

Branch Name:	B.Sc. Microbiology
Program Code:	SC102
Course Name:	Gene Transfer Techniques
Course Code:	2SC1020501
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 ultrasonication -liposome mediated-gene transfer, Silicon carbide based) • Chemical Method (Competent cell preparation, CaCl₂ 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 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. (2008). Genomics: Applications in human biology. Blackwell Publishing, Oxford, U.K.

List of Open Source Software/learning website:

<https://archive.nptel.ac.in/courses/102/103/102103013/#>

<https://www.google.com/search?q=npTEL+on+gene+transfer&oeq=npTEL+on+gene+transfer+&aqs=chrome..69i57j0i22i30j0i390i650l3.15670j0j15&sourceid=chrome&ie=UTF-8#fpstate=ive&vld=cid:48eeb28e,vid:Pg-HzNgna7w>

<https://nptel.ac.in/courses/102103041>

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 transformation, conjugation transduction.	2 Understanding
CLO2	List the types of gene transfer and use of biomolecules.	1 Remembering
CLO3	Enabling students to understand types, advantages and disadvantages transgenesis.	2 Understanding,
CLO4	Development of capacity to understand recombination and apply its knowledge.	3 Applying, 2 Understanding
CLO5	Learn about transposable element, evaluate mechanisms associated with it, identify and compare the different types of it.	3 Applying 4 Analyze 5 Evaluate,
CLO6	Understand the mechanism of artificial gene transfer and apply its knowledge for creating recombinant DNA	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	PSO1	PSO2	PSO3
CLO1	M	M				M		M				
CLO2	H	H	M		M			L	M			
CLO3	M	M	H					M	M		M	
CLO4	M				M				H	M		
CLO5	M		H		M					H		
CLO6				H		M	H		H		H	M

H: High, M: Medium, L: Low