SEMESTER-III

COURSE 6: MOLECULAR BIOLOGY

Theory Credits: 3 3 hrs/week

I. LEARNING OUTCOMES

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

1. Learn about genome structure and organization.

2. Learn about mechanism and enzymes of DNA replication.

3. Learn about enzymatic synthesis and features of transcription.

4. Learn about regulation of gene expression.

5. Learn about genetic code and protein synthesis.

II. Syllabus

Unit I Genome Structure

1. Watson and Crick model of DNA; Genome organization with specific reference to prokaryotic and eukaryotic genomes; Genome size.
2. Concepts of Genetic Material, Gene, Chromosome and Genome.
3. Experiments to prove DNA as genetic material (Griffith experiment, Hershey- Chase experiment)

Unit II DNA Replication

1. Enzymology of replication (DNA polymerase I, pol II and III, helicases, topoisomerases, single strand binding proteins, DNA melting proteins, primase.
2. Proof of semiconservative replication, Replication origins,
3. Rolling circle replication of DNA

Unit III Transcription:

1. Enzymatic synthesis of RNA: Basic features of transcription, the structure of prokaryotic RNA polymerase (core enzyme and hollo enzyme, sigma factor),
2. concept of promoter (Pribnow box, -10 and -35 sequences),
3. Four steps of transcription (promoter binding and activation, RNA chain initiation, chain elongation, termination and release). Reverse transcription.

Unit IV Gene Expression and regulation

1. Regulation of gene expression; Clustered genes
2. the operon concepts - Negative and positive control of the Lac Operon, trp operon,
3. Control of gene expression. Poly and Mono cistronic m-RNA,

Unit V Genetic Code and Protein Synthesis

1. Genetic code: Features of genetic code, Structure of m RNA, brief structure of tRNA,
2. The adaptor hypothesis, attachment of amino acids to tRNA.
3. Codon-anticodon interaction - the wobble hypothesis. Initiation, elongation, termination protein.

III . Skills Outcome

On Successful Completion of this Course, Student shall be able to

1. Learn about Quantitative estimation of Nucleic Acids
2. Learn about isolation of DNA from different sources
3. Learn about purity analysis of DNA

SEMESTER-III

COURSE 6: MOLECULAR BIOLOGY

Practical Credits: 1 2 hrs/week

1. Effect of UV radiations on the growth of microorganisms.
2. Determination of absorption maxima of DNA and RNA and their quantification
3. Quantitative estimation of RNA
4. Quantitative estimation of DNA
5. Isolation of plasmid DNA from bacteria
6. Isolation of genomic DNA from *E.coli*
7. Isolation of DNA from sheep liver
8. Isolation of DNA from plant leaves (Rice or Tobacco or any other plant)
9. Separation of DNA by Agarose gel Electrophoresis
10. Purity analysis of the Nucleic acids

V. REFERENCES

1. Cell and Molecular Biology, 8th edition. De Robertis, E.D.P. and De Robertis, E.M.F. 2006; Lippincott Williams and Wilkins, Philadelphia.
2. Cell Biology, (2017), De Robertis & De Roberis, Blaze Publishers & Distributors Pvt. Ltd.
3. The Cell: A Molecular Approach. 5th edition. Cooper, G.M. and Hausman, R.E. 2009. ASMPress & Sunderland, Washington, D.C.; Sinauer Associates, MA.
4. The World of the Cell, 7thedition, Becker, W.M., Kleinsmith, L.J., Hardin. J. and Bertoni, G. P. 2009 Pearson Benjamin Cummings Publishing, San Francisco.
5. David A. Thompson. 2011. Cell and Molecular Biology Lab. Manual.
6. P.Gunasekaran. 2007. Laboratory Manual in Microbiology. New Age International.
7. D O Hall, S E Hawkins. 1974. Laboratory Manual of Cell Biology. British Society for Cell Biology, Published by Crane, Russia.
8. Mary L. Ledbetter. 1993. Cell Biology: Laboratory Manual. Edition: 2. Published by Ron Jon Publishing. Incorporated.
9. Gunasekaran, P. 2009. Laboratory Manual in Microbiology. 1st Edition. New Age International Publishers.
10. Dr. T. Sundararaj. Microbiology Laboratory Manual. 2005. Dr.A.L. MPGIBMS, University of Madras, Taramani, Chennai – 600 113.
11. James G. Cappuccino and Natalie Sherman. 2013. Microbiology: A Laboratory Manual. 10th Edition. Benjamin Cummings.
12. Dr. David A Thompson. 2011. Cell and Molecular Biology Lab Manual.
13. George M. Malacinski. 2013. Freifeder's Essentials of Molecular Biology. Narosa Publishing House.

VI. CO-Curricular Activities

a) **Suggested C0-Curricular Activities**

1. Assignments
2. Seminars, Group Discussions on related topics
3. Charts on Replication, Transcription, and Translation