FOUR YEAR UNDERGRADUATE PROGRAM (2024 – 28)
Department of Biochemistry
Course Curriculum

PART- A: Introduction				
Program: Bachelor in Science *(Degree/Honors)*			**Semester - V**	Session: **2024-2025**
1	**Course Code**	**BCSE- 03 T**		
2	**Course Title**	**Biotechnology**		
3	**Course Type**	**Discipline Specific Elective (Theory)**		
4	**Pre-requisite (if, any)**	As Per the Program		
5	**Course Learning. Outcomes (CLO)**	*On successful completion of the course, the student shall be able to*: ➢ The students will acquire basic knowledge of recombinant DNA technology, DNA manipulation in prokaryotes and eukaryotes, engineering of DNA molecules using restriction and modification enzymes. ➢ They will get acquainted with the use of cloning and expression vectors, creation of genomic and cDNA libraries and their applications. ➢ Students will also understand the methods for production of proteins using recombinant DNA technology and their application in industrial systems.		
6	**Credit Value**	**3 Credits**	***Credit = 15 Hours - learning & Observation***	
7	**Total Marks**	**Max. Marks:**	**100**	**Min Passing Marks:** **40**

PART -B: Content of the Course

Total No. of Teaching–learning Periods (01 Hr. per period) - 45 Periods (45 Hours)

Unit	Topics (Course contents)	No. of Period
I	**Principles of gene cloning**: Restriction and modification systems, restriction endonucleases and other enzymes used in manipulating DNA molecules. Ligation of DNA molecules, DNA ligase, sticky ends, blunt ends, linkers and adapters, homopolymer tailing, Synthetic oligonucleotides. Plasmids and bacteriophages as vectors for gene cloning. Cloning vectors based on E. coli plasmids, pBR322, pUC8, pGEM3Z. Viruses as vectors, cloning vectors based on M13 and λ bacteriophage.	12
II	**Uptake of DNA by cells**, Selection and identification for transformed cells, Transfection. Chemical and physical methods of DNA introduction into cells. Direct selection, marker rescue. cDNA and Genomic libraries, Southern and Northern hybridization.	11
III	**Plant genetic engineering**: gene isolation, gene transfer systems, Ti plasmid, plant virus vectors, electroporation, microinjection, microprojectile technology, Transgenic plants and animals. **Production of recombinant proteins** by eukaryotic cells. Fusion tags such as, polyhistidine, glutathione, maltose binding proteins and their role in purification of recombinant proteins.	11
IV	**Application of Biotechnology:** Pharmaceutical products of DNA technology; Human protein replacements, Human therapies, Vaccines. Transgenics and animal cloning: Creating transgenic animals and plants. Animal cloning.	11
Keywords	Recombinant DNA, Transfection, Recombinant Protein, Transgenics	

Name and Signature of Convener & Members of CBoS:

PART–C: Learning Resources

Text Books, Reference Books and Others

Text Books Recommended –

- Principles of Gene Manipulation and Genomics (2006) 7th ed., Primrose, S.B., and Twyman, R. M., Blackwell publishing (Oxford, UK)
- Gene Cloning and DNA Analysis (2010) 6th ed., Brown, T.A., Wiley-Blackwell publishing (Oxford, UK)
- Molecular Biotechnology: Principles and Applications of Recombinant DNA (2010) 4th ed., Glick B.R., Pasternak, J.J. and Patten, C.L., ASM Press (Washington DC)
- Molecular Cloning: A laboratory manual (2014), 4nded., Michael R Green and J. Sambrook Cold spring Harbor laboratory press (3vol.)

Online Resources–

- **e-Resources / e-books and e-learning portals**
- https://www.klimud.org/public/atlas/idrar/web/www.irvingcrowley.com/cls/fund.htm
- https://www.mayoclinic.org/tests-procedures/prothrombin-time/about/pac-20384661
- https://www.ncbi.nlm.nih.gov/books/NBK482339/
- https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6709845/

PART -D: Assessment and Evaluation

Suggested Continuous Evaluation Methods:

Maximum Marks: **100 Marks**
Continuous Internal Assessment (CIA): **30 Marks**
End Semester Exam (ESE): **70 Marks**

Continuous Internal Assessment (CIA): **(By Course Teacher)**	Internal Test / Quiz-(2): **20 +20** Assignment / Seminar - **10** Total Marks - **30**	Better marks out of the two Test / Quiz + obtained marks in Assignment shall be considered against **30** Marks
End Semester Exam (ESE):	**Two section – A & B** Section A: **Q1.** Objective – **10 x1= 10** Mark; **Q2.** Short answer type- **5x4 =20 Marks** Section B: Descriptive answer type qts.,**1out of 2** from each unit-**4x10=40 Marks**	

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PART- A: Introduction				
Program: Bachelor in Science *(Degree / Honors)*			**Semester - V**	Session: **2024-2025**
1	**Course Code**	**BCSE- 05 P**		
2	**Course Title**	**Biotechnology**		
3	**Course Type**	**Discipline Specific Elective (Practical)**		
4	**Pre-requisite (if, any)**	As Per The Program		
5	**Course Learning. Outcomes (CLO)**	*On successful completion of the course, the student shall be able to:* ➢ Learn the experimental techniques of recombinant DNA technology and their biotechnological applications, such as separation of DNA fragments by Agarose gel electrophoresis, isolation of plasmid DNA from *E. coli,* transformation of *E. coli* cells, digestion of plasmid DNA, amplification of a DNA fragment by PCR, etc.		
6	**Credit Value**	**1 Credits**	***Credit =30 Hours Laboratory or Field learning/Training***	
7	**Total Marks**	**Max. Marks: 50**	**Min Passing Marks: 20**	

PART -B: Content of the Course		
Total No. of learning-Training/performance Periods: 30 Periods (30 Hours)		
Module	**Topics (Course contents)**	**No. of Period**
Lab./Field Training/ Experiment Contents of Course	➢ Agarose gel electrophoresis for separation of DNA fragments. ➢ Isolation of plasmid DNA from *E. coli.* ➢ Transformation of *E. coli* cells with plasmid DNA. ➢ Digestion of plasmid DNA with restriction enzymes. ➢ Amplification of a DNA fragment by PCR. ➢ Complementation of β–galactosidase for Blue and White selection.	**30**
Keywords	SDS, DNA isolation, Restriction digestion, PCR	

Name and Signature of Convener & Members of CBoS:

PART–C: Learning Resources

Text Books, Reference Books and Others

Text Books Recommended –

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Online Resources–

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- https://www.mayoclinic.org/tests-procedures/prothrombin-time/about/pac-20384661
- https://www.ncbi.nlm.nih.gov/books/NBK482339/
- https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6709845/

PART -D: Assessment and Evaluation

Suggested Continuous Evaluation Methods:

Maximum Marks: **50 Marks**
Continuous Internal Assessment (CIA): **15 Marks**
End Semester Exam (ESE): **35 Marks**

Continuous Internal Assessment (CIA): (By Course Teacher)	Internal Test / Quiz-(2): **10 & 10** Assignment/Seminar +Attendance - **05** Total Marks - **15**	Better marks out of the two Test / Quiz + obtained marks in Assignment shall be considered against **15** Marks
End Semester Exam (ESE):	**Laboratory / Field Skill Performance: On spot Assessment** **A. Performed the Task based on lab. work - 20 Marks** **B. Spotting based on tools & technology (written) – 10 Marks** **C. Viva-voce (based on principle/technology) - 05 Marks**	**Managed by Course teacher as per lab. status**

Name and Signature of Convener & Members of CBoS: