



**VIVEKANANDHA COLLEGE OF ENGINEERING FOR WOMEN**  
(Autonomous Institution, Affiliated to Anna University, Chennai)  
Elayampalayam, Tiruchengode – 637 205  
**DEPARTMENT OF BIOTECHNOLOGY**



**Course Code / Name : U15BT512 - GENETIC ENGINEERING**

**Class (Year / Programme / Department / Section): III/B.TECH/BT**

**UNIT I – BASICS OF GENETIC ENGINEERING**

S.No	Topics To Be Covered	Duration in Minutes	Teaching Aid	Books Referred
1.	Introduction and historical background	45	BB	T1
2.	Restriction and modifying enzymes	45	BB	T2
3.	Cloning vector; properties of a cloning vector	45	PPT	T1,R1
4.	Plasmid Vectors; Lambda phage vectors, phagemid, cosmid	45	BB	T1,R2
5.	shuttle vector, expression vectors; yeast vectors	45	BB	T1,R2
6.	Baculoviral based insect vector- mammalian expression vectors	45	PPT	T1,R1
7.	plant transformation vector	45	BB	T2,R2
8.	binary vector (Ti plasmid based), high capacity vector	45	PPT	T1,R2
9.	YAC	45	PPT	T2,R1

**UNIT-II CREATION OF RECOMBINANT MOLECULES**

S.No	Topics To Be Covered	Duration in Minutes	Teaching Aid	Books Referred
10.	Introduction	45	BB	T1,R2
11.	Construction of recombinant DNA molecules	45	PPT	T1,R2
12.	transformation of r-DNA molecules into target host organisms	45	BB	T2
13.	Calcium chloride mediated- electroporation- micro injection	45	PPT	T1

14.	gene gun, selection methods for recombinants	45	BB	T1,R1
15.	antibiotic resistance - blue & white selection	45	PPT	T2
16.	GFP	45	BB	T1,R1
17.	Luciferase based selection.	45	PPT	T1
18.	A Case Study	45	BB	T2,R1

### UNIT-III GENE CLONING AND EXPRESSION METHODS

S.No	Topics To Be Covered	Duration in Minutes	Teaching Aid	Books Referred
19.	Construction of genomic and cDNA libraries	45	PPT	T1,R2
20.	synthesis and labeling of DNA and RNA probes, random primer	45	BB	T2
21.	nick translation, end labeling. Screening of cDNA and Genomic libraries	45	BB	T1,R1
22.	hybridization probe method, antibody screening.	45	BB	T1
23.	PCR based cloning, differential cloning, positional cloning	45	BB	T1,R1
24.	Gene targeting-transposon mediated cloning, library screening methods	45	BB	T1
25.	nucleic acid hybridization based screening	45	PPT	T2
26.	nucleic acid Probe preparation methods - radioactive and non-radioactive	45	BB	T1
27.	PCR based screening- immunochemical screening	45	PPT	R2
28.	over-expression and purification of recombinant His tag fusion proteins using Ni <sup>+</sup> column	45	PPT	R1

### UNIT-IV MOLECULAR TECHNIQUES AND THEIR APPLICATION

S.No	Topics To Be Covered	Duration in Minutes	Teaching Aid	Books Referred
29.	Blotting techniques; Southern-northern-western blotting,	45	PPT	T1,R2
30.	Polymerase Chain Reaction (PCR); principle types applications of PCR	45	BB	T2,R1
31.	DNA fingerprinting using molecular markers; RT-PCR, RAPD-RFLP	45	PPT	T1
32.	application in plant variety characterization	45	BB	T1
33.	DNA sequencing-Maxam-Gilbert, Sanger's, Automated DNA sequencing, next generation DNA sequencing	45	PPT	T2

34.	RNAi and gene knock-out techniques	45	BB	T1
35.	gene modification using site directed mutagenesis	45	BB	T2,R1
36.	Genome sequencing methods	45	BB	T1,R2
37.	genomics and its importance, systems biology	45	BB	T2,R2
<b>UNIT- V APPLICATION OF GENETIC ENGINEERING</b>				
<b>S.No</b>	<b>Topics To Be Covered</b>	<b>Duration in Minutes</b>	<b>Teaching Aid</b>	<b>Books Referred</b>
38.	Application of genetically modified organisms	45	BB	T1,R1
39.	medicine-recombinant therapeutic proteins- recombinant vaccines	45	BB	T1
40.	Molecular Diagnosis of human genetic diseases, pathogenic virus and bacteria	45	BB	T1,R2
41.	agriculture – Transgenic Bt cotton- round-up ready soybean transgenic crops	45	PPT	T2,R1
42.	Biosafety levels for microbial plant and Animals	45	BB	T1,R1
43.	safety guidelines and release procedure for GMOs in India	45	PPT	T2
44.	effect of GMOs on environment	45	BB	T1,R1
45.	patenting of gene sequences and its issues.	45	BB	T2,R2
46.	Various applications	45	PPT	T1,R1

**TEXT BOOKS:**

1. Old, R. W. and Primrose, S. B., "Principles Of Gene Manipulation: An introduction To Genetic Engineering", Blackwell Science. 7<sup>th</sup> edition,2006
2. Clark DP and Pasternick NJ, Biotechnology: Academic Cell Updates, Academic Press, Elsevier,

**REFERENCE:**

1. Gupta, P.K., "Biotechnology and Genomics", Rastogi Publications,1st Ed, 2014
2. Brown, T.A., "Gene Cloning and DNA Analysis", Blackwell Science Ltd,2006