

SRI VENKATESWARA UNIVERSITY : TIRUPATI

MINOR

Subject: BIOTECHNOLOGY

w.e.f AY 2024-2025

Semester III

Course Code:

Course: III-3–Cell and Molecular Biology

Theory

Credits:3

3hrs/week

I. Learning outcomes:

Students after successful completion of the course will be able to understand

1. the basic structure of eukaryotic cell, Cell cycle and its regulation
2. replication of DNA and various models
3. the damage of DNA and the repair mechanisms
4. transcription and translation
5. Gene expression and various controls of gene expression

II. Syllabus:

UNIT -1: Eukaryotic cell

Structure of eukaryotic cell (plant and animal cells) and structure, functions of organelles. Cell division – mitosis and meiosis. Cell cycle and its regulation. Exo and endocytosis. Phago- and pinocytosis. Transport processes - active transport, ionophores and ion channels.

UNIT-2: DNA replication

Nucleic acids as genetic material, Central dogma of Molecular biology, DNA replication: conservative, semi-conservative and dispersive modes; Meselson & Stahl experiments, Enzymes involved in replication, Initiation, elongation and termination of DNA replication in prokaryotes. Rolling circle replication.

UNIT -3:DNA damage and repair

Structure of telomere, telomerase and its significance, factors contributing to DNA damage, types; repair mechanisms (Photo reactivation, mis-match, Excision, recombination & SOS repairs).

UNIT- 4:Transcription and Translation

Structure of RNA polymerase, significance of σ (sigma) factor, Structure of Promoter, mechanism of initiation, elongation and termination of transcription in prokaryotes; Post transcriptional modifications (cap, Poly A formation & splicing) in eukaryotes. Genetic code, Wobble hypothesis. Mechanism of initiation, elongation and termination of translation in prokaryotes.

UNIT – 5: Regulation of gene expression

Regulation of gene expression in prokaryotes - The operon concept, lac & tryp operons. Transcriptional control. Post translational control. DNA methylation & gene expression. Chromatin structure & gene expression.

Practical syllabus: Course III-3–Cell and Molecular Biology

Practical

Credits:1

2hrs/week

III. Skill outcomes

The student will be able

1. To observe various mitotic stages in onion root tips
2. To Perform problem solving related to genetic code

IV. Practical syllabus:

1. Observation of various mitotic stages in onion root tips
2. Theoretical problem solving related to start codon, mRNA length and protein molecular weight of a given DNA segment
3. Problem solving related to genetic code

V. References:

1. Alberts, B., Johnson, A., Lewis, J., Raff, M., Roberts, K., & Walter, P. (2008). Molecular Biology of the Cell (5th Ed.). New York: Garland Science.
2. Lodish, H. F. (2016). Molecular Cell Biology (8th Ed.). New York: W.H. Freeman.
3. Krebs, J. E., Lewin, B., Kilpatrick, S. T., & Goldstein, E. S. (2014). Lewin's Genes XI. Burlington, MA: Jones & Bartlett Learning.
4. Cooper, G. M., & Hausman, R. E. (2013). The Cell: a Molecular Approach (6th Ed.). Washington: ASM ; Sunderland.
5. Hardin, J., Bertoni, G., Kleinsmith, L. J.,