GENETIC ENGINEERING

Semester	Subject Code	Category	Lecture		Theory		P	C
II	21CPBT2A	Core - IV	4 hrs 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; K5- Synthesize; K6- Evaluate

MAPPING WITH PROGRAM OUTCOMES:

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

S-strong; M- medium; L-low

UNIT I

Enzymes in Genetic Engineering **14 Hours**

Overview of gene cloning.Enzymes for in vitro manipulation – Endonuclease, polymerases, topoisomerases, modifying enzymes, methylase, RNase, Ligases-Adapters, Linkers, Homopolymer Tailing.

UNIT II

Cloning vectors **15 Hours**

Cloning vehicles: Plasmids – Host range, Copy number control, Compatibility (pBR322, pUC) Bacteriophages-λ phage, M13, Cosmids, Phasmids, Yeast vectors-YAC, BAC, Ti Plasmid, Plant viral (CaMV, TMV) and Animal viral (SV 40,Retrovirus) vectors, Specialized vectors-Expression vector, Shuttle vectors.

Gene transfer techniques: biological methods, chemical methods, physical or mechanical methods, *Agrobacterium*- mediated gene transfer in plants.

UNIT III

Genetic engineering tools **15 Hours**

DNA sequencing – Importance, Chemical & Enzymatic methods, Pyro sequencing,Automated sequence. PCR -Principle, application and types of PCR.RFLP, RAPD and AFLP techniques.Blotting techniques: southern, northern and western**.** Genomic Library and cDNA library-Construction and Screening.

UNIT IV

Mutagenesis **15 Hours**

Site directed mutagenesis,RACE, Kuntels method of mutagenesis.Gene Silencing, RNA interference, antisense therapy, Gene Knockout. DNA foot printing, finger printing, DNA microarray and its application.

UNIT V

Gene therapy **16 Hours**

Gene therapy: Introduction and Methods, Gene therapy in the treatment of diseases (ADA,Cystic Fibrosis), Challenges and future of gene therapy.

Applications of recombinant DNA technology for humans-insulin production, vaccine and Tissue Plasminogen Activator, recombinant hormones.Metabolite engineering, imparting new agronomic traits to plants – resistance to abiotic and biotic stress, improving quality and quantity.Animal pharming. Bioethics: laws, possible dangers to society or nature.

Distribution of Marks: Theory 80% and Problems 20%

TEACHING METHODOLOGY:

- Class room teaching
- Assignments
- Discussions
- Homework

- PPT presentations
- Seminars
- Models and charts

TEXT BOOKS:

S.no	Authors	Title	Publishers	Year of publication
1.	Brown T.A	Introduction to gene cloning	Stanley Thomas Pub Itd	2016
2.	Primrose S.B. and Twyman R.M.	Principles of gene manipulation and Genomics	Blackwell Scientific Publications	2018

REFERENCE:

S.no	Authors	Title	Publishers	Year of publication
1	Benjamin Lewin	Genes IX	Oxford University & Cell Press	2010
2	Glick and Pasternak	Molecular biotechnology	Panima publishing corporation,NewDelhi	2010
3	Ernst.L.Winnacker	From gene to clones	Panima publishing corporation,New Delhi	2013

WEB SOURCES:

1. https://www.google.com/urwww.youtube.com%
2. https://www.google.com/urlwww.youtube.com%2Fwatch%
3. https://www.google.com/urlrecombinant-dna-technology-tools-and-techniques&usg
4. **Error! Hyperlink reference not valid.**
5. https://www.google.com/url?What-is-Gene-Therapy.aspx&usg

Syllabus Designer:

- Mrs. M. Malathi
  Assistant Professor