ST. JOSEPH’S COLLEGE FOR WOMEN (AUTONOMOUS) VISAKHAPATNAM

III SEMESTER   **BIOTECHNOLOGY** TIME:4HRS/WEEK

BTH-Ma2-3701(3) **MOLECULAR BIOLOGY** MARKS:100

W.e.f. 2023-24 admitted batch (23AK) **SYLLABUS**

**OBJECTIVES:** To enable the students to

1. Acquire knowledge about structure and organization of genetic material.
2. Swot about the basic mechanism in DNA replication.
3. Get an insight on transcription in both prokaryotes and eukaryotes.
4. Gain the basic concepts in gene expression and regulation.
5. Acquire knowledge about genetic code and protein synthesis.

**COURSE OUTCOMES: Students will**

* **CO1:** Capable to indentify the genome structure and organization in both

prokaryotes and eukaryotes.

* **CO2:** Be abundant in mechanism and enzymes of DNA replication.
  + - **CO3:** Able to learn about enzymatic synthesis and features of transcription.
* **CO4:** Be proficient in Lac operon and expression of clustered & mRNA genes.
* **CO5:** Acquire knowledge on determination of protein.

**UNIT-I: Genome Structure**

1. Watson and Crick model of DNA.
2. Genome organization with specific reference to prokaryotic and eukaryotic genomes; Genome size.
3. Concepts of Genetic Material, Gene, Chromosome and Genome.
4. 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 Pol-III, helicases, topoisomerases, single strand binding proteins (SSB’s), DNA melting proteins, primase & DNA Ligase.
2. Proof of semi-conservative replication, Replication origins (Ori-C).
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 -35sequences).
3. Four steps of transcription (promoter binding and activation, RNA chain initiation, chain elongation, termination and release).
4. Differences between prokaryotic and eukaryotic transcription.
5. Reverse transcription.

**UNIT – IV: Gene Expression and Regulation**

1. Regulation of gene expression; Clustered genes.
2. The concept of Regulon & Operon – Negative & Positive control of the Lac-Operon, Trp-Operon.
3. Control of gene expression.
4. Poly and Mono Cistronic m-RNA.

BTH-Ma2-3701(3) ::2::

**UNIT V: Genetic Code and Protein Synthesis**

1. Genetic code: Features of genetic code, Structure of mRNA & tRNA.
2. The adaptor hypothesis, attachment of amino acids to tRNA.
3. Codon – Anticodon interaction: The Wobble hypothesis.
4. Initiation, elongation & termination of Protein synthesis.
5. Differences between prokaryotic and eukaryotic translation.

**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.

\*\* \*\* \*\*