Four Year Undergraduate Program (2024-28)
Department of Biotechnology
Course Curriculum

Part A: Introduction			
Program: Bachelor in Life Sciences (Diploma/Degree/Honors)		Semester: IV Sem	Session:2024-2025
1	Course Code	BTSC-04-T	
2	Course Title	**Recombinant DNA technology**	
3	Course Type	Discipline Specific Course (DSC)	
4	Pre-requisite (if any)	As per program	
6	Course Learning Outcomes (CLO)	After completing this course, the students will be able to - • Understand various tools of genetic engineering. • Develop competency in genetic exploitation for human welfare. • Understand the practical application of recombinant DNA technology. • Understand the use of information technology in the field of genome and proteome analysis.	
6	Credit Value	03 Credits	(Credit = 15 Hours - learning & observation)
7	Total Marks	Max. Marks: 100	Min Passing Marks: 40

Part B: Content of Course (Theory)		
Total No. of Teaching–learning Periods (01 Hr. per period)- 45 Periods (45 Hours)		
Unit	Topic (Course content)	No. of Period
I	**Prerequisites of rDNA technology** 1. Recombinant DNA technology: General concept. Steps and application. 2. Host controlled Restriction Modification System, Ligases and Polymerases, Klenow fragment, Taq, Pfu polymerase. 3. Nuclease (Endo, Exo, and restriction endonuclease). 4. Modification Enzyme (Kinase, Phosphates and terminal deoxynucleotidyltransferase), Reverse Transcriptase.	12 (12 Hrs)
II	**Gene transfer** 1. Vectors: Based on Plasmid, Bacteriophages, Cosmid. 2. High capacity vectors. 3. The basic concept of Gene Transfer Methods: Microinjection, Electroporation, Lipofection, and Microprojectile. 4. Selection and Screening of Recombinants: Genetic and Hybridization methods.	11 (11 Hrs)
III	**Genomic validation** 1. PCR: Types of PCR, Steps, Applications, Advantages and Limitations of PCR. 2. Molecular Marker-RFLP, RAPD, and Microarray. 3. Human Genome Project. 4. Gene Library: Genomic and cDNA library, Chromosome walking and jumping.	11 (11 Hrs)
IV	**Application of genetic technology** 1. Gene Therapy: *In vivo* and *Ex vivo*, germline and somatic gene therapy. 2. Basic idea of stem cell technology: Types of stem cell cultures and their	11 (11 Hrs)

	Significance. 3. Introduction to Genomics, DNA sequencing methods – manual & automated: Maxam & Gilbert and Sangers method. 4. Introduction to protein structure, Chemical properties of proteins, physical interactions that determine the property of proteins, short-range interactions, electrostatic forces, van der Waal interactions, hydrogen bonds, and Hydrophobic interactions.	
Keywords	Recombinant DNA, Vectors, PCR, cDNA library.	

• Part C - **Learning Resource**
Text Books, Reference Books, Other Resources -
Text Book- ➢ **P S Verma and A K Agrawal** ➢ **An introduction to genetic engineering- S T Tischoll**
• Molecular Biology; Watson. • Gene VIII; Benjamin Lewin. • The Cell, A molecular Approach; Geoffrey M. Cooper. • Molecular Biology of the Cell; Alberts

Four Year Undergraduate Program (2024-28)
Department of Biotechnology
Course Curriculum

Part A: Introduction			
Program: Bachelor in Life Sciences (Diploma/Degree/Honors)		Semester: IV Sem	Session: 2024-2025
1	Course Code	**BTSC-04-P**	
2	Course Title	**Recombinant DNA technology**	
3	Course Type	Discipline Specific Course (DSC) - Practical	
4	Pre-requisite (if any)	As per program	
5	Course Learning Outcomes (CLO)	After completing this course, the students will be able to - • Isolate nucleic acid from biological cells. • Estimate and manipulate nucleic acid. • Amplify nucleic acid. • Analyse nucleic acid on the basis of database.	
6	Credit Value	01 Credits Credit =30 Hours Laboratory or Field learning/Training	
7	Total Marks	Max. Marks: 50	Min Passing Marks: 20

Part B: Content of Course		
Total No. of learning-Training/performance Periods: 30 Periods (30 Hours)		
Module	Topic (Course content)	No. of Period
Lab./Field Training/ Experiment Contents of Course	1. Isolation of chromosomal DNA from plant cells 2. Isolation of chromosomal DNA from *E.coli* 3. Qualitative and quantitative analysis of DNA using spectrophotometer 4. Plasmid DNA isolation 5. Restriction digestion of DNA. 6. Ligation of DNA. 7. Transformation of competent cells. 8. Demonstration of PCR. 9. Use of SNP databases at NCBI and other sites. 10. Use of OMIM database 11. Detection of Open Reading Frames using ORF Finder	30
Keywords	Recombinant DNA, Vectors, PCR, cDNA library.	

• Part C - **Learning Resource**
Text Books, Reference Books, Other Resources -
Text Book- • **P S Verma and A K Agrawal** • **An introduction to genetic engineering- S T Tischoll**
• Molecular Biology; Watson. • Gene VIII; Benjamin Lewin. • The Cell, A molecular Approach; Geoffrey M. Cooper. • Molecular Biology of the Cell; Alberts

- Modern Biotechnology, 2nd Edition, S.B. Primrose, Blackwell Publishing, 1987.
- Molecular Biotechnology: Principles and Applications of Recombinant DNA, 4th Edition, B.R. Glick, J.J. Pasternak and C.L. Patten, 2010.
- Molecular Cloning: A Laboratory Manual (3rd Edition) Sambrook and Russell Vol. I to III, 1989.