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 Sem I (SEC)

Offered as	**Minor**
Course/Paper Title	**Applications of biotechnology in forensic science**
Course Code	**23SBBT11SE**
Semester	**I**
No. of Credits	**2**
Total Teaching Hours	**30**

Course Objectives	
1.	To highlight the importance of forensic science for perseverance of the society.
2.	To emphasize the importance of scientific methods in crime detection.
3.	To provide a platform for students and forensic scientists to exchange views to work for the advancement of forensic science.
4.	To help students understand the role of biotechnology in forensic science

Course Outcome	
1.	Students will understand the importance of biotechnology in forensic science.
2.	Students will be familiar with the fundamental principles and functions of forensic science.
3.	Students will know the significance of forensic science to human society.

Syllabus		
Unit	**Title and Contents**	**Total Hours**
Unit I	**Branches of forensic science**	**18**
1	Introduction to forensic science - Definition and Origin of Term "forensic" - Principles and Laws of Forensic Science - Branches of forensic science	**03**
2	Forensic serology – - Blood: Composition: Plasma, Serum, Blood corpuscles, Proteins, Haemoglobin structure and function, Presumptive tests, Confirmatory tests for detection of blood from the sample (Teichmann crystal test, Wagener's test, Kastle-Meyer test) - 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) - Spot test to detect drug in samples- Marquis test, - Blood Grouping systems: ABO, Rhesus factor	**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 detection of crime - Procedure and Interpretation of results of Agarose gel electrophoresis and Genomic DNA isolation.	09

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F.Y.B.Sc. Biotechnology Sem I (OE)

Offered as	**Minor**
Course/Paper Title	**Biotechnology in healthcare**
Course Code	**23SBBT21OE**
Semester	**I**
No. of Credits	**2**
Total Teaching Hours	**30**

Course Objectives	
1.	To introduce basic introduction to healthcare fields in India.
2.	To present to the student's knowledge about healthcare advancements
3.	To understand the application of Biotechnology in healthcare
4.	How biotechnology is explored in field of healthcare

Course Outcome	
1.	Students will understand the applications of biotechnology in healthcare science.
2.	Students will become familiar about advancements of healthcare
3.	Students will understand development and designing of kits used in diagnosis
4.	Applicative based studies will be taken

Syllabus		
Unit	**Title and Contents**	**Total Hours**
Unit I	**Role of Biotechnology in the field of antibiotics, Enzyme therapy and vaccine production**	**15**
1	Introduction to antibiotics - Broad and narrow spectrum antibiotics with their examples.	05
2	Enzyme therapy - Introduction to enzyme therapy - Need for Enzyme therapy - Example- Alginate lyase - Challenges involved in Enzyme therapy	05

3	Vaccine Production - Introduction to vaccines - Types of vaccines with examples	05
Unit II	**Role of Biotechnology in the stem cell therapy and design of diagnostic products**	**15**
4	Stem cell therapy - Introduction to stem cells - Types of stem cells, properties and their applications.	05
5	Pharmaceutical and diagnostic products - Introduction to diagnostic products - Designing of kits and applications	05
6	Introduction to genetic disorders Examples of X- linked disorders and Y- linked disorders	05

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F.Y.B.Sc. Biotechnology Sem II

Offered as	**Minor**
Course/Paper Title	**Introduction to various fields of biotechnology**
Course Code	**23SBBT21MN**
Semester	**II**
No. of Credits	**2**
Total Teaching Hours	**30**

Course Objectives	
1.	To introduce the different branches of biotechnology
2.	To present to the students the milestones and developments in Biotechnology
3.	To understand the application of each branch of biotechnology in research and industry.

Course Outcome	
1.	Students will understand the applications of biotechnology.
2.	Students will understand the importance of biotechnology in Day to Day life.
3.	Students will be acquainted with the different branches of biotechnology.

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	05
	- Waste water treatment: Primary Secondary and tertiary treatment of waste water. - Bioremediation -Biopolymer degradation	
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

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F.Y. B.Sc. Biotechnology Sem II

Offered as	**Minor**
Course/Paper Title	**Recombinant DNA technology**
Course Code	**23SBBT22MN**
Semester	**II**
No. of Credits	**2**
Total Teaching Hours	**30**

Course Objectives	
1.	To introduce the concept of recombinant DNA technology.
2.	To make students understand the applications of recombinant DNA technology in the field of research and industry.
3.	To help students understand the tools involved in recombinant DNA technology
4.	To inculcate research aptitude in students

Course Outcome	
1.	Students will have the knowledge of basic concept of recombinant DNA technology
2.	Students will understand the applications of recombinant DNA technology in various fields like medicine, environment and industry.
3.	Students will understand the technique like Southern blotting, Northern blotting, Western blotting, PCR and it's applications in various fields.
4.	Students will have the knowledge of the tools involved in recombinant DNA technology.

Syllabus		
Unit	**Title and Contents**	**Total Hours**
Unit I	**Tools used in recombinant DNA technology**	**18**
1	**Introduction to recombinant DNA technology**	1
2	**Enzymes used in recombinant DNA technology** Restriction enzymes, it's types and nomenclature, DNA ligases, DNA modifying enzymes	4

3	**Vectors used in recombinant DNA technology** - Features of an ideal vector - Types of vectors - cloning vectors and expression vectors. - Study of cloning vectors- I. Plasmids - pBR322 II. Phage vectors - Lambda insertion vectors, Replacement vectors, Lambda phage genome and it's features. III. Cosmids IV. Artificial chromosome - YAC	9
4	**Methods of introducing recombinant DNA into the host cell -** Transformation method - Calcium chloride method to make host cells competent - Transfection methods – Electroporation, Particle gun method	4
Unit II	**Techniques in recombinant DNA technology**	**12**
5	**Methods for screening and selection of transformants** - Blotting or hybridization techniques – Southern blotting, Northern blotting, Western blotting.	5
6	**Polymerase Chain reaction (PCR) and DNA sequencing method** - Basic principle of PCR, procedure, and applications of PCR - Types of PCR -Example; RT-PCR -Automated DNA sequencing method- Pyrosequencing	3
7	**Applications of recombinant DNA technology –**	4
	- Applications in Animal pharming - Example- Dolly -The sheep. - Applications in Plant biotechnology - Process of delaying fruit ripening by antisense RNA technology, transgenic plants - golden rice - Applications in medicine and diagnostics - Recombinant insulin, recombinant vaccines.	

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F.Y.B.Sc. Biotechnology Sem II (VSC)

Offered as	**Minor**
Course/Paper Title	**Biochemical techniques**
Course Code	**23SBBT21VS**
Semester	**II**
No. of Credits	**2**
Total Teaching Hours	**60**

Course Objectives	
1.	To introduce students to the basic and important biochemical techniques.
2.	To understand the applications of these techniques in the field of research and industry.
3.	To provide knowledge of performing these techniques in laboratory.

Course Outcome	
4.	Students will also get basic knowledge of detecting biomolecules like carbohydrates, proteins, lipids, nucleic acids from various samples.
5.	Students will become familiar with the quantitative and qualitative analysis of biomolecules and its applications in research and industry
6.	Students will be able to apply these techniques in various fields of life sciences.

Syllabus		
Sr No	**Title and Contents**	**Total Practicals**
1	Biochemical calculations and preparation of buffer solution and	1
	reagents	
2	Quantitative estimation of reducing sugars by DNSA method	1
3	Qualitative tests for detection of sugars	1
4	Qualitative tests for detection of amino-acids and proteins	1
5	Quantitative estimation of proteins by Biuret method	1
6	Quantitative estimation of proteins by Folin Lowry method	1
7	Qualitative and quantitative estimation of cholesterol	1

8	Separation of amino-acids by paper chromatography	1
9	Separation of plant pigments by Thin layer chromatography	1
10	Qualitative tests for detection of phytochemicals from the sample	1
11	Determination of Saponification number of lipids	1
12	Estimation of Ascorbic acid by 2,6 dichlorophenol iodophenol.	1
13	Estimation of citric acid by titration method	1
14	Quantitative estimation of DNA by diphenylamine method.	1
15	Isolation of starch from potato.	1

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F.Y.B.Sc. Biotechnology Sem II (SEC)

Offered as	**Minor**
Course/Paper Title	**Applications of bioinformatics**
Course Code	**23SBBT21SE**
Semester	**II**
No. of Credits	**2**
Total Teaching Hours	**30**

Course Objectives	
1.	To introduce the concept of databases and its applications in life sciences.
2.	To present to the students various methods for the data retrieval, data storage, and data mining.
3.	To understand the applications of databases in the field of research.

Course Outcome	
1.	Students will understand the applications of bioinformatics in various fields of life sciences.
2.	Students will be able to use various sequence alignment tools and compare the unknown sequence with known sequence
3.	Students will be able to analyse the biological experimental data using bioinformatics tools
4.	Students will be able to discuss various methods for the data retrieval, data storage, and data mining and use that data for the further analysis.

Syllabus		
Unit	**Title and Contents**	**Total Hours**
Unit I	**Nucleic Acid Sequence and Protein sequence databases**	**14**
1	Introduction to bioinformatics - Definition, History and Scope, Applications of bioinformatics in various fields.	02

2	Nucleic Acid Sequence and Protein sequence databases: - Nucleic Acid Sequence databases: GenBank, EMBL, DDBJ - Keyword-based search at Entrez Search Engine at NCBI. - Sequence Submission tools at NCBI, EMBL. - Protein sequence database: UniProtKB (SwissPort, TrEMBL). Open Access Bibliographic Resources and Literature Databases: PubMed, MEDLINE, PubMed Central at NCBI	12
Unit II	**Sequence Analysis and Multiple Sequence Alignment**	**16**
3	Sequence Analysis: - Various File Formats for Bimolecular Sequences: GenBank, FASTA - Basic concepts of sequence analysis: - Global Pairwise Sequence Alignment, Local Pairwise Sequence Alignment Needleman and Wunsch, Smith and Waterman algorithms for pairwise alignments, gap penalties, use of pairwise alignments for analysis of Nucleic acid and Protein sequences and interpretation of results. - Databases Searches: BLAST, FASTA - Scoring matrices: Basic concept of a scoring matrix, Matrices for nucleic acid and proteins sequences, PAM and BLOSSUM series.	10
4	Multiple Sequence Alignment (MSA) - The need for MSA - Basic concepts of various approaches for MSA (e.g. progressive,	06
	hierarchical, iterative). - Concept of Phylogeny: Molecular Phylogeny, Various Methods of Phylogenetic Tree Construction	

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