

IV SEMESTER

COURSE 11: r DNA TECHNOLOGY, BIOINFORMATICS AND BIOSTATISTICS

credits - 3

I. Course Outcomes:

On successful completion of the course, the students will be able to

1. Learn the principles and techniques of genetic engineering, including g restriction endonucleases, and DNA transformation.
2. Understand the use of vectors and the basics of polymerase chain reacti also explore the applications of genetic engineering in industry, agr medicine.
3. Gain knowledge of blotting techniques, DNA labeling, DNA sequenc basics of intellectual property rights.
4. Learn about bioinformatic resources, sequence databases, sequence align use of biostatistics in data analysis.
5. Develop skills in measuring central tendency and dispersion, understand types of data, and utilizing biostatistical software for analysis and data pr

UNIT- I: Recombinant DNA Technology

No. of Hours: 9

1. Basic principles of genetic engineering. Steps in gene cloning.
2. Restriction endonucleases- applications of Type II restriction enzymes in genetic engineering; DNA polymerases and ligases;Use of linkers and adaptors
3. Vectors – Cosmid , Bacteriophages , BAC, YAC
4. Transformation of DNA by Chemical method, Electroporation.

UNIT- II: Applications of r-DNA technology

No. of Hours: 9

1. Genomic and C-DNA Libraries, RFLP, RAPD,
2. Basics of Polymerase chain Reaction
3. Application of genetic engineering in industry, agriculture and medicine, Hybirdoma Technology.

UNIT- III: Techniques in genetic engineering and IPR

No. of Hours: 9

1. Blotting Techniques.
2. Labeling of DNA, DNA foot printing.
3. DNA Sequencing-Sanger's method
4. Outlines of Intellectual property Rights (Patents,Trademark,Copyright)

UNIT- IV:Bioinformatics

No. of Hours: 9

1. Bioinformatic resources : NCBI, EBI, DDBJ, PUBMED, BIOMED.

2. Sequence Databases – GENBANK, BLAST, FASTA, ExPasy, PDB, NDB, UNIPROT – SWISS PROT.
3. Sequence alignment – Sequence homology, pairwise sequence alignment, automated DNA sequencing, ChIP.

UNIT- V:Biostatistics

No. of Hours: 9

1. Measurement of central tendency : MEAN , MEDIAN, MODE.
2. Measurement of dispersion : RANGE, MEANDEVIATION , STANDARD DEVIATION.
3. Use of Biostatistic softwares.
4. Sample and population ; Types of Data , methods of Data presentation.

III. Skill Outcomes: On successful completion of the course, the student will be able to

1. Perform plasmid DNA isolation, agarose gel electrophoresis
2. Understand the principles and applications of DNA fingerprinting for genetic profiling and identification.
3. Utilize nucleic acid and protein databases to access, retrieve, and analyze genetic and protein sequence information
4. Apply sequence alignment algorithms and tools
5. Develop skills using bioinformatics tools and databases

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credits -1

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1. Isolation of plasmid DNA by Agarose gel Electrophoresis.
 2. Preparation of Recombinant vector by using T4 DNA Ligase.
 3. To Understand the concept of DNA fingerprinting by Random Amplification of Polymorphic DNA.
 4. Nucleic acid and protein databases.
 5. Sequence alignment
 6. Sequence homology and Gene annotation.

References

1. Ghosh Z. and Bibekanand M. (2008) Bioinformatics: Principles and Applications. Oxford University Press.
2. Pevsner J. (2009) Bioinformatics and Functional Genomics. II Edition. Wiley-Blackwell. 3.Campbell A. M., Heyer L. J. (2006) Discovering Genomics, Proteomics and Bioinformatics. II Edition. Benjamin Cummings. Crueger W, Crueger A (1990)

Biotechnology: A text Book of Industrial Microbiology 2nd edition Sinauer associates, Inc.

3. Demain, A. L and Davies, J. E. (1999). Manual of Industrial Microbiology and Biotechnology, 2nd Edition, ASM Press.
4. Glazer AN and Nikaido H (2007) Microbial Biotechnology, 2nd edition, Cambridge University Press Glick BR, Pasternak JJ, and Patten CL (2010) Molecular Biotechnology 4th edition, ASM Press Gupta PK (2009) Elements of Biotechnology 2nd edition, Rastogi Publications
5. Prescott, Harley and Klein's Microbiology by Willey JM, Sherwood LM, Woolverton CJ (2014), 9th edition, Mc Graw Hill Publishers.
6. Ratledge, C and Kristiansen, B. (2001). Basic Biotechnology, 2nd Edition, Cambridge University Press.
7. Stanbury PF, Whitaker A, Hall SJ (1995) Principles of Fermentation Technology 2nd edition., Elsevier Science
8. Swartz, J. R. (2001). Advances in Escherichia coli production of therapeutic proteins. Current Opinion in Biotechnology, 12, 195–201.

V Co – curricular Activities:

1. Training of students and basic gene cloning methods.
2. Industrial visit on Recombinant products.
3. Preparation of videos on labeling of DNA and DNA sequencing.
4. Students participation in seminars of the copyright, Patent, Trademark and IPR.
5. Assignments on PCR, Restriction enzymes , vectors , RFLP, RAPD, Hybridoma Technology, Sequence alignment tools of DNA , central tendency , Data collection and presentation.
6. Conducting group discussion , Quiz, debate in related topics.