

Syllabus template

Semester: 5	
Course : Major	
Paper Title: Advanced Molecular Biology and Microbial Genetics	
Paper code: C3MB230511T	Credits:
Hours/week : 4	
Category: Core/MDC/SEC/VAC : CORE (Major)	
Theory / Practical / Composite : Theory	
No of Modules : None	
<p>Course Overview: This course provides an in-depth understanding of the molecular mechanisms that regulate gene expression, maintain genome stability, and drive genetic variation in both prokaryotic and eukaryotic systems. It integrates classical genetic experiments with modern molecular insights to build a strong conceptual foundation in molecular genetics and microbial genetics.</p>	
Course Outcome:	
<p>(CO1): Remember</p> <ol style="list-style-type: none"> 1. Define transcriptional regulation in prokaryotes and eukaryotes. 2. Recall the operon model proposed by François Jacob and Jacques Monod. 3. List types of mutations, mutagens, DNA damage, DNA repair mechanisms, and transposable elements. 4. Identify mechanisms of horizontal gene transfer (transformation, conjugation, transduction) 	
<p>(CO2): Understand</p> <ul style="list-style-type: none"> • Explain mechanisms of gene regulation at transcriptional and translational levels. • Describe RNA processing events and RNA interference. • Summarize plasmid replication and maintenance systems. • Discuss the significance of classical experiments such as the Luria–Delbrück experiment and mutagen detection using the Ames test. 	
<p>(CO3): Apply</p> <ul style="list-style-type: none"> • Apply principles of gene regulation to interpret gene expression patterns. • Demonstrate how different mutations influence phenotype. • Apply knowledge of DNA repair pathways to specific types of DNA damage. • Use concepts of horizontal gene transfer and transposition in microbial genetics applications. 	
<p>(CO4): Analyze</p> <ul style="list-style-type: none"> • Differentiate between prokaryotic and eukaryotic gene regulation mechanisms. • Compare types of mutations and DNA repair systems. 	

- Analyze mechanisms of generalized vs. specialized transduction and replicative vs. non-replicative transposition.
- Examine regulatory networks controlling gene expression.

(CO5): Evaluate

- Evaluate the biological significance of regulatory mechanisms in cellular adaptation.
- Assess experimental data from mutation and gene transfer studies.
- Critically evaluate the role of DNA repair systems in genome stability.
- Judge the impact of transposable elements on genome evolution.

(CO6): Create

- Design experiments to study gene regulation and mutation detection.
- Propose genetic engineering strategies using plasmids and transposons.
- Develop conceptual models explaining regulatory pathways in cells.

Prerequisites: *Basic knowledge about any prior course*

SYLLABUS

UNIT/Module	CONTENT	HOURS or NUMBER OF CLASSES	CO Mapping	COGNITIVE LEVEL
I.				
II.				
III.				
IV.				
V.				

Text Books

- 1.
- 2.
- 3.

Suggested readings

- 1.
- 2.
- 3.

Web Resources

- 1.
- 2.
- 3.
- 4.

Evaluation

Paper Structure for Theory Semester Exam Module :

Course outcomes (COs) and Cognitive Level Mapping

COs	CO Description	Cognitive levels
CO1		
CO2		
CO3		
CO4		
CO5		
CO6		