

Branch Name:	B.Sc. Biotechnology
ProgramCode:	SC101
CourseName:	Genetic Engineering-II
CourseCode:	2SC1010502
Pre-requisiteCourse:	Molecular Biology

Course Objectives:

1. The course is designed to acquire basic knowledge of Nucleic acid isolation, various methods of DNA manipulation, hybridization
2. It will also help in acquiring knowledge of gene cloning (Prokaryotes and Eukaryotes)
3. This course will enable students to understand DNA sequencing, PCR. Molecular Markers, etc

Teaching and Examination Scheme:

Teaching Scheme (Hours per week)				Evaluation Scheme (Marks)				
Lecture (L)	Tutorial (T)	Practical (P)	Credit	Theory (Marks)		Practical (Marks)		Total (Marks)
				University Assessment	Continuous Assessment	University Assessment	Continuous Assessment	
3	--	--	3	70	30	--	--	100

Subject Contents:

Sr. No	Topic	Total Hours	Weightage (%)
1	- Basic Requirements for Molecular Biology Laboratory - Various Approaches of nucleic acid Isolation (DNA & RNA), Quality and Quantity determination of isolated nucleic acid - Various methods of DNA manipulation – Digestion, Ligation, labelling, etc. - Blotting and Hybridization: Southern, Northern, Western, Colony, dot blot, Hybridization and detection by autoradiography and Fluorescence - Colony hybridization technique - Sequencing of DNA: Sanger's method for DNA sequencing, automated DNA sequencings, pyro-sequencing and microarraybased sequencing. - Chemical and automated DNA Synthesis, Next Generation Sequencing. - Gene library construction (Genomic & c-DNA library)	15	33%
2	- Enzymes: restriction endonucleases, RNA polymerase, DNA ligase, alkaline phosphatase, reverse transcriptase. - Cloning and expression vectors: Plasmid based vectors, bacteriophage lambda based vectors, cosmids, P1 based vector, PAC, BAC, Phagemids, High capacity yeast cloning vector: -YAC, specialized yeast vectors: pYES and pPICZ - Gene cloning in prokaryotes – isolation of DNA to be cloned – insertion of DNA fragments into vector – use of linkers and adaptors- use of homo polymer tails, transfer of recombinant DNA into bacterial cells. - Cloning in eukaryotes in plant cell, yeast, filamentous fungi	15	33%
3	- Genome mapping: - Molecular markers (RFLP, RAPD, AFLP, SNP, SCAR, SSR, VNTR). - Chromosome walking. - Polymerase chain reaction techniques: Basic PCR technique, - Variation of PCR techniques and Applications of PCR. - Applications of r-DNA technology: Gene therapy, Expression of therapeutic proteins, Forensic science, Food, Agriculture. - Gene Editing Strategies	15	34%

Text Books:

Brown TA. (2010). Gene Cloning and DNA Analysis. 6th edition. Blackwell Publishing, Oxford, U.K.
 Textbook of Biotechnology by R. C. Dubey, Publisher : S. Chand, and Co
 Biotechnology by S.S. Purohit.
 Genetic Engineering by Sandhya Mitra
 Fundamentals of Molecular Biology 2009, Tar ganti K. Pal, Saroj S.
 Cell biology & Genetics: Verma and Agrawal

Reference Books:

Molecular Cell Biology 5th edition by Lodish, Berk, Matsudalia
 Clark DP and Pasternik NJ. (2009). Biotechnology: Applying the Genetic Revolution. Elsevier Academic Press, USA
 Primrose SB and Twyman RM. (2006). Principles of Gene Manipulation and Genomics, 7th edition. Blackwell Publishing, Oxford, U.K.
 Sambrook J and Russell D. (2001). Molecular Cloning-A Laboratory Manual. 3rd edition. Cold
 Genetics: principles and analysis. 4th edition 1998, Denial L. Hartl, Elizabeth tones.
 Principles of genetics: E.J. Gardner.
 Genes 9: Benjamin Levi
 Lehninger Principles of Biochemistry, 5th Edition, Nelson DL and Cox MM (2008), W.H. Freeman
 and Company,
 Microbiology Powar and Dagainawala

Course Learning Outcomes (CLO): On completion of this course, the students will be able to:

CLO	Description	Bloom's Taxonomy Level
CLO1	Discuss the mechanism of DNA isolation, manipulation, hybridization experiments.	2 Understanding
CLO2	List the types of PCR. Various types of gene transfer methods	1 Remembering
CLO3	Enabling students to understand types, advantages and disadvantages various molecular markers.	2 Understanding,
CLO4	Development of capacity to understand DNA sequencing, Chromosome walking..	3 Applying, 2 Understanding
CLO5	Learn about PCR, Prokaryotic and Eukaryotic Gene cloning	5,3, 4 Evaluate, Applying, Analyze
CLO6	Discuss the mechanisms involved in pyrosequencing, gene transfer techniques, NGS.	6 Creating

Mapping of CLOs with POs & PSOs

Course Learning Outcomes	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CLO1	H	H	M	M	H	H	H	M	H		L	H	M	M	H
CLO2	M	M			L	H	H	H	L		M			L	
CLO3	M	H	M				M	M	H	L		H	L		M
CLO4	H	H	L	M	H			L	M	M	H	L	M	M	
CLO5	M	L	M	M	M	H	L	M		M	H	H	M	M	H
CLO6	M	M	M		M	M	L	M	M	L	H	M			M

H:High, M:Medium, L:Low