

This course aims to acquaint the students to versatile tools and techniques employed in genetic engineering and recombinant DNA technology. It provides theoretical basis to DNA modifying enzymes, cloning vector types, host genotype specificities for selection and screening of recombinants. Current experimentation and progress in these fields as well as ethical considerations of this research will be discussed.

Specific Learning Outcomes (SLO):

Upon successful completion of this course, the student will be able to:

- Describe the function of most common enzymes used in molecular biology
- Recognize the importance of cloning vectors
- Understand and articulate different libraries
- Illustrate creative use of modern tools and techniques and when they could be applied
- Explore the principle behind gene therapy

UNIT I Tools for Genetic Engineering: Principles and techniques– historical development in gene technology – Restriction endonucleases and DNA modifying enzymes used in cloning. Preparation and purification of DNA from living cells.

UNIT II Vectors for gene cloning: –Cloning vectors for *E.coli*- plasmids- properties- pBR322- Bacteriophage vectors-cosmids, phagemids, insertion and replacement vectors. Yeast plasmid vectors- Artificial chromosome vectors -BAC, YAC– vectors for cloning in higher plants– vectors for animal cells. Expression vectors and properties. Introduction of

DNA into living cells- transformation- transfection and *in vitro* packaging- Alternative DNA delivery systems.

UNIT III Gene cloning Strategies and techniques: Cloning from DNA, mRNA-Genomic libraries, cDNA libraries. Techniques used in genetic engineering: nucleic acid hybridization, blotting techniques, Polymerase chain reaction, Methods of DNA sequencing

UNIT IV Selection and Screening of recombinants: Direct selection through marker rescue- methods of screening – genetic methods, immunological methods, plus and minus screening, HRT and HART.

UNIT V Applications of genetic engineering: Production of recombinant pharmaceuticals – recombinant insulin, human growth hormone- somatotropin, Recombinant vaccines-DNA vaccines. Disease diagnosis and gene therapy. Production of transgenic plants, animals – methods involved - limitations and obstacles and its applications. Recombinant DNA debate and Bioethics

TEXT BOOK

Brown TA, (2001) Gene cloning and DNA analysis- an Introduction 4th edn. Blackwell, Oxford.

REFERENCES

1. Old, R.S. and Primrose, S.B. (1995) Principles of Gene manipulation. An Introduction to genetic Engineering. 5th Edition. Blackwell Scientific Publication, London.
2. Glick BR and Pasternak JJ (1996) Molecular Biotechnology – Principles and Applications of Recombinant DNA, Panima Publishing Co, New Delhi.
3. Desmond S.T. Nicholl (1994) An Introduction to Genetic Engineering, Cambridge University, Oxford.