



**SARDAR PATEL UNIVERSITY**  
**Vallabh Vidyanagar, Gujarat**  
**(Reaccredited with 'A' Grade by NAAC (CGPA 3.25)**  
**Syllabus with effect from the Academic Year 2022-2023**

(Bachelor of Science)  
(B.Sc.) (Biotechnology) Semester IV

Course Code	US04CBIT51	Title of the Course	Molecular Biology
Total Credits of the Course	4	Hours per Week	4

Course Objectives:	To acquaint students to Chromosomes and genome organization To familiarize students to the process of replication, transcription and translation in prokaryotes To understand DNA damage , DNA repair and operon concept
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Course Content		
Unit	Description	Weightage* (%)
1.	Chromosome structure, types and banding (G, C, Q, R, T) - Nucleosome, chromatin, DNA binding proteins Histones & Non-histones DNA protein interaction. Genome organization- Unique sequence, repetitive sequence. Denaturation, renaturation and Cot curve. Introduction to Transposons.	25%
2.	Prokaryotic Replication- definition, property and features of prokaryotic DNA replication. Unidirectional and bidirectional replication. Initiation, elongation and termination of replication. Enzymes and proteins involved in replication. Closed clamp and rolling circle model of replication. Regulation of prokaryotic replication.	25%
3.	DNA mutation at chromosome and gene level, DNA- damage & repair, mismatch repair, direct repair, excision repair, SOS repair.	25%
4.	Prokaryotic Transcription- Definition, Initiation, elongation, termination of transcription. Prokaryotes translation- Definition , aminoacylation of tRNA , Initiation , elongation and termination of translation. Gene regulation- - lac and trp operon	25%



Teaching-Learning Methodology	Classroom interaction, Use of blackboard and chalk ICT tools involving smart boards, power point presentation, videos, animations & models. Assignments Seminar, unit test, and quiz
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Evaluation Pattern		
Sr. No.	Details of the Evaluation	Weightage
1.	Internal Written / Practical Examination (As per CBCS R.6.8.3)	15%
2.	Internal Continuous Assessment in the form of Practical, Viva-voce, Quizzes, Seminars, Assignments, Attendance (As per CBCS R.6.8.3)	15%
3.	University Examination	70%

Course Outcomes: Having completed this course, the learner will be able to	
1.	Understand genetic material and its mechanism to copy, and decode the information at molecular level
2.	Understand the chromosome and genome organization
3.	Understand the DNA damage and various types of DNA repair.
4.	Understand the gene regulation.

Suggested References:	
Sr. No.	References
1.	Genes—Benjamin Lewin.
2.	Molecular biology of the gene-Watson et al
3	Molecular biology of the cell- Alberts et al
4	Cell and Molecular Biology: Concepts and Experiments. Karp, G. (2010). VI Edition. John Wiley & Sons. Inc.



5	Cell and Molecular Biology. De Robertis, E.D.P. and De Robertis, E.M.F. (2006). VIII Edition. Lippincott Williams and Wilkins, Philadelphia
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On-line resources to be used if available as reference material
On-line Resources

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**B.Sc.—Biotechnology Semester—IV**

Course Code	US04CBIT52	Title of the Course	Plant and Animal Biotechnology
Total Credits of the Course	4	Hours per Week	4

Course Objectives:	1.To know about Plant Tissue Culture, its methodologies, and its applications. 2.To understand about Animal Tissue Culture its methodologies, and its applications. 3. To understand about Stem Cells and its applications.
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Course Content		
Unit	Description	Weightage* (%)
1.	<ul style="list-style-type: none"><li>• Introduction to plant tissue culture, totipotency of plant cells (Dedifferentiation, redifferentiation, regeneration of whole plant)</li><li>• Nutritional requirements for plant tissue culture: nutrient media – macronutrients and micronutrients, media additives (carbon source, vitamins, amino acids)</li><li>• Plant growth regulators structure, analogs&amp; functions(cytokinins, auxins, gibberellins).</li><li>• Preparation of media, selection and surface sterilization of explants, inoculation, incubation (temperature and light regime), regeneration of plants.</li><li>• Initiation of callus cultures and cell suspension cultures</li><li>• Regeneration (shoot regeneration and somatic embryogenesis).</li></ul>	25%
2.	<p>Applications of Plant Tissue Culture</p> <ul style="list-style-type: none"><li>• Meristem culture and production of disease-free plants</li><li>• Micropropagation of elite ornamental plants, encapsulation, and production of synthetic seeds</li><li>• Cell suspension cultures (batch and continuous culture) for production of secondary metabolites</li><li>• Embryo culture and embryo rescue; Protoplast culture and fusion, Development of somatic hybrids and cybrids and their applications</li><li>• Somaclonal variation and their applications; production of haploids, Anther, pollen, ovary&amp; ovule culture</li></ul>	25%
3.	<ul style="list-style-type: none"><li>• Introduction of animal cell culture and tissue culture- basic</li></ul>	25%





	<p>concepts. Historical landmarks. Laboratory facility. Culture Media-Natural and artificial. Substrate and suspension culture, Initiation of Cell cultures, Primary culture, secondary culture, subculturing. Concept of cell line- finite and continuous.</p> <ul style="list-style-type: none"> <li>• Organ culture, Bioreactors for large scale culture of cells.</li> </ul>	
4.	<ul style="list-style-type: none"> <li>• Introduction to Transgenic animals, Objectives of Gene Transfer, Gene transfer methods in Animals (Calcium Phosphate precipitation, Lipofection, Fusion with Bacterial Protoplasts, Electroporation, Retroviral Infection, Microinjection).</li> <li>• Applications of transgenics animals (Fish, Cattle, Sheep and Mice)</li> <li>• Cell culture products (interferons)</li> <li>• Stem cells-types, and its applications.</li> </ul>	25%

Teaching-Learning Methodology	Classroom lectures and uses of chalk and blackboard. ICT tools involving smart boards, power point presentations, videos, animations, and models.
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Evaluation Pattern		
Sr. No.	Details of the Evaluation	Weightage
1.	Internal Written / Practical Examination (As per CBCS R.6.8.3)	15%
2.	Internal Continuous Assessment in the form of Practical, Viva-voce, Quizzes, Seminars, Assignments, Attendance (As per CBCS R.6.8.3)	15%
3.	University Examination	70%

Course Outcomes: Having completed this course, the learner will be able to	
1.	Understand the terms and different definitions used in plant tissue culture.
2.	Understand about requirements and methodologies used in PTC.
3.	Understand terms and definitions used in animal tissue culture.
4.	Understand about requirements and methodologies used in animal tissue culture
5.	Understand about stem cells and its applications.





Suggested References:

Sr. No.	References
	<ul style="list-style-type: none"><li>• Plant tissue culture – Kalyan Kumar De (1st Edition)</li><li>• Plant tissue culture and organ culture – Reinert and Bajaj (1st Edition)</li><li>• Culture of Animal Cells, R.I Freshney, Wiley-Leiss.</li><li>• Animal Cell Culture – A Practical approach, J.R.W. Masters, Oxford.</li><li>• Animal Cell Culture Techniques, M. Clynes, Springer Verlag.</li><li>• Cell Culture Lab Fax, M. Butler and M. Dawson, Bios scientific Publications Ltd.</li><li>• Cell Growth and Division – A Practical approach, R. Basega, IRL Press.</li><li>• Comprehensive Biotechnology, Moo-Young, Alan T. Bullm Howard Dalton, Panima publication.</li><li>• Biotechnology in crop improvement – Harvinder Singh Chawla (1st Edition)</li><li>• Plant Tissue culture- Rajdhan</li><li>• Genetics – P K Gupta</li><li>• Cell biology, genetics, molecular biology, evolution, and ecology- P.S. Verma and R.S. Agarwal</li><li>• Expanding horizons of Biotechnology – B D Singh</li></ul>

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

On-line Resources






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**B.Sc. (Biotechnology) Semester-4**

Course Code	US04CBIT53	Title of the Course	Practicals
Total Credits of the Course	4	Hours per Week	4

Course Objectives:	To acquaint students with molecular techniques & different instruments used in biotechnology lab
	To enrich the students to have practical experience on molecular biology and genetic engineering
	To have hands on experience in isolation of DNA and plasmid DNA

**Course Content**

Unit	Description
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**SECTION 1**

- 1 Study of lab instruments LAF, electrophoresis unit and UV transilluminator
- 2 Isolation of plasmid DNA from Ecoli by alkali lysis method
- 3 Restriction digestion
- 4 Isolation of DNA from plant by CTAB method
- 5 Effect of UV as a mutagen on the given culture.
- 6 Study of renaturation of DNA and Cot Curve

**SECTION 2**

- 1 Chromosome banding (Giemsa & Q banding)
- 2 Preparation of MS media
- 3 Study of callus culture
- 4 Study of embryo culture
- 5 Study of stem culture
- 6 Agarose Gel electrophoresis
- 7 Encapsulation of embryo







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Teaching-Learning Methodology	Chalk board, Power point presentation, quizzes, Videos available on NPTEL and BISAG
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Evaluation Pattern		
Sr. No.	Details of the Evaluation	Weightage
1.	Internal Written / Practical Examination (As per CBCS R.6.8.3)	15%
2.	Internal Continuous Assessment in the form of Practical, Viva-voce, Quizzes, Seminars, Assignments, Attendance (As per CBCS R.6.8.3)	15%
3.	University Examination	70%

Course Outcomes: Having completed this course, the learner will be able to	
1.	Extending the hands on experience on media preparation
2.	Able to demonstrate the various types of culture used in plant tissue culture.
3.	Developing and applying the skills gained through the molecular and plant tissue culture techniques for research as well as in various fields of applied science
4.	To give hands on experience in isolation of DNA

On-line resources to be used if available as reference material
On-line Resources
Nptel.ac.in
SANDHAN BISAG

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