

<b>INSTITUTE</b>	<b>FACULTY OF SCIENCE</b>
<b>PROGRAM</b>	<b>BACHELOR OF SCIENCE (MICROBIOLOGY)</b>
<b>SEMESTER</b>	<b>6</b>
<b>COURSE TITLE</b>	<b>MICROBIAL GENETICS AND GENOMICS</b>
<b>COURSE CODE</b>	<b>02MB0358</b>
<b>COURSE CREDITS</b>	<b>4</b>

**Objective:**

- 1 To study microbial genetics and genomics, focusing on mutation mechanisms, genetic exchange, plasmids, phage genetics, and transposable elements.

**Course Outcomes:** After completion of this course, student will be able to:

- 1 Interpret genome organization in model organisms and its role in microbial adaptability through mutations.
- 2 Evaluate different types of plasmids, their replication mechanisms, and their significance in microbial evolution and biotechnology.
- 3 Explain genetic exchange mechanisms like transformation, conjugation, and transduction in horizontal gene transfer and microbial diversity.
- 4 Assess the genetic mechanisms of phage infection and transposable elements in genome evolution and engineering.

**Pre-requisite of course:**NA

**Teaching and Examination Scheme**

<b>Theory Hours</b>	<b>Tutorial Hours</b>	<b>Practical Hours</b>	<b>ESE</b>	<b>IA</b>	<b>CSE</b>	<b>Viva</b>	<b>Term Work</b>
4	0	0	50	30	20	0	0

<b>Contents : Unit</b>	<b>Topics</b>	<b>Contact Hours</b>
1	<b>Mutations</b> Genome Organization: concept and genome organization of Model organisms. Mutations and mutagenesis: Definition and types of Mutations; Physical and chemical mutagens; Molecular basis of mutations; Functional mutants (loss and gain of function mutants); Uses of Mutations, Reversion and suppression: True revertants; Intra- and inter-genic suppression; Ames test; Mutator genes.	12
2	<b>Plasmids</b> Types of plasmids – F plasmid, R Plasmids, colicinogenic plasmids, Ti plasmids, linear plasmids, yeast- 2 μ plasmid, Plasmid replication and partitioning, Host range, plasmid-incompatibility, plasmid amplification, Regulation of copy number, curing of plasmids.	18

<b>Contents : Unit</b>	<b>Topics</b>	<b>Contact Hours</b>
3	<b>Mechanisms of Genetic Exchange</b> Transformation - Discovery, mechanism of natural competence. Conjugation - Discovery, mechanism, Hfr and F' strains, Interrupted mating technique and time of entry mapping Transduction - Generalized transduction, specialized transduction, LFT & HFT lysates, Mapping by recombination and co-transduction of markers.	15
4	<b>Phage Genetics and Transposable elements</b> Features of T4 genetics, Genetic basis of lytic versus lysogenic switch of phage lambda. Prokaryotic transposable elements – Insertion Sequences, composite and non-composite transposons, Replicative and Non replicative transposition. Eukaryotic transposable elements - Yeast (Ty retrotransposon), Drosophila (P elements), Maize.	15
<b>Total Hours</b>		<b>60</b>

**Textbook :**

- 1 A Textbook of Microbial Genetics, Pradeep D. Devkate, Booksclinic Publishing, 2023

**References:**

- 1 Molecular Biology of the Gene, Molecular Biology of the Gene, James D. Watson, Pearson, 2013
- 2 Molecular Genetics of Bacteria, Molecular Genetics of Bacteria, Larry Snyder , ASM Press, 2019
- 3 Genetics: Analysis and Principles, Genetics: Analysis and Principles, Robert J. Brooker, MCGraw Hill, 2020

**Suggested Theory Distribution:**

The suggested theory distribution as per Bloom's taxonomy is as follows. This distribution serves as guidelines for teachers and students to achieve effective teaching-learning process

Distribution of Theory for course delivery and evaluation					
<b>Remember / Knowledge</b>	<b>Understand</b>	<b>Apply</b>	<b>Analyze</b>	<b>Evaluate</b>	<b>Higher order Thinking / Creative</b>
5.00	10.00	30.00	30.00	20.00	5.00

**Instructional Method:**

- 1 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, etc.
- 2 The internal evaluation will be done on the basis of continuous evaluation of students in the class-room in the form of attendance, assignments, verbal interactions etc.

**Instructional Method:**

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

**Supplementary Resources:**

- 1 [https://www.youtube.com/watch?v=1VCUoWrR\\_Gk](https://www.youtube.com/watch?v=1VCUoWrR_Gk)