



Subject: Molecular basics in Microbiology-MSMCMB12507

Type of course: Major

Prerequisite: These courses provide students with foundation knowledge of molecular biology.

Rationale: To teach students understand the fundamental processes of life by studying the molecular mechanisms that underlie biological phenomena. This knowledge helps answer questions about how living organisms function and interact with their environment.

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks					Total Marks
CI	T	P		Theory Marks		Practical Marks		CA	
			ESE	MSE	V	P	ALA		
4	0	0	4	60	30	10	00	50	150

Legends: CI-Class Room Instructions; T – Tutorial; P - Practical; C – Credit; ESE - End Semester Examination; MSE- Mid Semester Examination; V – Viva; CA - Continuous Assessment; ALA- Active Learning Activities.

Course Content:

Unit No	Course content	Hrs	% Weightage
1	<p>Chapter:1- Fundamentals of Genetic material:</p> <ul style="list-style-type: none"> • Resume of DNA structure and topology, central dogma of molecular biology, DNA Replication, • DNA polymerase, Exonucleases, Endonucleases (homing and retrohoming Endonucleases), • Topoisomerases, Gyrases, Methylases, Ligases and Protein Factors. Superhelical Density, C value paradox, Cot curves. <p>Chapter: 2- DNA Sequencing:</p> <ul style="list-style-type: none"> • Maxam and Gilbert, Sanger's and Automated (Illumina, Ion torrent) Method. 	15	25%



2	<p>Chapter:3- DNA replication</p> <ul style="list-style-type: none"> Semiconservative and discontinuous mechanism of DNA replication – leading, lagging strand, Okazaki fragments, DNA polymerases, helicase, primase, topoisomerase, process of replication; initiation, elongation, termination, telomerase replicates the ends of chromosomes, rolling circle replication. <p>Chapter:4- Mutation</p> <ul style="list-style-type: none"> Mutation and its types Types of Mutagens Types of Mutants Isolation experiment of carcinogens. Newcombe's Experiment. <p>Chapter:5- DNA repair</p> <ul style="list-style-type: none"> Nucleotide excision repair; Mismatch correction; SOS repair; Photoreactivation. 	15	25%
3	<p>Chapter:6- Gene expression</p> <ul style="list-style-type: none"> Transcription: Prokaryotic and eukaryotic RNA polymerases, process of transcription; initiation, elongation and termination, RNA processing. RNA interference: miRNA, siRNA and piRNA. Translation: structure and role of t-RNA in protein synthesis, ribosome structure, basic features of genetic code, protein synthesis; ribosome assembly, activation of amino acids, initiation, elongation and termination, post-translational modification of proteins. 	15	25%
4	<p>Chapter:7- Regulation of gene expression</p> <ul style="list-style-type: none"> Regulation of gene expression in prokaryotes: Operon concept, positive and negative regulation. Operon: Lactose, Tryptophan, Arabinose, Histidine operon regulation; global regulatory responses. 	15	25%

Continuous Assessment:

Sr. No	Active Learning Activities	Marks
1	<p>Conference/Workshop Student will attend any subject related workshop or conference (online/offline). Student will upload certificate on GMIU web portal.</p>	10



2	Research Project Student will review for research project and after discussion with faculty they will start performing research project and results with photograph will upload on GMIU web portal.	10
3	Theme based poster Faculty will provide specific theme to students and students will prepare specific theme based poster and upload on GMIU web portal.	10
4	Paper Review Faculty will provide a particular portion of the research paper and a group of students will review it and prepare a conclusion in 100 words and upload it to GMIU web portal.	10
5	Brain writing Faculty will provide a picture, text passage or video clip, student observe, analyze and write about it and upload on GMIU web portal.	10
Total		50

Suggested Specification table with Marks (Theory):60

Distribution of Theory Marks (Revised Bloom's Taxonomy)						
Level	Remembrance (R)	Understanding (U)	Application (A)	Analyze (N)	Evaluate (E)	Create (C)
Weightage	20%	40%	30%	10%	-	-

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

Course Outcome:

After learning the course the students should be able to:	
CO1	Integrate structural and functional studies of DNA
CO2	Learn about organization of chromosomal DNA in prokaryotes and Eukaryotes as well as its replication.
CO3	Apply insights into gene expression processes.
CO4	Figure out gene expression processes with its regulation.



Instructional Method:

The course delivery method will depend upon the requirement of content and need of students. The teacher in addition to conventional teaching method by black board, may also use any of tools such as demonstration, role play, Quiz, brainstorming, MOOCs etc.

From the content 10% topics are suggested for flipped mode instruction.

Students will use supplementary resources such as online videos, NPTEL/SWAYAM videos, e-courses, Virtual Laboratory

The internal evaluation will be done on the basis of Active Learning Assignment

Practical/Viva examination will be conducted at the end of semester for evaluation of performance of students in laboratory.

Reference Books:

- 1) Lewin B. "Genes". Jones & Bartlett Publishers.
- 2) Alberts B, Bray D, Lewis J, Raff M, Roberts K, and Watson J.D. "Molecular Biology of the Cell". Garland Science.
- 3) Watson J.D, Baker T.A, Bell S.P, Gann A, Levine M and Losick R."Molecular Biology of the Gene". Benjamin-Cummings Publishing Co.,
- 4) Freifelder D. "Molecular Biology".

