

Wollo University
College of Natural Science
Department of Biotechnology

Program	Biotechnology
Module name	Genomic Science and Bioinformatics
Module number	08
Module Code	Biot-M2081
Courses Title	Genetic Engineering
Courses code	Biot2081
Year	II
Semister	II
CHr/ECTS	4/7
Instructor	Chanie D.

Course Description:

The course deals with Introduction to Gene manipulation; cloning vectors and hosts; construction of DNA library; PCR and its application; Genome analysis, mapping of genome and genomics; Application of recombinant DNA in agriculture, medicine and forensic science.

Course Objectives:

At end of this course, the students will be able to:

- ✓ Know the basic principles of gene manipulation, DNA sequencing, cDNA synthesis;
- ✓ Identify various Cloning and Expression vectors and techniques used for genetic transformations;
- ✓ Know the different blotting techniques;
- ✓ Understand commercially produced recombinant proteins.

Chapter	Content	References
One	1. Introduction to Gene manipulation	✓ Brown T.A. Gene Cloning and DNA analysis: An Introduction. 4th edition, Chapman & Hall, London, 2001
	1.1. General Processes involved in Gene manipulation 1.2. The range of Manipulating Enzymes: ✓ Nucleases, ✓ Ligases ✓ Dnases and Polymerases, ✓ Modifying enzymes, ✓ Topoisomerases ✓ Restriction Endonucleases and ligation strategies 1.3. Analysing the result of restriction endonuclease	✓ Pamela P. Biotechnology: A guide to Genetic Engineering. Wm.C. Brown Publishers, 1993. ✓ Bibek Ray and Arun Bhunia, 2007. Fundamental of Food Microbiology, 4 th ed. CRC.Press, London.

Two	2. Cloning Vectors and Cloning Hosts 2.1. Cloning Vectors 2.1.1. Prokaryotic cloning vectors - Basic and desirable property of plasmids - Types of vectors (<i>Natural and Artificial derived plasmid vectors</i>) 2.1.2. Bacteriophage vectors - Lamda phage, Cosmid, Phagemid, M13 phage, Fosmid, Etc 2.1.3. Eukaryotic cloning vectors - Yeast derived vectors - Artificial chromosomes 2.2. Cloning Hosts ✓ Microorganism, plant cell, animal cell ✓ Gene transfer in Bacteria, plant and Animal cells by natural and artificial transformation ✓ Advanced transformation technology	✓ Old and Primrose. Principles of Gene Manipulation. 5th edition, Blackwell scientific publication, London, 1994 ✓ Glick B.R., & Pasternak J.J. Molecular Biotechnology: Principles and Applications of Recombinant DNA. 3rd edition, ASM press, Washington, D.C., 2003.
Three	3. Construction of DNA Libraries - Synthesis of cDNA and DNA libraries - Genomic DNA library - cDNA library - polymerase chain reaction (PCR) - Principles and types of PCR - Application of PCR	✓ Gupta, P.K. Elements of Biotechnology. Rastogi publications, 2003.
Four	4. Genome Analysis, Mapping of Genomes and Genomics - Genome Analysis - Mapping genomes and genomics - Types and methods of gene probe generation - Methods of labeling Gene probes - Strategies for identifying desirable recombinant clones - Genetic and Physical Mapping - DNA and RNA finger printing - DNA sequencing and Mutagenesis of the Nucleic acids	✓ Purohit, S. S. Biotechnology: Fundamentals and Applications, 3rd edition, 2004.

Five	5. Application of rDNA Technology in Medicine - Production of pharmaceuticals (<i>insulin, recombinant proteins and others</i>) - Identification of genes responsible for human diseases - Molecular diagnosis of disease and Gene therapy	▪ Purohit, S. S. Biotechnology: Fundamentals and Applications. 4th edition, 2005. ▪ Ratledge, C., and Kristian, B. Basic Biotechnology. 2nd edition, Cambridge University press, 2001. ▪ Russell, P.J. Genetics: A Molecular Approach. 2nd edition, Pearson edu. San Francisco, 2006. ▪ Sambrook, J., Fritsch, E.F. and Maniatis T., Molecular Cloning: A Laboratory Manual. Cold Spring Harbour Laboratory Press, New York, 2000.
Six	6. Application of rDNA Technology in Agriculture - Gene addition approach to plant genetic engineering - Importance of genetic engineering in plants - Antisense RNA technology Problems with genetically modified plant	

Delivery Methods:

- Lecture on theory, making various exercises alone or in a small group, reports and assignments.

Evaluation:

- ✓ Quizz 5%
- ✓ Tests 2x15=30%
- ✓ Assignments 20%
- ✓ Attendance 5%
- ✓ Final Exam..... 40%

Total..... 100%

Approval section

Course Instructor

Name

Date

Signature

Department head

Name

Date