M. C. E. Society's
Abeda Inamdar Senior College
Of Arts, Science and Commerce, Camp, Pune-1
(Autonomous) Affiliated to Savitribai Phule Pune University
NAAC accredited 'A' Grade

F.Y.B.Sc. Biotechnology (Semester I)
(Theory)

Offered as	**Minor**
Course/Paper Title	**Biotechnology: An Interdisciplinary Approach**
Course Code	**26SBBT11MN**
Semester	**I**
No. of Credits	**2**
Total Teaching Hours	**30**

Course Objectives	
1.	To understand the fundamental concepts, branches, and scope of Biotechnology, including its applications in medicine, agriculture, environment, and industry.
2.	To explore various biotechnological techniques, tools, and methodologies used in research, diagnostics, and industrial applications.
3.	To analyze the role of Biotechnology in addressing challenges in medicine, agriculture, environment, and food safety.
4.	To develop awareness of emerging opportunities in Biotechnology, entrepreneurship, and interdisciplinary research.

Course Outcome	
1.	Students will be able to explain the fundamental concepts, branches, and daily life applications of biotechnology.
2.	Students will be able to demonstrate key biotechnological techniques such as disease diagnostics, stem cell applications, vaccine production, and environmental bioremediation.
3.	Students will be able to assess career opportunities in Biotechnology, including research, industry, entrepreneurship, and biomedical applications.

Syllabus		
Unit	**Title and Contents**	**Total Hours**
Unit I	**Introduction to Biotechnology and applications of Biotechnology in the field of medicine and agriculture**	**15**
1	Introduction to Biotechnology • Introduction & Branches of Biotechnology • Biotechnology in day-to-day life • Exploring techniques in Biotechnology	05

2	Application of Biotechnology in the field of medicine - • Disease diagnosis and methods • Concept of Stem cells and their applications in medicine. • Vaccine production • Invitro Fertilization Techniques.	05
3	Application of Biotechnology in agriculture - • Biofertilizers & Biopesticides • Introduction to GMOs with examples • Role of Biotechnology in Agriculture	05
Unit II	**Various opportunities in Biotechnology and its applications in the field of environment and industry.**	**15**
4	Role of Biotechnology in solving problems related to environment • Waste water treatment: Primary Secondary and tertiary treatment of waste water. • Bioremediation • Biopolymer degradation	05
5	Role of Biotechnology in food & dairy industry- • Prebiotics and Probiotics: • Single cell protein • Food safety • Food adulteration: Concept and methods of detection	05
6	Other opportunities in Biotechnology – • In Research • In Industry, Start-ups & Entrepreneurship (Small scale start up) • Biomedical engineering • Clinical technician • Process development scientist	05

References

1. J. A. Davis, W. S. Resnikoff, *Milestones in Biotechnology*: Classic papers in Genetic Engineering.

2. J. Hammond & P. McGravey, V.Yushibov, *Plant biotechnology*, Springer-Verlag.

3. Amann, R.I. Stromley, J. Stahl, *Applied & Environmental Microbiology*

4. B. D. Singh- *A textbook of Biotechnology*, 4th Edition, Publisher: Kalyani

5. Primrose and Twyman, *Principles of Gene Manipulation* & Genomics , (2006, 7th Edition), Blackwell Publishing

6. Mahajan Ritu *Introduction to Basics of Biotechnology*

7. Bhattacharya BC, and Banerjee R, *Environmental Biotechnology*, ISBN: 9780195687828, 2007.

8. Byong H. Lee, *Fundamentals of Food Biotechnology*, 2nd Edition, ISBN: 978-1-118-38495-4

9.D A Sawant, *Industrial Biotechnology*, Nirali Prakashan; 4th edition (1 January 2015),

ISBN-13 : 978-9382448983

10. Jayant Acherekar, *Concepts in biotechnology*, Dominant Publishers (January 1, 2005), ISBN-13 : 978-8178882703

11. Purohit, Biotechnology: *Fundamentals and application*, Agrobios (India) (1 January 2005), ISBN-13 : 978-8177541397

E Resources:

https://www.britannica.com/technology/biotechnology.

https://www.springer.com/journal/11157

https://www.vedantu.com/biology/biotechnology-in-agriculture

F.Y.B.Sc. Biotechnology Semester I,
(Minor Practical)

Offered as	**Minor**
Course/Paper Title	**Applications of Biotechnology**
Course Code	**26SBBT12MN**
Semester	**I**
No. of Credits	**2**
Total Teaching Hours	**30**

Course Objectives	
1.	To develop practical skills in accessing and utilizing literature databases like PubMed, MEDLINE, and PubMed Central for research in Biotechnology.
2.	To acquire hands-on experience in microbial techniques, including isolation, characterization, and immobilization of microorganisms.
3.	To understand and analyze microbial interactions with the environment, such as soil bioremediation and probiotic identification.
4.	To foster the ability to design and interpret experiments for research and industrial applications in Biotechnology.

Course Outcome	
1.	Students will be able to demonstrate the use of literature databases (PubMed, MEDLINE, PubMed Central) to retrieve and analyze relevant scientific information.
2.	Students will be able to perform microbial techniques including yeast cell immobilization and isolation/characterization of soil and Rhizobium spp.
3.	Students will be able to analyze microbial roles in environmental and health-related applications, including petrol degradation and probiotic identification.

Syllabus		
Sr. No	**Title and Contents**	**Total Practicals**
1.	Study of Literature Databases: PubMed, MEDLINE, PubMed Central at NCBI	02

Syllabus passed in BOS of Microbiology and Biotechnology meeting held on 24th Jan 2026

2.	Immobilization of yeast cells by Entrapment method	02
3.	Isolation and characterization of probable petrol degrading organisms from soil.	04
4.	Isolation and characterization of *Rhizobium spp*	02
5.	Isolation of probiotics from the sample	02

References

1. Jin Xiong, *Essential Bioinformatics* 1st ed. United States of America by Cambridge University Press, New York, 2006

2. Des Higgins & Willie Taylor, *Bioinformatics: Sequence, structure and databanks*, Oxford University Press, 2000

3. AD Baxevanis & BFF Ouellette, *Bioinformatics: A practical guide to the analysis of genes and proteins*, Wiley Interscience New York, 2001.

4. David W. Mount, *Bioinformatics Sequence and Genome Analysis* 2 nd ed. cold spring harbor New York, USA: Cold spring harbor laboratory press, 2004

5. Stephen Misener & Stephen A. Krawetz, *Bioinformatics: Methods and Protocols*, Humana Press, New Jersey, 2000

6. AH Wood, T.K. Parry Smith DJ, *Introduction to bioinformatics*, Pearson education Asia, 2001

E Resources:

https://www.expasy.org/

https://www.rcsb.org

https://www.coursera.org/specializations/bioinformatics

https://www.uniprot.org/

https://www.edx.org/learn/bioinformatics

https://www.ebi.ac.uk/

F.Y.B.Sc. Biotechnology Semester I
(SEC)

Offered as	**Minor**
Course/Paper Title	**Forensic science**
Course Code	**26SBBT11SE**
Semester	**I**
No. of Credits	**2**
Total Teaching Hours	**30**

Course Objectives	
1.	To understand the fundamental concepts, branches, and legal principles of forensic science.
2.	To develop practical skills in forensic serology, including detection of blood, saliva, and semen using presumptive and confirmatory tests.
3.	To explore forensic psychology and criminal profiling to analyze patterns of criminal behavior for investigative purposes.
4.	To acquire knowledge and hands-on experience in forensic DNA analysis, including DNA fingerprinting, genomic DNA isolation, and interpretation of electrophoretic results.

Course Outcome	
1.	Students will be able to explain the branches, principles, and laws of forensic science and their role in criminal investigation.
2.	Students will be able to perform forensic serology techniques, including blood, saliva, and semen detection, and apply chemical tests such as the Marquis test.
3.	Students will be able to analyze criminal behavior using forensic psychology principles and develop basic profiling skills.

Syllabus		
Unit	**Title and Contents**	**Total Hours**
Unit I	**Branches of forensic science**	**18**
1	Introduction to forensic science Definition and Branches of forensic science • Principles and Laws of Forensic Science	03
2	Forensic serology – • Blood: Composition: Plasma, Serum, Blood corpuscles, Proteins, Haemoglobin structure and function, Presumptive tests and • Confirmatory tests for detection of blood from the sample (Teichmann crystal test, Wagener's test, Kastle-Meyer test) • Spot test to detect drug in samples- Marquis test, • Blood Grouping systems: ABO, Rhesus factor • Saliva: Composition, Presumptive tests and Confirmatory tests • Semen: Composition, Presumptive tests and Confirmatory tests (Christmas tree staining, Florence test and Barberio's method as chemical method to detect seminal stains from the sample)	15
Unit II	**Forensic psychology and Forensic DNA Analysis**	**12**
3	Criminal psychology • Science of criminal behaviour- Profiling, consultation and assessment	03
4	Forensic DNA Analysis • DNA fingerprinting: A Molecular technique involved in	09

	detection of crime • Procedure and result interpretation of Agarose gel electrophoresis • Genomic DNA isolation	

References

- Nyla R. Branscombe Robert A. Baron, *Social Psychology*, Pearson Education, ISBN 13 : 978-9332586116, 14th edition, 2017
- Richard Saferstein, Criminalistic: *An Introduction to Forensic Science,* Prentice-Hall, New Jersey, 7th edition, ISBN-13 : 978-0130138279, 2000
- B. R. Sharma, *Forensic Science in Criminal Investigation and Trials*, Universal Law Publishing Co. Ltd, 5th edition, ISBN-13 : 978-9350354681, 2014
- B. R. Sharma, *Forensic Science in Criminal Investigation and Trials*, Universal Law Publishing Co. Ltd, 5th edition, ISBN-13 : 978-9350354681, 2014
- Nordby & James *Introduction to Forensic Science*, CRC Press; 4th edition, ISBN-13 : 978-1439853832, 2015
- Chatterjee C.C., *Human Physiology*, Medical Allied Agency, 1st edition, 1951

E- Resources

https://doi.org/10.1016/B0-08-043076-7/01387-5

https://doi.org/10.1016/B0-12-369398-5/00512-0

https://doi.org/10.1016/B978-0-12-382165-2.00032-5