Department of Liberal Education
Era University, Lucknow
Course Outline
Effective From: 2023-24

Name of the Program	**B.A. / B.Sc. (LIBERAL EDUCATION)**			**Year/ Semester:**	**3rd / 5th**
Course Name	**Recombinant DNA Technology**	**Course Code:**	**MB303**	**Type:**	**Theory**
Credits	**04**			**Total Sessions Hours:**	**60 Hours**
Evaluation Spread	**Internal Continuous Assessment:**	**50 Marks**		**End Term Exam:**	**50 Marks**
Type of Course	○ Compulsory	◉ Core		○ Creative	○ Life Skill
Course Objectives	This module will help students to understand following; a. Gene transfer; physical, chemical & biological methods b. Site-directed mutagenesis c. Gene shuffling d. Applications of gene targeting e. Transgenic animals f. Ti plasmids g. Gene targeting in plants				
Course Outcomes (CO): *After the successful course completion, learners will develop following attributes:*					
Course Outcome (CO)	**Attributes**				
CO1	Students will be able to explain about, different methods of gene recombination & gene transfer in prokaryotes and eukaryotes.				
CO2	They will be able to learn about the simple method for site-directed mutagenesis and process of gene shuffling.				
CO3	Students will understand the applications of gene targeting in transgenic animals.				
CO4	Students will be acquainted with the knowledge about how gene targeted in plants with the use of Ti plasmids and Arhizogenes.				
Pedagogy	Interactive, discussion-bases, student-centered, presentation.				
Internal Evaluation Mode	Mid-term Examination: 20 Marks Activity:10 Marks Class test: 05 Marks Online Test/Objective Test: 05 Marks Assignments/Presentation: 05 Marks Attendance: 05 Marks				
Session Details	**Topic**			**Hours**	**Mapped CO**
Unit 1	**Gene Recombination and Gene transfer** • Bacterial Conjugation, Transformation &Transduction • Episomes and Plasmids			15	CO1

	• Microinjection • Electroporation • Microprojectile • Shot Gun method • Ultrasonication • Liposome fusion • Microlaser **Activity:** Prepare a chart for any method with diagram use in gene transfer.		
Unit 2	**Changing genes: site-directed mutagenesis and Protein engineering** • Primer extension is a simple method for site directed mutation • PCR based site directed mutagenesis • Random mutagenesis • Use of Phage display techniques to facilitate the selection of mutant peptides • Gene shuffling • Production of chimeric proteins **Activity:** Assignment on PCR based site mutagenesis.	15	CO2
Unit 3	**Genetic engineering in animals** • Production of transgenic mice • ES cells can be used for gene targeting in mice with applications of gene targeting • Using Yeast to study Eukaryotic gene function • Therapeutic products produced by genetic engineering-blood proteins • Human hormones • Immune modulators and vaccines • Transgenic animals • Production of proteins of Pharmaceutical value **Activity:**List the recent therapeutic products produced by genetic engineering.	15	CO3
Unit 4	**Genetic engineering in plants** • Use of Agrobacterium tumefaciens and Arhizogenes • Ti plasmids • Strategies for gene transfer to plant cells • Direct DNA transfer to plants • Gene targeting in plants • Use of plant viruses as episomal expression vectors **Activity:** Class dicsussion on strategies of genetic engineering in plants.	15	CO4

CO-PO and PSO Mapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1							2		1				1	
CO2		1					2		1				1	
CO3			2	2	2	1	2		3	3	3		1	2
CO4	1			2	2	2	2		3	3	3		1	2

Strongcontribution-3,Averagecontribution-2, Lowcontribution-1,

Suggested Readings:

Text- Books	1. Goldsby RA, Kindt TJ, Osborne BA. (2007). Kuby's Immunology. 6th edition W.H. Freeman and Company, New York. (1-574)

Reference Books	1. Abbas AK, Lichtman AH, Pillai S. (2007). Cellular and Molecular Immunology. 6th edition Saunders Publication, Philadelphia. 2.Delves P, Martin S, Burton D, Roitt IM. (2006). Roitt's Essential Immunology.11th edition Wiley-Blackwell Scientific Publication, Oxford. 3.Goldsby RA, Kindt TJ, Osborne BA. (2007). Kuby's Immunology. 6th edition W.H. Freeman and Company, New York. 4.Murphy K, Travers P, Walport M. (2008). Janeway's Immunobiology. 7th edition Garland Science Publishers, New York.
Para Text	**Unit 1:** 1. https://www2.nau.edu/~fpm/bio205/genereg.html **Unit 2:** 1. https://www.blackwellpublishing.com/primrose/9781405135443_4_008.pdf **Unit 3:** 1. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3078015/ 2.https://www.animallaw.info/intro/genetic-engineering-and-animals **Unit4:** 1. https://www.frontiersin.org/articles/10.3389/fbioe.2019.00026/full https://royalsociety.org/topics-policy/projects/gm-plants/what-is-gm-and-how-is-it-done/#:~:text=GM%20is%20a%20technology%20that,is%20transferred%20into%20plant%20cells.&text=Genetic%20modification%20of%20plants%20involves,it%20new%20or%20different%20characteristics

Recapitulation & Examination Pattern

Internal Continuous Assessment:

Component	Marks	Pattern
Mid Semester	20	**Section A:** Contains **10** MCQs/Fill in the blanks/One Word Answer/ True-False type of questions. Each question carries **0.5 mark.** **Section B:** Contains **07** descriptive questions out of which **05** questions are to be attempted. Each question carries **03 marks**.
Activity	10	Will be decided by subject teacher
Class Test	05	Contains **05 descriptive questions.** Each question carries **01** mark.
Online Test/ Objective Test	05	Contains **10 multiple choice questions.** Each question carries **0.5** mark.
Assignment/ Presentation	05	Assignmet to be made on topics and instruction given by subject teacher
Attendance	05	As per policy
Total Marks	**50**	

Course created by: Dr. Manaal Zahera **Signature:**	**Approved by: Dr. Amita Jain** **Signature:**