Bot.Sp-03 RECOMBINANT DNA TECHNOLOGY Credit Hours: 3(2+1)

Introduction of the Course

This course is designed to provide essential knowledge about basic techniques of Recombinant DNA Technology. It also includes detailed study about DNA Structure and Regions, Study of various Vectors used in the development of recombinant DNA, their types and uses for expression of desired gene. This course will also make students familiar with the knowledge about Genetically Modified Plant, Transgenic Crop and their Importance. Concept based knowledge of breeding and production of new varieties of plant for future benefits.

Course Objectives

1. To enable the students to understand the concept of recombinant DNA synthesis
2. To make the students learn the application of recombinant DNA technology in various fields such as agriculture and medicine for the benefit of mankind

Contents

Unit I: Basic Techniques

- Agarose gel electrophoresis
- Southern (Northern and Western blotting)
- Transformation of *E.coli:* Transformation of other organisms.
- Cutting and joining DNA molecules. Cutting DNA molecules
- Host controlled restriction and modification, Nomenclature, Target sites, Mechanical shearing of DNA
- Joining DNA molecules, DNA ligase, Double linkers, Adapters, Homopolymer tailing.

Unit II: Plasmids as cloning vehicles

- Basic properties of plasmids
- Desirable properties of plasmid cloning vehicles, pBR322, low copy number plasmid vectors.
- Bacteriophage, cosmid vectors, filamentous phage vectors M13.

Unit III: Genetic methods

- Analysing DNA sequences
- Genomic DNA libraries
- Chromosome walking
- Complementary DNA cDNA
- Site directed mutagenesis
- Recombinant selection and screening
- Nucleic acid hybridization methods.
- Expression in *E.coli* of cloned DNA molecules
- The effect of plasmid copy number plasmid stability
- Applications of recombinant DNA technology.

Practicals:

- *E.coli* culture and growth curve
- Transformation of plasmid DNA to *E.coli.*
- Conjugation
- Extraction of plasmid DNA.
- Gel electrophoresis
- Polyacrylamide gel electrophoresis.
- Detection of bacterial proteins.

Teaching-learning Strategies

1. Lectures
2. Group Discussion
3. Laboratory Work
4. Seminar/ Workshop

Assessment and Examinations:

As per University Rules

Recommended Readings

1. Brown, T.A. (2020). *Gene Cloning*, an introduction. 8th Ed. Chapman Hall.
2. Burke, M. T. (2018). *Nanotechnology: the business*. CRC Press.
3. Eckert, C. (2018). Genome Editing and Engineering. In *SIMB Annual Meeting 2018*. SIMB.
4. Gardner, E.J. 2004 *Principles of Genetics,* John Willey and Sons,.
5. Glover, D.M. (2005). *DNA Cloning, a Practical Approach* (volume I and II). IRL Press.
6. Hardy K.G. (1993) *Plasmid, practicalapproach*. IRL Oxford University Press.
7. Hardy, K.G. (2003). *Plasmid, A Practical Approach.* IRL Press at Oxford University Press.
8. Hunter, V., & Strickland, F. (2018). *Applications of Recombinant DNA Technology*. Scientific e-Resources.

9. Ijaz, S., & Haq, I. U. (2019). *Recombinant DNA Technology*. Cambridge Scholars Publishing.
10. Manahan, S. (2017). *Environmental chemistry*. CRC press.
11. Nicholl, D.S.T. (2002). *An Introduction to Genetic Engineering*. (3rd Ed.) Cambridge University Press.
12. Nicholl, D.S.T. (2008). *An introduction to Genetic Engineering*. Cambridge University Press.
13. Old, R. W. and Primrose, S. B. (2003) *Principles of Gene Manipulation*, an introduction to genetic engineering, Blackwell Scientific Publications.
14. Pierce, B.A. (2013). *Genetics*; *A Conceptual Approach.* 5th Ed. W. H. Freeman and Company, New York.
15. Primrose, S.B., and Twyman, R. M. (2006). *Principles of Gene Manipulation and Genomics.* (7th Ed.) Wiley- Blackwell Scientific Publications.
16. Sambrook, J., Fritsch, E.F. and Maniatis, T. (2006). Molecular Cloning, A Laboratory Manual (2nd Ed.). Cold Spring Harbor Laboratory Press.
17. Sambrook, J., Fritsch, E.F. and Maniatis T. (2012). *Molecular Cloning, A Laboratory Manual*. Cold Spring Harbor Laboratory Press.
18. Snustad, D.P. and Simmons, M.J., (2011). *Principles of Genetics,* (6th Ed.), John-Wiley and Son Inc. New York. Shen, C. H. (2019). *Diagnostic molecular biology*. Academic Press.
19. Synder, D. C. and Champness, W. (2020). *Molecular Genetics of Bacteria.* (5th Ed.) ASM Press, Washington
20. Thro, E. (1993) *Genetic Engineering, Shaping the Material of Life*. Facts on file, New York.
21. Thro, E. (2003). *Genetic Engineering, Shaping the Material of Life.* Facts on file, New York.
22. Yi, D. (2015). *The recombinant university: Genetic Engineering and the Emergence of Biotechnology at Stanford,* University of Chicago Press.
23. Williamson, R. (1983) *GeneticEngineering* (Volume I-V), Academic Press.
24. Wilson, J. and Hunt, T. (2004). *Molecular Biology of the Cell – The Problems Book*, Garland Publishing
25. Wu, R. (2014). *Recombinant DNA Methodology II*. Academic press. (1st Ed.)

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