Discipline : Biotechnology.	**Semester : 3rd**	**Name of the teaching faculty : Sweta Mishra**
Subject : TH4 Molecular biology	No. of Days/ per week class allotted: 3	Semester from date : 01/07/2026 to date : 05/11/2026 No. of weeks : 15
Week	Class Day	Theory / Practical Topics
1st	1st	1.1 Definition, Scope, and Historical Perspectives of Molecular Biology.
	2nd	1.2 Structure and Types of Nucleic Acids (DNA and RNA review).
	3rd	1.3 The Central Dogma of Molecular Biology – Overview and Exceptions (e.g., Reverse Transcription).
2nd	1st	2.1 Gene Concept and Organization of Genetic Material in Prokaryotes vs. Eukaryotes.
	2nd	2.2 Overview of DNA Replication: Semiconservative nature, Meselson-Stahl experiment.
	3rd	2.3 Enzymes and proteins involved in replication (DNA Polymerases, Helicase, Primase, Ligase, SSB proteins).
3rd	1st	3.1 Prokaryotic DNA Replication – Initiation, Elongation, and Termination.
	2nd	3.2 Eukaryotic DNA Replication – Key differences, replication origins, and cell cycle regulation.
	3rd	3.3 Okazaki fragments and lagging/leading strand synthesis mechanisms.
4th	1st	4.1 End-replication problem in linear chromosomes and the role of Telomeres/Telomerase.
	2nd	4.2 Types of DNA Damage: Endogenous vs. Exogenous factors (UV, chemicals, oxidation).
	3rd	4.3 Direct Reversal Repair Mechanisms and Base Excision Repair (BER).
5th	1st	5.1 Nucleotide Excision Repair (NER) and Mismatch Repair (MMR) pathways.
	2nd	5.2 Double-Strand Break Repair: Homologous Recombination and Non-Homologous End Joining (NHEJ).
	3rd	5.3 Revision & Problem-Solving Session on DNA Replication and Repair (Progressive Assessment Prep).
6th	1st	6.1 Introduction to Transcription: Features of promoters, RNA Polymerases in Prokaryotes vs. Eukaryotes.

	2nd	6.2 Prokaryotic Transcription – Initiation, Elongation, and Sigma factor involvement.
	3rd	6.3 Prokaryotic Transcription Termination – Rho-dependent and Rho-independent mechanisms.
7th	1st	7.1 Eukaryotic Transcription – RNA Polymerase I, II, and III promoter recognition and transcription factors.
	2nd	7.2 Eukaryotic Transcription Elongation and Termination mechanisms.
	3rd	7.3 Post-Transcriptional Modifications: 5' Capping and 3' Polyadenylation.
8th	1st	8.1 RNA Splicing: Intron vs. Exon, Spliceosome assembly, and catalytic steps.
	2nd	8.2 Alternative Splicing and its biological significance in diversity.
	3rd	8.3 Mid-Semester Review / Quiz on Units I, II, and III.
9th	1st	9.1 The Genetic Code: Properties, Wobble Hypothesis, and codon-anticodon interaction.
	2nd	9.2 Transfer RNA (tRNA) structure and Aminoacyl-tRNA Synthetase charging.
	3rd	9.3 Ribosome structure (Prokaryotic vs. Eukaryotic subunits) and active sites (A, P, E sites).
10th	1st	10.1 Prokaryotic Translation – Initiation factors, Shine-Dalgarno sequence, and complex assembly.
	2nd	10.2 Prokaryotic Translation – Elongation cycles and peptide bond formation.
	3rd	10.3 Prokaryotic Translation – Termination factors and ribosome recycling.
11th	1st	11.1 Eukaryotic Translation Initiation – Cap-dependent vs. Cap-independent (IRES) mechanisms.
	2nd	11.2 Eukaryotic Elongation, Termination, and comparison with Prokaryotes.
	3rd	11.3 Inhibitors of Translation (Antibiotics targeting prokaryotic ribosomes).
12th	1st	12.1 Post-Translational Modifications and Protein Folding (brief introduction).
	2nd	12.2 Polymerase Chain Reaction (PCR): Principle, components, and thermal cycles.
	3rd	12.3 Variations of PCR: Reverse Transcription PCR (RT-PCR) and Quantitative PCR (qPCR).
13th	1st	13.1 Agarose Gel Electrophoresis: Principle,

		instrumentation, and nucleic acid visualization.
	2nd	13.2 Polyacrylamide Gel Electrophoresis (PAGE) and SDS-PAGE for protein analysis.
	3rd	13.3 Gel extraction, quantification, and purity evaluation of biomolecules.
14th	1st	14.1 Southern Blotting: Principle, procedure, probe hybridization, and applications in DNA analysis.
	2nd	14.2 Northern Blotting: Principle, RNA preparation, and applications in gene expression studies.
	3rd	14. Western Blotting: Principle, transfer protocols, antibody detection, and applications in protein analysis.

Discipline : Biotechnology.	**Semester : 3rd**	**Name of the teaching faculty : Sweta Mishra**
Subject : TH1 Microbiology	No. of Days/ per week class allotted: 3	Semester from date : 01/07/2026 to date : 05/11/2026 No. of weeks : 15
Week	Class Day	Theory / Practical Topics
1st	1st	1.1 Introduction to microbiology; definition scope and significance.
	2nd	1.2 History of microbiology, early discoveries(hooke, leewenhoek)
	3rd	1.3 history of microbiology ; golden era(Pasteur,kochs postulates)
2nd	1st	2.1 Branches of microbiology (bacteriology, virology, mycology, etc.
	2nd	2.2 roll of micro organism in environment and human health.
	3rd	2.3 introduction to microbial taxonomy and classification system.
3rd	1st	3.1 three domain of life – archea, bacteria and eucheria.
	2nd	3.2 detailed characteristics of prokaryotic cell.
	3rd	3.3 detailed characteristics of eukaryotic cell.
4th	1st	4.1 comparative analysis; prokaryote vs eukaryotes.
	2nd	4.2 morphological classification of bacteria.
	3rd	4.3 physiological and genetic criteria for classification.
5th	1st	5.1 review and summary of microbial taxonomy.
	2nd	5.2 bacterial cell structure : cell wall(gram +ve vs gram – ve)
	3rd	5.3 bacterial cell structure : cell membrane , capsule, flagella and pili.
6th	1st	6.1 internal structure of bacteria: cytoplasm , ribosome,endospore.
	2nd	6.2 eukaryotic micro organism: structure and classification of protozoa.
	3rd	6.3 eukaryotic micro organism: structure and classification of algae.
7th	1st	7.1 viruses: general structure, capsid symmetry, and classification.
	2nd	7.2 viral replication cycle : lytic cycle.
	3rd	7.3 viral replication cycle : lysogenic cycle.
8th	1st	8.1 introduction to microbial metabolism: energetic and pathways.
	2nd	8.2 microbial growth: binary fission and introduction to growth curve.

	3rd	8.3 Microbial growth phases: lag phase and exponential phase.
9th	1st	9.1 microbial growth phase : stationary phase and death phase.
	2nd	9.2 physical factor affecting microbial growth(pH, temperature , oxygen).
	3rd	9.3 chemical factor affecting growth- control of microbial growth (physical method).
10th	1st	10.1 control of microbial growth (chemical method and disinfectants)
	2nd	10.2 antibiotics : mechanism of action and antibiotic resistance.
	3rd	10.3 microbial genetics: protein synthesis(transcription and translation)
11th	1st	11.1 genetic recombination in bacteria: transduction.
	2nd	11.2 genetic recombination in bacteria : conjugation.
	3rd	11.3 pathogenic micro organism and infectious disease.
12th	1st	12.1 major bacterial and viral infectious disease in human.
	2nd	12.2 industrial microbiology: fermentation process and products.
	3rd	12.3 environmental microbiology : microbial echology and role in echosysytem.
13th	1st	13.1 Micro organism in food industry: prevention , spoilage and fermented foods.
	2nd	13.2 micro organism in waste treatment: primary, secondary and tertiary treatment.
	3rd	13.3 application of micro organism in biotechnology.
14th	1st	14.1 nitrogen fixation : biological mechanism and symbiotic/ non symbiotic microbes.
	2nd	14.2 comperehenshive review of unit 5 and core synthesis.
	3rd	14. question answer discussion end term practice.

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Discipline: Biotechnology.	**Semester: 3rd**	**Name of the teaching faculty: Swetangini Naik**
Subject: Biochemistry (Th2)	No. of Days/ per week class allotted: 3	Semester from date : 01/07/2026 to date : 05/11/2026 No. of weeks : 15
Week	Class Day	Theory / Practical Topics
1st	1st	**Unit-I** Introduction to Biochemistry: definition, scope, and importance of biochemistry
	2nd	overview of biomolecules and metabolism
	3rd	Micro biomolecules and macro biomolecules
2nd	1st	water and its role in biological systems
	2nd	water and its role in biological systems
	3rd	**Unit-II** Carbohydrates: Introduction, Classification
3rd	1st	Monosaccharides with structure
	2nd	disaccharides, with examples, importance
	3rd	polysaccharides with examples, importance
4th	1st	Glycolysis,
	2nd	Gluconeogenesis
	3rd	Citric acid cycle
5th	1st	Amino acids,
	2nd	Protein structure
	3rd	Enzymes: Types, mechanisms of action,
6th	1st	Enzyme kinetics,
	2nd	Factors affecting Enzyme activity
	3rd	**Unit: III** Lipids: Introduction

7th	1st	Classification of Lipids
	2nd	Structure of Lipids
	3rd	Functions of lipids in biological systems
8th	1st	Nucleic Acids: Introduction, DNA & RNA
	2nd	Structure and function of DNA
	3rd	Structure and function of DNA
9th	1st	Structure and function of RNA
	2nd	Structure and function of RNA
	3rd	Doubt clearing class
10th	1st	**Unit: IV** Metabolism and Bioenergetics: Overview of metabolism
	2nd	Anabolism
	3rd	catabolism
11th	1st	ATP: The energy currency of the cell
	2nd	ATP: The energy currency of the cell
	3rd	Electron transport chain
12th	1st	Electron transport chain
	2nd	oxidative phosphorylation
	3rd	Doubt clearing session
13th	1st	**Unit: V** Clinical Biochemistry and Applications
	2nd	Biochemical basis of diseases: diabetes
	3rd	Obesity, genetic disorders
14th	1st	Diagnostic enzymes
	2nd	biomarkers,

	3rd	Role of biochemistry in medicine
15th	1st	nutrition, and environmental science
	2nd	Doubt clearing class
	3rd	Previous year question discussion

Discipline : Biotechnology.	**Semester : 3rd**	**Name of the teaching faculty : Anasuya Dash**
Subject : Th5 Cell Biology	No. of Days/ per week class allotted: 3	Semester from date : 01/07/2026 to date : 05/11/2026 No. of weeks : 15
Week	Class Day	Theory / Practical Topics
1st	1st	1.1 Introduction to cell biology – meaning, definition, scope and importance.
	2nd	1.2 History of cell biology major discoveries and development of cell biology.
	3rd	1.3 Cell theory – principles and significance of cells.
2nd	1st	2.1 Prokaryotic and eukaryotic cells – basic characteristics.
	2nd	2.2 Difference between prokaryotic and eukaryotic cells.
	3rd	2.3 Overall structure of a cell, plasma membrane – introduction and function.
3rd	1st	3.1 Cytoplasm and cytoskeleton – components and functions.
	2nd	3.2 Nucleus – structure, nuclear envelope, nucleolus and functions.
	3rd	3.3 Mitochondria – structure and functions.
4th	1st	4.1 Endoplasmic reticulum – rough and smooth ER.
	2nd	4.2 Golgi apparatus – structure and functions.
	3rd	4.3 Lysosomes and peroxisomes – structure and functions.
5th	1st	5.1 Ribosomes – structures, types and function in protein synthesis.
	2nd	5.2 Chloroplasts in plant cells – structure and functions.
	3rd	5.3 Revision of cell structure and organelles; comparison of organelles.
6th	1st	6.1 Cell membrane – structure and components.
	2nd	6.2 Fluid mosaic model of the cell membrane.
	3rd	6.3 Passive transport – diffusion, facilitated diffusion and osmosis.
7th	1st	7.1 Active transport – primary and secondary active transport.
	2nd	7.2 Endocytosis and exocytosis; revision of membrane transport.

	3rd	7.3 Introduction to cell cycle – importance and major phases.
8th	1st	8.1 G1, S and G2 phases of interphase.
	2nd	8.2 M phase and cell cycle check points.
	3rd	8.3 Mitosis – overview and significance.
9th	1st	9.1 Mitosis – prophase and metaphase.
	2nd	9.2 Mitosis – anaphase and telophase; cytokinesis.
	3rd	9.3 Meiosis – overview and significance.
10th	1st	10.1 Meiosis I – prophase I and its important events.
	2nd	10.2 Meiosis I and meiosis II – stages and differences.
	3rd	10.3 Regulation of cell cycle and its implications in cancer; revision.
11th	1st	11.1 Introduction to Microscopy – principle and importance.
	2nd	11.2 Light microscopy – principle, parts and working, applications and observation techniques.
	3rd	11.3 Electron microscopy – principle and types.
12th	1st	12.1 SEM and TEM – basic principles and applications.
	2nd	12.2 Fluorescence microscope – principle and applications.
	3rd	12.3 Cell culture techniques – introduction importance and basic requirements.
13th	1st	13.1 Basic cell culture procedure and aseptic techniques.
	2nd	13.2 Staining methods – purpose and common staining approaches.
	3rd	13.3 Flow cytometry – principle, components and application.
14th	1st	14.1 Cell signalling – introduction and importance; signalling molecules.
	2nd	14.2 Cell surface receptors – types and functions.
	3rd	14.3 Pathways of intracellular signal transduction.
15th	1st	15.1 Signal transduction and cytoskeleton; development and causes of cancer.
	2nd	15.2 Oncogenes and tumor suppressor genes.
	3rd	15.3 Complete course revision.

Discipline : Biotechnology.	**Semester : 3rd**	**Name of the teaching faculty : Anasuya Dash**
Subject : Th3 Instrumentation	No. of Days/ per week class allotted: 3	Semester from date : 01/07/2026 to date : 05/11/2026 No. of weeks : 15
Week	Class Day	Theory / Practical Topics
1st	1st	1.1 Introduction to instrumentation; importance and applications in biotechnology.
	2nd	1.2 Simple microscopy and phase contrast microscopy – principle, working and application.
	3rd	1.3 Fluorescence and electron microscopy (SEM and TEM) – principle, working and application.
2nd	1st	2.1 pH meter – principle, components, calibration and measurement of pH.
	2nd	2.2 Absorption and emission spectroscopy – basic principles and applications.
	3rd	2.3 Principle of absorption spectroscopy and Beer – Lambert law.
3rd	1st	3.1 Fluorimetry – principle, instrumentation and applications.
	2nd	3.2 Colorimetry – principle, components and working.
	3rd	3.3 Spectrophotometry – principle and instrumentation.
4th	1st	4.1 Visible spectrophotometry – working, applications and measurement.
	2nd	4.2 UV and infrared spectrophotometry – principle and application.
	3rd	4.3 Centrifugation – principle and basic procedure.
5th	1st	5.1 Types of centrifuges – laboratory, high speed and ultra centrifuge.
	2nd	5.2 Cell fractionation techniques – principle and basic procedure.
	3rd	5.3 Isolation of sub cellular organelles and particles.
6th	1st	6.1 Introduction to chromatography – principle, terminology and applications.
	2nd	6.2 Paper chromatography – principle, procedure and applications.
	3rd	6.3 Thin Layer chromatography (TLC) – principle, materials and procedure.
7th	1st	7.1 TLC – separation, detection and calculation of Rf value.

	2nd	7.2 Column chromatography – principle, components and working.
	3rd	7.3 Silica gel filtration chromatography – principle, components and working.
8th	1st	8.1 Gel filtration chromatography – principle and separation based on molecular size.
	2nd	8.2 Affinity chromatography – principle, ligand and applications.
	3rd	8.3 Ion exchange chromatography – principle, cation and anion exchange.
9th	1st	9.1 Gas chromatography and HPLC – principles, instrumentation and applications.
	2nd	9.2 Introduction to Electrophoresis – principle, factors affecting migration and application.
	3rd	9.3 Agarose gel electrophoresis – principle, materials and procedure.
10th	1st	10.1 Agarose gel electrophoresis – separation and visualization of DNA.
	2nd	10.2 Polyacrylamide gel electrophoresis (PAGE) – principle and applications.
	3rd	10.3 Native PAGE – principle and procedure.
11th	1st	11.1 SDS–PAGE – principle, sample preparation and working.
	2nd	11.2 SDS–PAGE – protein separation and interpretation of bands.
	3rd	11.3 Agarose gel vs PAGE vs SDS–PAGE – comparison and application.
12th	1st	12.1 Pulse field gel electrophoresis – principle and application.
	2nd	12.2 Immunoelectrophoresis – principle and application.
	3rd	12.3 Isoelectric focusing – principle and separation based on pl.
13th	1st	13.1 Western blotting – principle, steps and application.
	2nd	13.2 Western blotting – detection and interpretation of result.
	3rd	13.3 Introduction to biosensor – definition, principle and components.
14th	1st	14.1 Biosensors – type, working and application in biotechnology.
	2nd	14.2 Introduction to nanotechnology – basic concept and importance.
	3rd	14.3 Nanotechnology – applications in biotechnology and biomedical field.

15th	1st	15.1 PCR – principle, components and basic steps.
	2nd	15.2 PCR – denaturation, annealing and extension; applications.
	3rd	15.3 RT – PCR and comparison with PCR.