

SEMESTER-VI

BTC DSC 351T RECOMBINANT DNA TECHNOLOGY

Contact Hours: 45

Full Marks = 100 [ESE (70) CCA (30)]

Course Objective: The course in Recombinant DNA Technology aims to provide students with a comprehensive understanding of the principles and practical techniques involved in genetic engineering. It seeks to introduce students to the fundamental concepts of recombinant DNA technology, including the use of enzymes, vectors and gene transfer methods. The course also covers advanced topics like PCR, mutagenesis, library construction, and screening. Furthermore, it aims to explore the applications of genetic engineering in animals and plants, including the production of transgenic organisms and therapeutic products.

UNIT 1

(10 Lectures)

Introduction: definition, principles and general steps of recombinant DNA technology.

Enzymes used in genetic engineering: restriction enzyme; ligase; polymerase; alkaline phosphatase; terminal transferase. **Vectors:** plasmid; cosmid; BAC; YAC.

UNIT 2

(10 Lectures)

Gene transfer: transformation; microinjection; electroporation; ultrasonication; lipofection; particle bombardment. **Hybridization techniques:** southern blotting; northern blotting.

Library construction and screening: preparation of genomic and cDNA library, screening of recombinants.

UNIT 3

(8 Lectures)

PCR: principle, procedure and applications. **Random and site directed mutagenesis:** PCR based method of site directed mutagenesis; random mutagenesis; production of chimeric proteins.

UNIT 4

(10 Lectures)

Applications of genetic engineering in animals: production and applications of transgenic mice, production of therapeutic products – insulin, growth hormone and clotting factors.

Genetic modification in medicine: definition and types of gene therapy; production of therapeutic products (e.g. human hormones, blood proteins, immune modulators)

UNIT 5

(7 Lectures)

Genetic engineering in plants: *Agrobacterium tumefaciens* and *A. rhizogenes*; Ti plasmids; construction of binary vectors and co-integrate vectors; T-DNA transfer and integration.

Course Outcome: *This course in Recombinant DNA Technology equips students with a deep understanding of the principles and techniques central to genetic engineering. They become proficient in working with crucial enzymes, various vectors, and gene transfer methods like transformation and microinjection. Students also master advanced techniques such as PCR, mutagenesis, library construction, and screening. With this knowledge, they can explore the applications of genetic engineering in animals and plants, including creating transgenic organisms and therapeutic products. Overall, this course prepares students for genetic engineering research and its applications in diverse fields like medicine and biotechnology.*

SUGGESTED READING

1. Brown TA. (2006). Gene Cloning and DNA Analysis. 5th edition. Blackwell Publishing, Oxford, U.K.
2. Clark DP and Pazdernik NJ. (2009). Biotechnology-Appling the Genetic Revolution. Elsevier Academic Press, USA.
3. Glick, B.R., Pasternak, J.J. (2003). Molecular Biotechnology- Principles and Applications of recombinant DNA. ASM Press, Washington
4. Primrose SB and Twyman RM. (2006). Principles of Gene Manipulation and Genomics, 7th edition. Blackwell Publishing, Oxford, U.K.
5. Sambrook J, Fritsch EF and Maniatis T. (2001). Molecular Cloning-A Laboratory Manual. 3rd edition. Cold Spring Harbor Laboratory Press.