TECHNO INDIA UNIVERSITY
WESTBENGAL

EM 4, Sector V, Salt Lake, Kolkata-700091, West Bengal, India
Phone: +91 9836544416/17/18/19, Fax: +91 33 2357 1097

2-Year Master of Science (M.Sc.) Curriculum and Syllabus for Microbiology

Third Semester

Course Code	Course Name	L	P	T	Credit
TIU-PMB-T211	Cell Biology	3	0	0	3
TIU-PMB-T213	Biological Methods	3	0	0	3
TIU-PMB-T215	Immunology and Cancer	3	0	0	3
TIU-PMB-T221	DNA Metabolism and Gene regulation	3	0	0	3
TIU-PMB-T219	Medical and Diagnostic Technology	3	0	0	3
TIU-PMB-S201	CASD-Scientific writing	0	3	0	3
TIU-PMB-L211	Cell biology lab	0	2	0	2
TIU-PMB-L203	Molecular Biology Lab	0	2	0	2
TIU-PMB-L205	Medical and Diagnostic Microbiology Lab	0	2	0	2
TIU-PES-S297	ESD	0	2	0	2
	Total Credits	**15**	**11**	**0**	**26**

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Semester III

TIU-PMB-T211	Cell Biology

Cellular Organization

1. Structure of model membrane, lipid bilayer and membrane protein diffusion, osmosis, ion channels, active transport, membrane pumps, mechanism of sorting and regulation of intracellular transport, electrical properties of membranes.

2. Cell wall, nucleus, mitochondria, Golgi bodies, lysosomes, endoplasmic reticulum, peroxisomes, plastids, vacuoles, structure & function of cytoskeleton and its role in motility

3. cell cycle, regulation and control of cell cycle

4. Cell signaling through G-protein coupled receptors. Receptor Tyrosinekinase, Apoptosis

5. Control of gene expression at transcription and translation level: regulating the expression of phages, viruses, prokaryotic and eukaryotic genes, role of chromatin in gene expression and gene silencing

References books:

1. Genomics and Genetic Engineering By Satya; Pratik New India Publishing Agency (2007)
2. S.B. Primrose, R.M. Twyman and R.W.Old; Principles of Gene Manipulation. 6th Edition, S.B.University Press, 2001.
3. J. Sambrook and D.W. Russel; Molecular Cloning: A Laboratory Manual, Vols 1-3, CSHL, 2001.
4. Brown TA, Genomes, 3rd ed. Garland Science 2006
5. Selected papers from scientific journals.
6. Technical Literature from Stratagene, Promega, Novagen, New England Biolab etc.

TIU-PMB-T213	Biological Methods

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1. Isolation and purification of RNA , DNA (genomic and plasmid) and proteins,
2. different separation methods.
3. Analysis of RNA, DNA and proteins by one and two dimensional gel electrophoresis, Isoelectric focusing gels.
4. Molecular cloning of DNA or RNA fragments in bacterial and eukaryotic systems.
5. Expression of recombinant proteins using bacterial, animal and plant vectors.
6. Isolation of specific nucleic acid sequences
7. Generation of genomic and cDNA libraries in plasmid, phage, cosmid, BAC and YAC vectors.
8. In vitro mutagenesis and deletion techniques, gene knock out in bacterial and eukaryotic organisms. Genomics and its application to health and agriculture, including gene therapy.
9. Protein sequencing methods, detection of post translation modification of proteins. DNA sequencing methods, strategies for genome sequencing.
10. Tissue and cell culture methods for plants and animals. Transgenic animals and plants

Reference Books:

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

TIU-PMB-T215	Immunology and Cancer

1. Immunoglobins, organization and expressions of Ig genes;
2. B cell maturation, activation and differentiation; MHC/HLA; antigen processing and presentation.
3. T cells, T cell receptors, Tcell maturation, activation and differentiation.
4. Cytokines; cell mediated and humoral effector responses.
5. Autoimmunity , immunodeficiency diseases,
6. Transplantation immunology
7. Cancer and immune system.
8. Monoclonal and polyclonal antibodies, monoclonal antibody technique

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References books:

- Kuby Immunology

TIU-PMB-T221	DNA Metabolism and Gene regulation

1. Unit of replication, enzymes involved, replication origin and replication fork, fidelity of replication, extrachromosomal replicons, DNA damage and repair mechanisms, homologous and site-specific recombination
2. transcription factors and machinery, formation of initiation complex, transcription activator and repressor, RNA polymerases, capping, elongation, and termination, RNA processing, RNA editing, splicing, and polyadenylation, structure and function of different types of RNA, RNA transport
3. Ribosome, formation of initiation complex, initiation factors and their regulation, elongation and elongation factors, termination, genetic code, aminoacylation of tRNA, tRNA-identity, aminoacyl tRNA synthetase, and translational proof-reading, translational inhibitors, Post- translational modification of proteins
4. Control of gene expression at transcription and translation level: regulating the expression of phages, viruses, prokaryotic and eukaryotic genes

Reference Books:

- Prescott
- Panikar

TIU-PMB-T219	Medical and Diagnostic Technology

1. Automation in Microbiology
2. Immunoprophylaxis against diseases
3. Emerging infectious diseases and detection by modern techniques like ELISA, RIA, Histochemistry, RFLP, RAPD, Mantu, Microarray, PCR etc..
4. Bioterrorism.
5. Collection of specimens for bacteriological investigations.

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6. Methods of culture, techniques and organisms encountered in: CSF, blood culture, sputum, pus, urine, stool, UTI, endocarditis, Bone and joint infections.
7. Ribotyping

References books:

- Bailey and Scott's *Diagnostic Microbiology.* 9th ed. St. Louis: C.V. Mosby, 2003.
- Koneman, E.W., S.O. Allen, P.C. Schreckenberg, and W.C. Winn, eds. *Atlas and Textbook of Diagnostic Microbiology.* 4th ed. Philadelphia: J.B. Lippincott, 1992.
- Murray, P.R, E.J. Baron, M.A. Pfaller, P.C. Tenover, and R.H. Yolken, eds. *Manual of Clinical Microbiology.* 6th ed. Washington DC: American Society for Microbiology, 2005.

TIU-PMB-S201	CASD-Scientific writing

TIU-PMB-L211	Cell Biology Lab

1. Microscopic observation of cellular structure.
2. Cell culture techniques
3. Cell viability test-MTT assay
4. Cell permeability and ROS generation by Flow cytometry study
5. Flurescence microscopic study of cell viability by Acridine orange EtBr staining

TIU-PMB-L203	Molecular Biology Lab

1. DNA isolation from bacteria
2. Plasmid DNA isolation from bacteria

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3. Competence cell preparation
4. Transformation
5. Restriction digestion
6. Agarose gel electrophoresis

TIU-PMB-L205	Medical and Diagnostic technology Lab

1. PCR
2. Manual count of white blood cell(WBC'S)using haemocytometer
3. Determination of the blood group of an individual
4. Techniques of immunoelectrophoresis(SDS PAGE)
5. Ouchterlony double diffusion technique.
6. Precipitation techniques: immunodiffusion
7. Immuno electrophoretic method (Western Blot)

TIU-PES-S297	ESD