

GENETIC ENGINEERING

Semester	Subject Code	Category	Lecture		Theory		P	C
IV	21CBT4A	CORE - IV	4hrs per week	60	4 hrs per week	60	0	4

COURSE OBJECTIVE:

- ✓ To gain knowledge about gene cloning strategies and elucidate the cloning techniques in improvement of living organism.

COURSE OUTCOMES:

On the successful completion of the course, students will be able to

CO NUMBER	CO STATEMENT	KNOWLEDGE LEVEL (K1-K4)
CO1	Identify the role of enzymes in genetic engineering	K2
CO2	Understand the characteristics of vectors and gene transfer methods.	K2
CO3	Analyze different molecular techniques	K4
CO4	Assess the effectiveness of techniques in appropriate field.	K4
CO5	Apply gene manipulation methods in enhancement of living organism	K3

Knowledge level: K1- Remember; K2- Understand; K3- Apply; K4- analyze

MAPPING WITH PROGRAMME OUTCOMES:

COS	PO1	PO2	PO3	PO4	PO5	PO6
CO1	S	M	S	M	M	M
CO2	M	M	M	S	M	M
CO3	S	S	M	M	M	M
CO4	M	M	M	S	M	M
CO5	M	M	M	M	S	S

S-strong; M- medium; L-low

UNIT-I: ENZYMES IN GENETIC ENGINEERING**12 Hours**

Overview of gene cloning. Enzymes for in vitro manipulation – Endonuclease, polymerases, topoisomerases, modifying enzymes, Rnase, Ligases-Adapters, Linkers, Photopolymer Tailing. DNA packaging in nucleosome, chromatin and chromosome.

UNIT-II: CLONING VECTORS**12 Hours**

Cloning vehicles: Plasmids – Host range, Copy number control, pBR322, Cosmids, bacteriophages, Phasmids, Yeast vectors-YAC, BAC, Ti Plasmid, Plant viral (CaMV, TMV) and Animal viral (SV 40, Retrovirus) vectors.

UNIT-III: GENE TRANSFER METHODS:**12 Hours**

Gene transfer techniques: Biological methods -Transformation, Conjugation. Chemical methods-Calcium phosphate method, use of polyethylene glycol and DEAE Dextran, liposome mediated transfer. Physical or mechanical methods-Electroporation, Microinjection, Biolistic transformation. *Agrobacterium*- mediated gene transfer in plants.

UNIT-IV: GENETIC ENGINEERING TOOLS**12 Hours**

DNA sequencing – Maxam & Gilbert method, Sanger Coulson method. PCR-Principle, technique and its application. RFLP, RAPD and AFLP techniques. Nuclear markers. Mitochondrial markers.

UNIT-IV: APPLICATIONS OF GENETIC ENGINEERING**12 Hours**

Gene therapy and its application. Applications of recombinant DNA technology for humans-insulin production. Gene Silencing, RNA interference, antisense therapy. DNA foot printing, DNA finger printing. DNA microarray and its application.

Distribution of Marks: Theory 80% and Problems 20%

TEACHING METHODOLOGY

- Class room teaching
- Assignments
- Discussions
- Home work
- PPT presentations
- Seminars
- Models/Charts

TEXT BOOKS:

S.NO	AUTHORS	TITLE	PUBLISHERS	YEAR OF PUBLICATION
1.	Brown T.A	Introduction to gene cloning	Stanley Thomas Pub Ltd	2016

2.	Primrose S.B. and Twyman R.M.	Principles of gene manipulation and Genomics	Blackwell Scientific Publications	2008
3.	Dr.Desmond S.T	An Introduction to Genetic Engineering	Paperback Publications	2018
4.	Maertín Thompson	Genetic Engineering	Hardback	2017
5.	Christopher How	Gene cloning manipulation	Paperback Publications	2016

REFERENCE:

S.NO	AUTHORS	TITLE	PUBLISHERS	YEAR OF PUBLICATION
1.	Benjamin Lewin	Genes IX	Oxford University & Cell Press	2008
2.	Glick and Pasternak	Molecular biotechnology	Panima publishing corporation, New Delhi	2010
3.	Ernst.L.Winnacker	From gene to clones	Panima publishing corporation, New Delhi	2003
4.	Rose M. Morgan	The Genetics Revolution	Hardback	2005
5.	Ernst.L.Winnacker	From gene to clones	Panima publishing corporation, New Delhi	2003

Web Sources:

1. <https://www.youtube.com/watch?v=6UiKZKFHbMQ>
2. <https://www.youtube.com/watch?v=BK12dQq4sJw>
3. <https://www.youtube.com/watch?v=D8oWNRUX8L4&t=16s>
4. <https://ghr.nlm.nih.gov/primer/therapy/procedures>
5. http://www.premierbiosoft.com/tech_notes/microarray.html

Syllabus Designer:

- Mrs.S.Akhila.M.Sc.P.Phil.,
Assistant Professor