

Branch Name:	B.Sc. Biotechnology
Program Code:	SC101
Course Name:	Genetic Engineering-I
Course Code:	2SC1010501
Pre-requisite Course:	Molecular Biology

Course Objectives:

1. The course is designed to acquire basic knowledge of gene transfer and simple outline of how the gene can be transferred from one to the other organism.
2. It will also help in acquiring knowledge on artificial gene transfer tools and methods.
3. This course will enable to students to understand transposition mechanism.

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	Bacterial recombination: Principles, its biological significance, types of recombination and their molecular mechanisms (generalized-Homologous DNA recombination-Holiday Model, Non homologous site specific and illegitimate recombination), recombination frequency and its significance. • Transposable genetic elements: Structure: Insertion , Types of bacterial transposons: Composite Transposons and Non composite transposons ; Mechanisms of Transposition – replicative and non replicative Plasmid DNA – Introduction of Bacterial Plasmid, f –plasmids, R plasmids, colicinogenic, Other types of Plasmid	15	34%
2	Gene transfer in bacteria. •Transformation: transformation principle, competence factor, mechanism of DNA uptake, transfection. •Transduction: Introduction, types-restricted, generalized and abortive transduction •Conjugation: Introduction, types of crosses involved: F ⁺ , Hfr and F', interrupted mating Experiment	15	33%
3	Methods of gene transfer Physical (Electroporation, Gene gun- particle bombardment, Microinjection- divert transformation, transformation by ultra sonication -liposome mediated- gene transfer, Silicon carbide based) Chemical Method (Competent cell preparation, CaCl ₂ mediated gene transfer, PEG mediated gene transfer) Biological method (Agrobacterium mediated gene transfer, Ti plasmid)	15	33%

Text Books: Prescott, Harley and Klein's Microbiology.9th Edition. McGraw Hill Higher education

Principles of Microbiology by R. M. Atlas

Reference Books:

- Brown TA.(2010). Gene Cloning and DNA Analysis.6th edition. Blackwell Publishing, Oxford,U.K.

Molecular Cell Biology 5 th edition by Lodish, Berk, Matsudalia

Clark DP and Pasternik NJ. (2009). Biotechnology: Applying the Genetic Revolution.

ElsevierAcademic Press, USA

- Primrose SB and Twyman RM. (2008). Genomics: Applications in human biology. Blackwell Publishing, Oxford, U.K.

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 conjugation.	2 Understanding
CLO2	List the types of gene transfer.	1 Remembering
CLO3	Enabling students to understand types, advantages and disadvantages transgenesis.	2 Understanding,
CLO4	Development of capacity to understand recombination.	3 Applying, 2 Understanding
CLO5	Learn about transposable element, evaluate mechanisms associated with it, identify and compare the different types of it.	5,3, 4 Evaluate,Applying, Analyze
CLO6	Discuss the mechanisms involved in transduction.	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