TECHNO INDIA UNIVERSITY

WEST BENGAL

Curriculum for 2-year M.Sc in Microbiology

Department of Microbiology

Techno India University, West Bengal

EM-4, EM Block, Sector V, Bidhannagar, Kolkata, West Bengal 700091

Course Curriculum For All Semester

SEMESTER 4

Department of Microbiology, Prokaryotic genetics (Theory)

Program: M. Sc. in Microbiology	**Year, Semester:** 2nd Yr., 4th 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	K1
CO-2:	Classify different types of mutations and their effects	K2
CO-3:	Apply methods for mutation detection and genetic analysis	K3
CO-4:	ompare homologous and non-homologous recombination mechanisms	K4
CO-5:	Assess chromatin structure and its role in gene regulation	K5
CO-6:	Integrate microbial genetics concepts in biotechnology and research	K6

COURSE CONTENT :

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**
Recombination : Homologous and non-homologous recombination including transposition		
MODULE 4:	**Chromatin**	**15 Hours**
Operon, unique and repetitive DNA, interrupted genes, gene families, structure of chromatin and chromosomes, heterochromatin, euchromatin, transposons		
TOTAL LECTURES		**45 Hours****

CO-PO-PSO MAPPING:

CO \ PO / PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3
CO-1	3	3	2	2	2	1	1	2	3	3	3
CO-2	3	3	2	2	2	1	-	2	3	3	2
CO-3	3	3	3	3	2	1	-	2	3	3	3
CO-4	3	3	3	3	2	1	-	2	3	3	3
CO-5	3	2	2	3	2	-	-	2	2	3	3
CO-6	3	3	3	3	3	2	2	3	3	3	3

‘3’ – Strongly correlated; ‘2’ – Moderately correlated; ‘1’ – Slightly correlated; ‘ - ’ Not applicable

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:** 2nd Yr., 4th 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
CO-6:	Design Experimental Approaches for Studying Chromosomal Alterations	K6

COURSE CONTENT :

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**	**6 Hours**
Human genetics : Pedigree analysis, lod score for linkage testing, karyotypes, genetic disorders		
MODULE 6:	**Quantitative genetics**	**6 Hours**
Quantitative genetics : Polygenic inheritance, heritability and its measurements, QTL mapping		
MODULE 7:	**Chromosome structures**	**7 Hours**
Structural and numerical alterations of chromosomes : Deletion, duplication, inversion, translocation, ploidy and their genetic implications		
TOTAL LECTURES		**45 Hours****

CO-PO-PSO MAPPING:

CO \ PO / PSO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PSO1**	**PSO2**	**PSO3**
CO-1	3	3	2	2	1	1	-	2	3	3	2
CO-2	3	3	3	3	2	-	-	2	3	3	2
CO-3	3	3	2	3	2	-	-	2	3	3	2
CO-4	3	3	3	3	2	1	-	3	3	3	3
CO-5	3	3	3	3	2	-	-	2	3	2	2
CO-6	3	3	3	3	3	2	1	3	3	3	3

‘3’ – Strongly correlated; ‘2’ – Moderately correlated; ‘1’ – Slightly correlated; ‘ - ’ Not applicable

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

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****

CO-PO-PSO MAPPING:

CO \ PO / PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3
CO-1	3	3	2	-	-	-	-	2	2	-	-
CO-2	3	3	3	-	-	-	-	2	2	-	-
CO-3	3	2	3	-	-	-	-	2	2	-	-
CO-4	3	3	3	2	-	-	-	3	2	-	-
CO-5	3	2	2	2	-	-	-	2	2	-	-
CO-6	3	3	3	3	-	-	-	3	2	-	-

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Department of Microbiology, Project

Program: M. Sc. in Microbiology	**Year, Semester:** 2nd Yr., 4th 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
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**	**30 Hours**
Hands on experiments and writings		
TOTAL LECTURES		**30 Hours ****

CO-PO-PSO MAPPING:

CO \ PO / PSO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PSO1**	**PSO2**	**PSO3**
CO-1	3	2	3	-	-	-	-	2	3	2	2
CO-2	3	3	3	-	-	-	-	2	3	2	2
CO-3	3	2	3	-	-	-	-	3	2	2	2
CO-4	3	3	3	2	-	-	-	3	2	2	2
CO-5	3	3	3	2	-	-	-	3	2	3	3
CO-6	3	3	3	2	-	-	-	3	2	3	3

‘3’ – Strongly correlated; ‘2’ – Moderately correlated; ‘1’ – Slightly correlated; ‘ - ’ Not applicable

Department of Microbiology, Seminar presentation Grand viva

Program: M. Sc. in Microbiology	**Year, Semester:** 2nd Yr., 4th Sem
Course Title: Seminar presentation 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

COURSE CONTENT :

MODULE 1:	**Seminar**	**30 Hours**
Presentation of work and grand viva		
TOTAL LECTURES		**30 Hours****

CO-PO-PSO MAPPING:

CO \ PO / PSO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PSO1**	**PSO2**	**PSO3**
CO-1	2	3	2	-	2	-	-	3	2	2	2

CO-2	1	3	2	-	-	-	-	3	1	2	2
CO-3	2	3	3	2	-	-	-	3	2	2	3
CO-4	2	3	2	-	-	1	-	3	2	2	2
CO-5	3	2	2	2	-	-	-	3	3	2	3
CO-6	2	2	3	-	3	-	-	2	2	3	2

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Department of Microbiology, Entrepreneurship Skill Development (ESD)

Program: M. Sc. in Microbiology	**Year, Semester: 2**nd Yr., 4th 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

COURSE CONTENT :

MODULE 1:	**Entrepreneurship Skills**	**30 Hours**
Development of Entrepreneurship Skills		
TOTAL LECTURES		**30 Hours****

CO-PO-PSO MAPPING:

CO \ PO / PSO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PSO1**	**PSO2**	**PSO3**
CO-1	3	2	2	1	2	-	-	2	2	1	2
CO-2	2	3	2	2	3	-	-	2	3	2	3
CO-3	2	2	3	3	2	-	-	2	3	2	3
CO-4	2	2	2	3	2	-	-	2	2	2	3
CO-5	3	2	2	3	3	-	-	2	3	2	3
CO-6	2	3	3	2	3	-	-	3	2	2	3

‘3’ – Strongly correlated; ‘2’ – Moderately correlated; ‘1’ – Slightly correlated; ‘ - ’ Not applicable