticals and functional foods in human health and disease management eg., Coronary heart diseases, diabetes, cancer. **(3 Lectures)**
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. Kumaresan, V. (2005). Biotechnology. New Delhi, Delhi: Saras Publication. 2. 2. Sathe, T.V. (2004). Vermiculture and Organic Farming. New Delhi, Delhi: Daya publishers. 3. 3. Subha Rao, N.S. (2000). Soil Microbiology. New Delhi, Delhi: Oxford & IBH Publishers. 4. W.G. Eckert and S.H. James, Interpretation of Bloodstain Evidence at Crime Scenes, CRC Press, Boca Raton (1989). 5. G.T. Duncan and M.I. Tracey in Introduction to Forensic Sciences, 2nd Edition, W.G. Eckert (Ed.), CRC Press, Boca Raton (1997). 6. R. Saferstein, Criminalistics, 8th Edition, Prentice Hall, New Jersey (2004). 7. T. Bevel and R.M. Gardner, Bloodstain Pattern Analysis, 3rd Edition, CRC Press, Boca Raton (2008).

	8. J.M. Butler, Forensic DNA Typing, Elsevier, Burlington (2005). 9. K. Inman and N. Rudin, An Introduction to Forensic DNA Analysis, CRC Press, Boca Raton (1997). 10. H. Coleman and E. Swenson, DNA in the Courtroom: A Trial Watcher's Guide, GeneLex Corporation, Washington(1994). 11. W.J. Tilstone, M.L. Hastrup and C. Hald, Fisher's, Techniques of Crime Scene Investigation, CRC Press, Boca Raton (2013). 12. Lipi Das, Eshani Bhaumik, Utpal Raychaudhuri & Runu Chakraborty, Role of nutraceuticals in human health., Food Sci Technol (March–April 2012) 49(2):173–183 DOI 10.1007/s13197-011-0269-4 13. Nutraceuticals and Functional Foods in Human Health and Disease Prevention (PDFDrive).pdf Edited by Debasis Bagchi Harry G. Preuss Anand Swaroop CRC Press ISBN: 13: 978-1-4822-3722-1	
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**