

SARDAR PATEL UNIVERSITY  
Vallabh Vidyanagar Gujarat  
(Reaccredited with 'A' Grade by NAAC (CGPA 3.11)  
Syllabus with effect from the Academic Year 2024-2025

B.Sc. (Biotechnology) Sem.- IV

Course Code	US04MABTE01	Title of the Course	Introduction to animal and plant biotechnology
Total Credits of the Course	04	Hours per Week	04

Course Objectives	<ol style="list-style-type: none"> <li>1. To understand the objective and technique for gene transfer</li> <li>2. To get an overview of animal and plant tissue culture.</li> <li>3. To study various application of gene transfer in plants and animals.</li> </ol>
-------------------	--

	Course Content	Weight age*(%)
Unit 1	<p><b>Gene transfer Techniques:</b> Objectives of Gene transfer, Methods of Gene Transfer: Physical- electroporation, gene-gun method and microinjection. Chemicals-Ca-phosphate, Co-precipitate, lipofection. Biology- vector mediated (Ti and retrovirus) Screening of transgenics (Visual selection (GFP, luc), Antibiotic (Neomycin/hygromycin) / herbicide resistance (glyphosate/glyosinate), auxotrophy)</p>	25
Unit 2	<p><b>Plant Tissue Culture:</b> History, , General terminology in PTC pros and cons of Plant tissue culture, Basic Requirements of Plant tissue culture, sterilization techniques. Nutrients requirements, Media and preparation of MS media, Totipotency-its concept, callus culture, meristem culture.</p>	25
Unit 3	<p><b>Animal Cell Culture:</b> History, advantages limitation and application of ACC, equipments used in ATC, substrate and Media- Natural &amp; Artificial, Types of cell culture (Primary &amp; secondary), suspension culture. Initiation of cell culture and methods for scale up of cell culture process (Rollers Bottles, spinner culture). Organ culture</p>	25
Unit 4	<p><b>Application of Plant and Animal tissue culture:</b> Plant tissue culture-Artificial seeds, Disease resistant plants, secondary metabolites, Animal cell culture- virus vaccines, recombinant proteins (production of human growth factors), animal cloning.-embryo transfer in cattle.</p>	25

SARDAR PATEL UNIVERSITY  
Vallabh Vidyanagar Gujarat  
(Reaccredited with 'A' Grade by NAAC (CGPA 3.11))  
Syllabus with effect from the Academic Year 2024-2025

Teaching-Assignments, Learning	Lecture, Recitation, Group discussion, Guest speaker, Debate, Seminar, Quizzes.
--------------------------------	---

Evaluation Pattern		
Sr. No.	Details of the Evaluation	Weightage
1.	CEE: Internal Continuous Assessment in the form of Practical, Viva-voce, Quizzes, Seminars, Assignments, Attendance, etc	50%
2.	University Examination	50%

Course Outcomes: Having completed this course, the learner will be able to	
1.	The students will get knowledge about various techniques of gene transfer and selection.
2.	The student will have insight of basics of requirements and cell cultures in plant tissue culture.
3.	The students will have an overview of types of animal cell culture, process and requirements of animal cell culture
4.	The students will get an idea about various applications of plant and animal tissue cultures.

Suggested References:
Introduction to plant tissue culture- M K Razdan Introduction to plant biotechnology- H.S.Chawla Expanding Horizon of Biotechnology- B.D Singh A textbook of Biotechnology- R.C Dubey Animal Biotechnology-Freshney

On-line resources to be used if available as reference material
On-line Resources
Relevant entries on Wikipedia and Encyclopaedia Britannica

SARDAR PATEL UNIVERSITY  
Vallabh Vidyanagar Gujarat  
(Reaccredited with 'A' Grade by NAAC (CGPA 3.11)  
Syllabus with effect from the Academic Year 2024-2025

**B.Sc. (Biotechnology) Sem.- IV**

Course Code	US04MABTE02	Title of the Course	Bioinstrumentation
Total Credits of the Course	04	Hours per Week	04

Course Objectives	<ol style="list-style-type: none"> <li>1. The student will be exposed to principles, design and working of instruments used in life sciences.</li> <li>2. Students will learn about the application of various instruments and its intended use in biological field.</li> </ol>
-------------------	---

	Course Content	Weight age*(%)
Unit 1	<b>Centrifugation:</b> Basic Principle of Sedimentation, the basic components of centrifuge, Types of rotors: Vertical, Swing-out, Fixed-angle, - Types, Principle & applications of centrifugation (Density gradient Centrifugation {Zonal and Isopycnic}, Differential Centrifugation, Ultra centrifugation)	25
Unit 2	<b>Chromatography</b> Properties of solvents (mobile phase, stationary phase). Basic Principle, Methods and Applications of chromatography( Paper Chromatography, TLC, , Gel Filtration Chromatography, Ion Exchange Chromatography, Affinity Chromatography, Column Chromatography )	25
Unit 3	<b>Electrophoresis: -</b> Introduction, Support media, Principle, Methodology and Applications of: Agarose Gel Electrophoresis Iso-electric Focusing, Immuno Electrophoresis, Capillary Electrophoresis, SDS-PAGE, 2D PAGE	25
Unit 4	<b>Spectrophotometry:</b> Property of Eletromagnetic radiation, Interaction of EM radiation with matter, concept of physical phenomenon of EM radiation- absorption, emission, refraction, diffraction, transmission & flurosence. Beer Lambert law, Principle, design, working and applications of UV and Visible spectrophotometer - IR Spectroscopy - Raman Spectroscopy.	25

Teaching-Assignments, Learning	Lecture, Recitation, Group discussion, Guest speaker, Debate, Seminar, Quizzes.
--------------------------------	---

SARDAR PATEL UNIVERSITY  
Vallabh Vidyanagar Gujarat  
(Reaccredited with 'A' Grade by NAAC (CGPA 3.11))  
Syllabus with effect from the Academic Year 2024-2025

Evaluation Pattern		
Sr. No.	Details of the Evaluation	Weightage
1.	CEE: Internal Continuous Assessment in the form of Practical, Viva-voce, Quizzes, Seminars, Assignments, Attendance, etc	50%
2.	University Examination	50%

Course Outcomes: Having completed this course, the learner will be able to	
1.	Understand the basic techniques of centrifugation and chromatography for studying cells and separation of biomolecules.
2.	Understand the principle of measuring the concentrations of macromolecules in solutions by colorimeter and spectrophotometer and use them in Biochemistry.
3.	Students will learn the process of electrophoresis and its use for analysis, purification of macromolecules

Suggested References:	
Sr No	References
	1. Biochemistry. 6th Edition by Berg, J. M., Tymoczko, J. L. and Stryer, L. (2006). Freeman, New York.
	2. Principles and techniques of biochemistry and molecular biology, Wilson, K., & Walker, J. (2010). 7th Ed. Cambridge university press.
	3. Biophysical chemistry, principle and techniques, Upadhyay, A & Nath, N. (2004). 4th Ed. Himalaya Publishing House.
	4. Modern spectroscopy by Hollas, J. M. (2004).. 4th Ed. John Wiley & Sons

On-line resources to be used if available as reference material
On-line Resources
Relevant entries on Wikipedia and Encyclopedia Britannica

SARDAR PATEL UNIVERSITY  
Vallabh Vidyanagar Gujarat  
(Reaccredited with 'A' Grade by NAAC (CGPA 3.11))  
Syllabus with effect from the Academic Year 2024-2025

B.Sc. (Biotechnology) Sem.- IV

Course Code	US04MABTE03	Title of the Course	Practicals
Total Credits of the Course	4	Hours per Week	08

Course Objectives	<ol style="list-style-type: none"> <li>1. The students will study principle, working of different types of Instruments</li> <li>2. To study media and products of animal and plant cultures.</li> </ol>
-------------------	---

	Course Content	Weight age*(%)
Section-I	<ol style="list-style-type: none"> <li>1. Determination of <math>\lambda_{max}</math> of given solution using spectroscopy</li> <li>2. Quantification of Protein using Protein using Folin-Lowry method</li> <li>3. Estimation of reducing sugar by DNS.</li> <li>4. Separation of plant pigment by paper chromatography</li> <li>5. Extraction of Proteins by TCA</li> <li>6. Electrophoresis separation of serum proteins</li> <li>7. Extraction of secondary metabolites from given plant sample</li> <li>8. Demonstration of SDS page</li> <li>9. Demonstration of column chromatography</li> <li>10. Demonstration of Initiation of primary cultures in animal cell culture.</li> </ol>	50
Section-II	<ol style="list-style-type: none"> <li>1. Study of MS media and its preparation</li> <li>2. Check purity of DNA/Protein by spectrophotometer.</li> <li>3. To study DNA/RNA/Plasmid on Agarose Gel electrophoresis.</li> <li>4. Desalting of proteins by dialysis</li> <li>5. Used of semilog graph paper for calculation of mol weight of unknown sample using gel profiles.</li> <li>6. Effects of growth regulators on growth of plants</li> <li>7. To perform callus culture using suitable plant source.</li> <li>8. To perform meristem culture</li> </ol>	50

SARDAR PATEL UNIVERSITY  
Vallabh Vidyanagar Gujarat  
(Reaccredited with 'A' Grade by NAAC (CGPA 3.11)  
Syllabus with effect from the Academic Year 2024-2025

Teaching-Assignments, Learning	Lecture, Recitation, Group discussion, Guest speaker, Debate, Seminar, Quizzes.
--------------------------------	---

Evaluation Pattern		
Sr. No.	Details of the Evaluation	Weightage
1.	CEE: Internal Continuous Assessment in the form of Practical, Viva-voce, Quizzes, Seminars, Assignments, Attendance, etc	50%
2.	University Examination	50%

Course Outcomes: Having completed this course, the learner will be able to	
	<ol style="list-style-type: none"> <li>1. The students will be able to understand the working and handling of the instruments.</li> <li>2. Students will learn media preparation and culture methods in plant and animal tissue culture.</li> <li>3. Students will learn the optimal separation methods for biomolecules.</li> </ol>

Suggested References:	
Sr No	References
	<ol style="list-style-type: none"> <li>1. Experimental microbiology (Vol. 1 &amp; 2) by Rakesh Patel</li> <li>2. Molecular cloning (Vol. 1,2,3) by Sambrook et.al</li> </ol>

On-line resources to be used if available as reference material
On-line Resources
Relevant entries on Wikipedia and Encyclopaedia Britannica

SARDAR PATEL UNIVERSITY  
 Vallabh Vidyanagar Gujarat  
 (Reaccredited with 'A' Grade by NAAC (CGPA 3.11))  
 Syllabus with effect from the Academic Year 2024-2025

**B.Sc. (Biotechnology) Sem.- IV**

Course Code	US04MIBTE01	Title of the Course	Fundamental of molecular biology & genetic engineering
Total Credits of the Course	02	Hours per Week	02

Course Objectives	<p>1.The students will learn about the molecular mechanism- replication, transcription and translation of Prokaryotes</p> <p>2.To give an idea about various Prokaryotes enzymes and vectors used in genetic engineering.</p>
-------------------	---

Course Content		
Unit 1	<p><b>Introduction to Prokaryotic replication, Transcription &amp; Translation</b></p> <p>Central dogma of molecular biology .Replication-definition property and features and significance of Replication. Enzyme and Proteins involved in replication. Initiation, elongation and termination of replication.</p> <p>Transcription:-Definition and concept of gene promoter. Initiation, elongation and termination</p> <p>Overview of translation</p>	Weight age*(%)          25
Unit 2	<p><b>Prokaryotic Enzyme and Vectors used in Genetic engineering</b></p> <p>Tools of recombinant technique-Restriction enzyme source, classes, nomenclature and application of restriction enzyme. Host controlled restriction and modification system in bacteria. Ligation properties, types and function of DNA ligase. Introduction to linkers and adaptors.</p> <p>Vector –definition, properties and bacterial vectors (Bacteriophage lambda, pBR322, pUC18) .</p>	25

Teaching-Assignments, Learning	Lecture, Recitation, Group discussion, Guest speaker, Debate, Seminar, Quizzes.
--------------------------------	---

SARDAR PATEL UNIVERSITY  
Vallabh Vidyanagar Gujarat  
(Reaccredited with 'A' Grade by NAAC (CGPA 3.11))  
Syllabus with effect from the Academic Year 2024-2025

Evaluation Pattern		
Sr. No.	Details of the Evaluation	Weightage
1.	CEE: Internal Continuous Assessment in the form of Practical, Viva-voce, Quizzes, Seminars, Assignments, Attendance, etc	50%
2.	University Examination	50%

Course Outcomes: Having completed this course, the learner will be able to	
1.	The students will study about Prokaryotic mechanism and various enzymes of replication
2.	The students will understand about mechanism of prokaryotic transcription.
3.	The students will have an overview of translation.
4.	The student will have idea about various prokaryotic enzymes and vectors in genetic engineering.

Suggested References:	
Sr No	References
	<ol style="list-style-type: none"> <li>1. Principles of Biochemistry- Lehninger</li> <li>2. Molecular Biology of the gene- J.D.Watson</li> <li>3. Genetic engineering- S.Rastogi and N. Pathak</li> <li>4. Expanding Horizon of Biotechnology – B.D Singh</li> <li>5. Molecular Cell Biology- Lodish</li> </ol>

On-line resources to be used if available as reference material
On-line Resources
Relevant entries on Wikipedia and Encyclopaedia Britannica



SARDAR PATEL UNIVERSITY  
Vallabh Vidyanagar Gujarat  
(Reaccredited with 'A' Grade by NAAC (CGPA 3.11))  
Syllabus with effect from the Academic Year 2024-2025

B.Sc. Biotechnology Sem.- IV

Course Code	US04MIBTE02	Title of the Course	Practicals
Total Credits of the Course	02	Hours per Week	04

Course Objectives	<ol style="list-style-type: none"> <li>1. The students will get a practical approach for isolating DNA &amp; RNA</li> <li>2. The students will learn screening techniques of recombinants</li> </ol>
-------------------	--

Course Content	
Section-I	<ol style="list-style-type: none"> <li>1. Isolation of Genomic DNA from <i>E.coli</i>.</li> <li>2. Isolation of RNA from Prokaryotes</li> <li>3. Isolation of DNA from Onion</li> <li>4. Demonstration of ligation</li> <li>5. Demonstration of blue white screening</li> <li>6. Demonstration of restriction digestion.</li> <li>7. Study of replica plating.</li> </ol>

Teaching-Assignments, Learning	Lecture, Recitation, Group discussion, Guest speaker, Debate, Seminar, Quizzes.
--------------------------------	---

Evaluation Pattern		
Sr. No.	Details of the Evaluation	Weightage
1.	CEE: Internal Continuous Assessment in the form of Practical, Viva-voce, Quizzes, Seminars, Assignments, Attendance, etc	50%
2.	University Examination	50%

SARDAR PATEL UNIVERSITY  
Vallabh Vidyanagar Gujarat  
(Reaccredited with 'A' Grade by NAAC (CGPA 3.11))  
Syllabus with effect from the Academic Year 2024-2025

Course Outcomes:	
------------------	--

Having completed this course, the learner will be able to	
---	--

- |  |  |
|--|--|
|  | 1. The students will learn various nucleic acid isolation techniques.    |
|  | 2. The students will acquire the knowledge of screening of recombinants. |

Suggested References:	
-----------------------	--

Sr No	References
	Molecular Cloning Vol.(1,2,3) by Sambrook et.al

On-line resources to be used if available as reference material
---

On-line Resources
-------------------

Relevant entries on Wikipedia and Encyclopaedia Britannica
--