

SEMESTER 4

Department of Microbiology, Prokaryotic genetics (Theory)

Program: M. Sc. in Microbiology	Year, Semester: 2 nd Yr., 4 th Sem
Course Title:Prokaryotic genetics (Theory)	Subject Code:TIU-PMB-T212
Contact Hours/Week: 2–1–0 (L–T–P)	Credit: 3

COURSE OBJECTIVE:

Enable the student to:

- 1. Understand Genetic Mechanisms in Microbes
- 2. Analyze Mutations and Genetic Variability
- 3. Examine Recombination and Chromatin Organization

COURSE OUTCOME:

On completion of the course, the student will be able to:

CO-1:	Describe genetic transfer mechanisms in microbes	
CO-2:	2: Classify different types of mutations and their effects	
CO-3:	3: Apply methods for mutation detection and genetic analysis	
CO-4:	Compare homologous and non-homologous recombination mechanisms	K4
CO-5:	5: Assess chromatin structure and its role in gene regulation	
CO-6:	-6: Integrate microbial genetics concepts in biotechnology and research	

MODULE 1: Microbial genetics	10 Hours	
Microbial genetics: Methods of genetic transfers – transformation, conjugation, transduction and		
sex-duction, mapping genes by interrupted mating, fine structure analysis of genes		
MODULE 2: Mutation	10 Hours	

Mutation: Types, causes and detection, mutant types – lethal, conditional, biochemical, loss of function, gain of function, germinal verses somatic mutants, insertional mutagenesis

MODULE 3: Recombination

10 Hours

15 Hours

Recombination : Homologous and non-homologous recombination including transposition

MODULE 4: Chromatin

Operon, unique and repetitive DNA, interrupted genes, gene families, structure of chromatin and chromosomes, heterochromatin, euchromatin, transposons

TOTAL LECTURES

45 Hours

Books:

- 1. Klug WS, Cummings MR, Spencer, C, Palladino, M (2011). Concepts of Genetics, 10th Ed.,
- 2. Benjamin Cummings
- 3. Pierce BA (2011) Genetics: A Conceptual Approach, 4th Ed., Macmillan Higher Education Learning
- 4. Watson JD, Baker TA, Bell SP et al. (2008) Molecular Biology of the Gene, 6th Ed., Benjamin

Cummings

- 5. Gardner EJ, Simmons MJ, Snustad DP (2008). Principles of Genetics. 8th Ed. Wiley-India
- 6. Russell PJ. (2009). i Genetics- A Molecular Approach. 3rd Ed, Benjamin Cummings
- 7. Sambrook J and Russell DW. (2001). Molecular Cloning: A Laboratory Manual. 4th Edition, Cold Spring Harbour Laboratory press.
- 8. Maloy SR, Cronan JE and FriefelderD(2004) Microbial Genetics 2nd EDITION., Jones and Barlett Publishers

Department of Microbiology, Eukaryotic genetics (Theory)

Program: M. Sc. in Microbiology	Year, Semester: 2 nd Yr., 4 th Sem
Course Title: Eukaryotic genetics (Theory)	Subject Code:TIU-PMB-T214
Contact Hours/Week: 2–1–0 (L–T–P)	Credit: 3

COURSE OBJECTIVE:

Enable the student to:

- 1. Master Fundamental and Advanced Genetic Principles
- 2. Apply Gene Mapping and Human Genetics Techniques
- 3. Analyze Genetic Variation and Chromosomal Alterations

COURSE OUTCOME:

On completion of the course, the student will be able to:

CO-1:	Explain Fundamental and Extended Genetic Principles	K2
CO-2:	Analyze Gene Mapping Techniques	K4
CO-3:	Evaluate Extra Chromosomal Inheritance Patterns	K5
CO-4:	Apply Pedigree Analysis and Genetic Testing in Human Genetics	K3
CO-5:	Interpret Quantitative Genetic Data	K4
C0-6:	Design Experimental Approaches for Studying Chromosomal	K6
60-0.	Alterations	K U

MODULE 1: Mendelian principles		6 Hours
Mendelian principles : Dominance, segregation, independent assortment.Concept of gene : Allele, multiple alleles, pseudoallele, complementation tests		
MODULE 2: Extensions of Mendelian principle		7 Hours
Extensions of Mendelian principles: Codominance, incomplete dominance, gene interactions pleiotropy, genomic imprinting, penetrance and expressivity, phenocopy, linkage and crossing over, sex linkage, sex limited and sex influenced characters		
MODULE 3: Gene mapping		7 Hours

Gene mapping methods : Linkage maps, tetrad analysis, mapping with molecular markers, mapping by using somatic cell hybrids, development of mapping population in plants

MODULE 4: Extra chromosomal inheritance

6 Hours

Extra chromosomal inheritance : Inheritance of Mitochondrial and chloroplast genes, maternal inheritance

MODULE 5: Human genetics

Human genetics : Pedigree analysis, lod score for linkage testing, karyotypes, genetic disorders

MODULE 6: Quantitative genetics

Quantitative genetics : Polygenic inheritance, heritability and its measurements, QTL mapping

MODULE 7: Chromosome structures

Structural and numerical alterations of chromosomes : Deletion, duplication, inversion, translocation, ploidy and their genetic implications

TOTAL LECTURES

Books:

- 1. Genes VIII: Benjamin Lewin
- 2. Molecular Biology of Gene: Watson et al. Cell & Molecular Biology: Lodish et al.
- 3. Molecular Biology of cell Bruce Alberts et al., Garland Publications
- 4. Sambrooket al (2000) Molecular Cloning Volumes I, II, & III Cold spring Harbor Laboratory Press, New York, USA

Department of Microbiology, CASD

Program: M. Sc. in Microbiology	Year, Semester: 2 nd Yr., 4 th Sem	
Course Title:CASD	Subject Code:TIU-PMB-S200	
Contact Hours/Week : 2–1–0 (L–T–P)	Credit: 3	

6 Hours

6 Hours

7 Hours

45 Hours

COURSE OBJECTIVE:

Enable the student to:

- 1. Develop Effective Communication Skills
- 2. Enhance Linguistic Proficiency
- 3. Improve Professional and Academic Writing

COURSE OUTCOME:

On completion of the course, the student will be able to:

CO-1:	Explain fundamental concepts of communication	K1
CO-2:	Analyze the role of language in communication	K4
CO-3:	Use appropriate language in different contexts	K3
CO-4:	Demonstrate proficiency in professional writing	K6
CO-5:	Evaluate different writing styles	K5
CO-6:	Enhance clarity and coherence in writing	K3

COURSE CONTENT:

MODULE 1:	Presentation	30 Hours
Review paper presentation		
TOTAL LECTURES		30 Hours

Department of Microbiology, Project

Program: M. Sc. in Microbiology	Year, Semester: 2 nd Yr., 4 th Sem	
Course Title:Project	Subject Code:TIU-PMB-P204	
Contact Hours/Week: 2-1-0 (L-T-P)	Credit: 3	

COURSE OBJECTIVE:

Enable the student to:

- 1. Develop Practical Research and Experimental Skills
- 2. Enhance Technical Writing and Documentation Abilities
- 3. Apply Critical Thinking for Problem-Solving in Projects

COURSE OUTCOME:

On completion of the course, the student will be able to:

CO-1:	Demonstrate proficiency in conducting hands-on experiments	K3
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CO-2:	Analyze and interpret experimental data	K4
CO-3:	Document research findings systematically	K3
CO-4:	Apply technical writing skills for project documentation	K6
CO-5:	Evaluate project outcomes and suggest improvements	K5
CO-6:	Present experimental results effectively	K6

COURSE CONTENT:

MODULE 1:	Project Work	
Hands on expe	riments and writings	
TOTAL LECTURES		

Department of Microbiology, Seminar presentation and Grand viva

Program: M. Sc. in Microbiology	Year, Semester: 2 nd Yr., 4 th Sem
Course Title: Seminar presentation and Grand viva	Subject Code:TIU-PMB-G296
Contact Hours/Week : 0–0–2 (L–T–P)	Credit: 2

COURSE OBJECTIVE:

Enable the student to:

- 1. Enhance Presentation and Communication Skills
- 2. Develop Critical Thinking and Question-Handling Abilities
- 3. Prepare for Professional and Academic Assessments

COURSE OUTCOME:

On completion of the course, the student will be able to:

CO-1:	Design and deliver structured presentations	K3
CO-2:	Demonstrate confidence in public speaking	K3
CO-3:	Defend research findings with logical reasoning	K5
CO-4:	Analyze feedback and improve presentation skills	K4
CO-5:	Synthesize key research insights effectively	K6
CO-6:	Use appropriate tools and visual aids	K3

MODULE 1:	Seminar	
Presentation of work and grand viva		
TOTAL LECTURES		

Department of Microbiology, Entrepreneurship Skill Development (ESD)

Program: M. Sc. in Microbiology	Year, Semester: 2 nd Yr., 4 th Sem
Course Title: Entrepreneurship Skill Development (ESD)	Subject Code:TIU-PES-S298
Contact Hours/Week: 0-0-2 (L-T-P)	Credit: 2

COURSE OBJECTIVE:

Enable the student to:

- 1. Understand Entrepreneurial Concepts
- 2. Enhance Business Planning and Management Skills
- 3. Develop Innovation and Problem-Solving Abilities

COURSE OUTCOME:

On completion of the course, the student will be able to:

CO-1:	Explain key entrepreneurial concepts	K1
CO-2:	Identify and evaluate business opportunities	K4
CO-3:	Demonstrate business planning skills	K3
CO-4:	Assess financial and resource management strategies	K5
CO-5:	Develop innovative solutions to entrepreneurial challenges	K6
CO-6:	Apply leadership and decision-making skills	K3

MODULE 1:	Entrepreneurship Skills	30 Hours
Development of	of Entrepreneurship Skills	
TOTAL LECT	URES	30 Hours