

Name of the Course: Genetic Engineering (900120)  
Proposed By: Dr. Sunita Sharma  
Department: Applied Science  
Credits: 03

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- Objectives:** 1. To illustrate creative use of modern tools and techniques for manipulation and analysis of genomic sequences.  
2. To provide knowledge for obtaining large number of clones of specific gene.  
3. To develop analytical skill of forensic, medical and agricultural investigations  
4. To explain the methods of gene annotation and gene function.

#### Unit-I

Basic concepts in genetic engineering. Tools of Genetic Engineering: Restriction enzymes, Modifying enzymes, DNA ligase, Polymerase etc. Cloning Vectors: Plasmids, Lambda phage, Phagemids, Cosmids, Artificial chromosomes (BACs, YACs), Shuttle vectors, virus based vectors.

#### Unit -II

Methods of gene transfer: cDNA and genomic DNA library, gene isolation Transformation, transduction, Particle gun, Electroporation, liposome mediated, microinjection, *Agro bacterium* mediated gene transfer.

#### Unit-III

Gene transfer Process: Gene cloning, Polymerase chain reaction and site directed mutagenesis, Expression of cloned gene in recombinant cells, production, recovery and purification of expressed proteins with examples.

#### Unit-IV

Application of rDNA technology: Antisense and ribozyme technology, Human genome project and its application, Gene therapy prospect and future.

#### Unit V

DNA vaccine, Transgenic plants, Forensic Science: DNA analysis in the identification of crime suspects, Studying kinship by DNA profiling, Sex identification by DNA analysis

**Course Outcomes: Upon successful completion of the course the student will be able to**

- CO1 Prepare** recombinant DNA by using various modifying enzymes and other tools.
- CO2 Compare** the properties of vector used for prokaryotic and eukaryotic gene cloning.
- CO3 Explain** the various transformation techniques used to insert a specific gene in various hosts.
- CO4 Select** the recombinants and transformants cells of a specific gene from genomic or cDNA library.
- CO5 Apply** knowledge of gene cloning and gene manipulation.

#### Reference Books:

1. From Genes to Clones by Winnacker. PANIMA
2. Molecular Biotechnology by Pasternack and Glick.
3. From Genes to Genomes: Concepts & Applications of DNA Technology by J.W. Dale & M.V. Schartz.
4. Gene Cloning & DNA Analysis: An Introduction (4th edition) by T.A. Brown.
5. Molecular Cloning by Sambrook, *et al.*
6. Principles of Gene Cloning by Old and Primrose.