BTC DSC 354P

RECOMBINANT DNA TECHNOLOGY AND BIOINFORMATICS

Contact Hours: 60

Full Marks = 100

Two Experiments are to be performed – one from each part

Course Objective: *These laboratory course aims to develop practical skills in molecular biology and bioinformatics. Students will learn DNA isolation from plant, bacteria and animal cell. They will also learn the technique of restriction digestion of DNA, southern blotting and PCR. In bioinformatics, students will understand and utilize nucleotide and protein sequence databases, perform BLAST searches, conduct multiple sequence alignments, construct phylogenetic trees, retrieve 3D protein structures, and learn the basics of Perl programming.*

Part A: Recombinant DNA technology

1. Isolation of chromosomal DNA from plant cells
2. Isolation of chromosomal DNA from *E.coli*
3. Isolation of plasmid DNA from *E.coli*
4. Restriction digestion of DNA
5. Qualitative and quantitative analysis of DNA using spectrophotometer
6. Demonstration of PCR
7. Demonstration of Southern blotting technique

Part B: Bioinformatics

1. Understanding and use of nucleotide sequence database: NCBI, EMBL and DDBJ
2. Understanding and use of protein sequence database: PDB and Swissprot
3. Performing BLAST and to find regions of similarity between sequences.
5. Multiple sequence alignment using Clustal W.
6. Phylogenetic tree construction.
7. Retrieval of 3D structure of proteins from PDB, and visualization with appropriate bioinformatics tools (e.g. RasMol).
8. Perl programming: length, reverse, reverse complement, concatenating DNA fragments, DNA to RNA.

Course Outcomes: *Upon completion, students will possess hands-on skills in molecular biology, including DNA and plasmid isolation, DNA analysis, and PCR techniques. They will also have competence in bioinformatics, enabling them to access and utilize nucleotide and protein sequence databases, perform sequence comparisons and alignments, construct phylogenetic trees, visualize protein structures, and apply basic Perl programming for sequence-related tasks. These skills are essential for various applications in genetics and genomics research.*

SUGGESTED READING

1. Alberts, B., Johnson, A., Lewis, J., Raff, M., Roberts, K., & Walter, P. (2014). Molecular Biology of the Cell. Garland Science.
2. Green, M. R., & Sambrook, J. (2012). Molecular Cloning: A Laboratory Manual. Cold Spring Harbor Laboratory Press.
3. Attwood, T. K., & Parry-Smith, D. J. (1999). Introduction to Bioinformatics. Pearson Education.
4. Durbin, R., Eddy, S. R., Krogh, A., & Mitchison, G. (1998). Biological Sequence Analysis: Probabilistic Models of Proteins and Nucleic Acids. Cambridge University Press.
5. Felsenstein, J. (2004). Inferring Phylogenies. Sinauer Associates.
6. Schwartz, R. L., & Phoenix, T. (2011). Learning Perl. O'Reilly Media.