

K.T.S.P.MANDAL'S
SAHEBRAOJI BUTTEPATIL MAHAVIDYALAYA
RAJGURUNAGAR
DEPARTMENT OF MICROBIOLOGY
TEACHING PLAN 2025-26
SEMESTER II
F.Y.B.Sc.

Subject – MB-151-T – Basics of Microbiology

Teacher Name – Prof. A.A.Indais

Month	Credit	Topics
December and January 2025	1	a. 1. Bacterial Cytology Morphology b. [Cell size, shape and arrangements of Bacteria] Structure, chemical composition, and functions of the following components in the bacterial cell: a. Cell wall (Gram positive, Gram negative) b. Concept of Mycoplasma, Spheroplast, protoplast, L-form c. Cell membrane d. Endospore (spore formation and stages of sporulation) e. Capsule f. Flagella g. Fimbriae and Pili h. Ribosomes i. Chromosomal & extra-chromosomal material j. Cell inclusion bodies. 2. Chemical Basis of Microbiology a. Atom, Biomolecules, types of bonds (covalent, co-ordinate bond, non-covalent) and linkages (ester, phospho-diester, peptide and glycosidic) b. Biomolecules: Classification, Structure, organization and functions of the following biomolecules i) Carbohydrates ii) Proteins iii) Lipids iv) Nucleic acids Classification of Bacteria: Introduction to Bergey's Manual of Determinative Bacteriology Characteristics & Classification of Viruses: ICTV nomenclature

February and March 2025	2	1. Cultivation of Microorganisms: a. Nutritional requirements and nutritional classification. b. Design and preparation of media: Common media ingredients and media types. c. Methods for cultivating photosynthetic, extremophilic, and chemo-lithotrophic bacteria, anaerobic bacteria, algae, fungi, actinomycetes, and viruses. d. Concept of Enrichment, Pure Culture, Isolation of culture by streak plate, pour plate, spread plate. e. Maintenance of bacterial and fungal cultures using different techniques. f. Culture collection centers and their role.- Requirements and guidelines of the National Biodiversity Authority for culture collection centers. 2. Bacterial growth: a. Kinetics of bacterial growth (Exponential growth model) b. Growth curve and Generation time c. Diauxic growth d. Measurement of bacterial growth- Methods of enumeration: i. Microscopic methods (Direct microscopic count, counting cells using improved Neubauer, Petroff-Hausser's chamber) ii. Plate counts (Total viable count) iii. Turbidometric methods (including Nephelometry) iv. Estimation of biomass (Dry mass, Packed cell volume) v. Chemical methods (Cell carbon and nitrogen estimation) Factors affecting bacterial growth [pH, Temperature, Solute Concentration (Salt and Sugar)] and Heavy metals(oligodynamic action)
March 2025		Revision And Assignment

Prof. A.A.Indais



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TEACHING PLAN 2025-26
SEMESTER II
S.Y.B.Sc.

Subject – MB-251- MJ: Bacterial Genetics

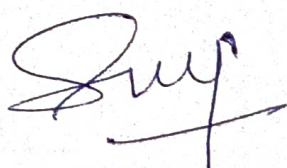
Teacher Name – Prof. A.A.Indais

Month	Credit	Topics
December and January 2025	1	Understanding DNA: Experimental evidence for nucleic acid as genetic material. a. Discovery of transforming material (hereditary material):Griffith's experiment b. Avery and MacLeod experiment c. Fraenkel-Conrat and Singer experiment (TMV virus) d. Hershay and Chase experiment b. Types of nucleic acids (DNA and RNAs) c. Structure of DNA a. Structure of Nitrogen bases, Nucleoside, Nucleotide and polynucleotide chain b. Bonds involved in DNA structure c. Different forms of DNA (A, B and Z form) d. Prokaryotic DNA replication a. Models of DNA replication (Conservative, semi-conservative and Dispersive) b. Meselson and Stahl's experiment (semi-conservative) c. Six basic rules of DNA replication d. Enzymes, proteins and other factors involved in DNA replication. e. Modes of DNA replication Rolling circle mechanism, theta and linear DNA replication

February and March 2025	2	Gene expression concept a. Genetic code and its properties b. Outline of transcription and translation Mutations and reversions Concept of Mutation, Mutation rate, Mutation frequency. Types of mutations: Point mutation, Nonsense, Missense, Silent, Conditional lethal-temperature sensitive, Amber, Reverse, suppressor a. Spontaneous Mutations - Discovery of spontaneous mutation (Fluctuation test) - Mechanism of spontaneous mutation (Tautomerism) - Isolation of Mutants: Replica plate technique b. Concept of Induced Mutations - Base pair substitution (Transitions, Transversions), Insertions and deletions-Frame / Phase shift mutations Physical Mutagenic agents: UV and X-ray Chemical mutagenic agents: - Base analogues (2 amino purine, 5 bromouracil), - HNO ₂ , Alkylating agents - Intercalating agents (EtBr, acridine orange) Plasmid genetics a. Properties of Plasmid b. Types of plasmids c. Plasmid curing
March 2025		Revision And Assignment


Prof. A.A. Indais 19/12/22




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TEACHING PLAN 2025-26
SEMESTER II
T.Y.B.Sc.

Subject – -MB-364: Molecular Biology

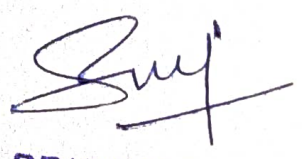
Teacher Name – Prof. A.A.Indais

Month	Credit	Topics
December and January 2025	1	Genetic Recombination and Bacteriophage Genetics. 1. Gene linkage and crossing over a. Mendel's laws: Eukaryotic Cell cycle, Mitosis, Meiosis b. Holliday model for Homologous recombination, Role of Rec and Ruvproteins c. Genetic mapping by Tetrad analysis in <i>N. crassa</i> (Numerical Calculations using PD, TT and NPD) d. Genetic Mapping by Parasexual cycle in <i>A. nidulans</i> 2. Bacteriophage Genetics 3. a. Lytic cycle: Virulent phages, T-series phages, Concept and formation of plaque, Lysogenic cycle: Temperate phage (□ phage) 4. b. Bacteriophage mutants: Plaque morphology (r type), Host range, Conditional lethal mutants (Ts and Am) 5. c. Concept of Genetic Complementation and Cis-trans test of genetic function. (Intergenic- rII locus of T4 phage, Mechanism of Intragenic complementation.) 6. d. Fine structure mapping of rII locus of T4 phage using Benzer's spot tests and deletion mapping

February and March 2025	2	DNA damage and repair mechanisms, Recombinant DNA technology 3. DNA damage and Repair mechanisms a. DNA damage by hydrolysis, deamination, alkylation, oxidation, Radiation (X rays and UV rays) b. DNA repair by Photo reactivation c. DNA repair by Mismatch repair mechanism d. DNA repair by Excision repair mechanisms (BER/NER) 4. Recombinant DNA Technology Tools and basics of recombinant DNA technology a. Introduction to recombinant DNA technology b. Restriction enzymes: Concept, Nomenclature, properties and types with examples (Eco R1, Sma I, Pst I). c. Vectors: Features of an ideal vector i. Plasmids: pBR322 ii. Bacteriophage vectors: Lambda iii. Cosmids iv. High capacity vectors: YACs, BACs v. Expression vectors d. Joining of DNA molecules- DNA Ligases (E. coli and T4 phage), Use of Linker / Adaptor / Homopolymer tailing e. Methods to transfer recombinant DNA into bacterial host cells (Physical – Electroporation, Gene gun, Chemical –CaCl ₂ mediated, liposome mediated) f. Methods of screening recombinants using selective markers and Blue- whitescreening 5. Molecular techniques used in RDT a. Isolation of genomic DNA b. Principle and methodology of Agarose gel electrophoresis and its applications c. Concept, Methodology and applications of Southern, Northern and Western blotting
March 2025		Revision And Assignment


19/12/2025
Prof. A.A. Indais




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DEPARTMENT OF MICROBIOLOGY

Teaching Plan (A.Y.2025-26)

F.Y.B.Sc. (Microbiology) NEP 2020 Pattern (Term II)

VEC-151-T: Environment Education II

Sr. No.	Month	Topic	Teacher
1	December	Identify various types of environmental pollution and their impacts on human health. Lectures, case studies on air, water, soil, noise pollution.	SRP
2	January	Explain basic concepts of climate change, including its causes and effects.	SRP
3	February	Analyze strategies for adaptation to and mitigation of climate change effects. Discussion-based learning, real-life examples	SRP
4	March	Evaluate environmental management practices and their effectiveness. Apply principles of environmental treaties and legislation to case studies.	SRP
5	April (From 15 December to 5 April)	Create action plans to address specific environmental issues based on current policies and management practices.	



Prof.S.R.Patil
Teacher Incharge


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Department of Microbiology

Teaching Plan (A.Y.2025–2026)

S.Y.B.Sc

MB-242: Air, Water and Soil Microbiology

Sr. No	Month	Topics	Teacher
1	DEC	Air Microbiology and Water Microbiology i. Air Microbiology a. Air flora • Transient nature of air flora • Droplet, droplet nuclei and aerosols b. Methods of Air sampling and types of air samplers • Impaction on solids • Impingement in liquid • Sedimentation • Centrifugation c. Air sanitation: Physical and chemical methods d. Airborne infections	ADD
2	JAN	ii. Water Microbiology a. Types of water: surface, ground, stored, distilled, mineral and de-mineralized water b. Recommended Bacteriological standards of Water Quality • Maharashtra Pollution Control Board (MPCB) Main Functions of MPCB Water quality standards for best designated usages • Central Pollution Control Board(CPCB) Main Functions of CPCB Designated Best Use Water Quality Criteria c. Water purification methods d. Water borne Infections e. Indicators of faecal pollution: <i>Escherichia coli</i> , <i>Bifidobacterium</i> , <i>Streptococcus faecalis</i> , <i>Clostridium perfringens</i> , New indicators: <i>Campylobacter</i> and <i>Pseudomonas</i>	ADD

3	FEB	f. Bacteriological analysis of water for potability i. Bacteriological standards of potable water: Bureau of Indian standards (BIS) ii. World Health Organization(WHO) iii. Presumptive coliform count iv. Confirmed test v. Completed test vi. Eijkman test vii. Membrane filter technique	ADD
4	MAR	Soil Microbiology a. Rhizosphere microflora and its role in the rhizosphere b. Role of microorganisms in composting and humus formation c. Biofertilizers: Bacterial, Cyanobacterial, fungal and their large-scale production	ADD
5	APR	d. Biocontrol agents: Bacterial, Viral, Fungal and their large-scale production e. Brief account of microbial interactions: Symbiosis, Neutralism, Commensalism, Competition, Ammensalism, Synergism, Parasitism and Predation f. Role of microorganisms in elemental cycles in nature: Carbon, Nitrogen	ADD

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Prof.A.D.Daundkar



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DEPARTMENT OF MICROBIOLOGY

Teaching Plan (A.Y.2025-26)

T.Y.B. Sc. Microbiology (CBCS 2019 Pattern)

Subject- MB 361 MJ: Medical Microbiology II (Sem VI)

Sr No.	Month	Topics	Teacher
1	December	Routes of drug administration; Mode of action of antimicrobial agents on Bacteria – Cell wall inhibitors (β -lactams), Cell membrane (Polymyxin), Protein synthesis inhibitors (Streptomycin, Tetracycline)	SRP
2	January	Mode of action of antimicrobial agents – Nucleic acid inhibitors (Fluoroquinolones, Rifamycin); Enzyme inhibitors (Trimethoprim, Sulfonamethoxazole); Antifungal drugs (Griseofulvin, Amphotericin B, Anidulafungin, Voriconazole); Antiviral drugs (Acyclovir, Oseltamivir, Remdesivir); Antiprotozoal drugs (Metronidazole, Chloroquine)	SRP
3	February	Mechanisms of drug resistance – Genetic basis (mutations, horizontal gene transfer); Resistance mechanisms (decreased uptake, target modification, drug inactivation, active efflux)	SRP
4	March	Introduction to	SRP

		cultivation of viruses; Human viruses (general study); Respiratory viruses (Influenza virus, Corona virus); Dengue virus; Hepatitis A virus; Rotavirus; Human papillomavirus; Japanese Encephalitis virus; Animal viruses (FMD virus, Rinderpest virus); Parasites (Plasmodium, Entamoeba)	
5	April (From 15 December to 5 April)	Fungal pathogens (Aspergillus spp., Cryptococcus neoformans, Histoplasma capsulatum)	



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Department of Microbiology

A.Y.2025-26

Teaching plan-Semester VI

DSEC-MB 362 Immunology– II

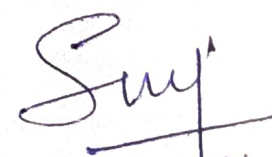
Sr.No.	Month	Topic	Teacher name
1	December	1. Cytokines: a. Concept- Cytokines, lymphokines, monokines, interleukines, chemokines, interferons and tumor necrosis factor b. Properties, Attributes and biological functions of cytokines	Prof.KKG
2	Jan	Adaptive / Acquired Immunity (Third line of defense): A. Humoral Immune Response i. Primary and secondary response kinetics, significance in vaccination programs ii. Response of secondary lymphoid organs to antigen iii. Antigen processing and presentation (Major Histocompatibility class I and class II restriction pathways), cell-cell interactions and adhesion molecules, response to super-antigens, role of cytokines in activation and differentiation of B-cells	Prof.KKG
3	Feb	3. Hypersensitivity a. General principles of different types of hypersensitivity reactions b. Gell and Coomb's classification of hypersensitivity – mechanism with examples for type I (Immediate), II, III and IV (delayed) B. Cell Mediated Immune Response i. Activation and differentiation of T cells, role of cytokines in activation	Prof.KKG

		ii. Mechanism of Cytotoxic T lymphocytes (CTL) mediated cytotoxicity, Antibody-dependent cellular cytotoxicity (ADCC) iii. Significance of Cell Mediated Immune Response (CMI) iv. Immune response against tumors and foreign transplanted cells	
4	March	4. Autoimmunity and Autoimmune diseases: a. Immunological tolerance b. Types of autoimmune diseases c. Factors contributing development of autoimmune diseases d. Immunopathological mechanisms e. Diagnosis and treatment of autoimmune diseases: Myasthenia gravis and Rheumatoid arthritis f. Therapeutic immunosuppression for autoimmunity	Prof.KKG
5	April	5. Immunodeficiency: i. Complement deficiencies ii. Introduction to congenital immunodeficiency disorders: Common Variable Immune Deficiency (CVID) and acquired immunodeficiency: Immune mechanisms in AIDS	Prof.KKG



Prof K.K. Gawade

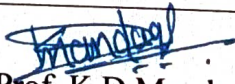


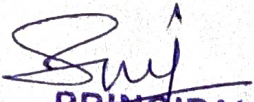

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DEPARTMENT OF MICROBIOLOGY
Teaching Plan (A.Y.2025-26), Term II
T.Y.B. Sc. Microbiology (CBCS 2019 Pattern)
Subject- MB 363: Metabolism (Semester VI)

Sr. No.	Month	Topic	Teacher
1.	December (From 17 December)	Credit I : Membrane transport and Bioenergetics 1. Membrane transport mechanisms: i. Passive transport - Diffusion, Osmosis, Facilitated transport ii. Active transport - Active transport systems in bacteria iii. Group translocation of sugars in bacteria iv. Ionophores: Mechanism and examples	KDM
2.	January	2. Bioenergetics: i. Laws of thermodynamics- first and second law ii. Concepts of free energy, entropy, high energy compounds: Pyrophosphate, enolic phosphates, acyl phosphates, thioester compounds, and guanidinium compounds . iii. Mitochondrial electron transport chain: components, arrangement of different components in the inner membrane, structure and function of ATP synthetase, inhibitors and uncouplers of ETC and oxidative phosphorylation, energetics of mitochondrial electron transport chain .	KDM
3.	February	Credit II : Metabolic pathways and Autotrophy 3. Biosynthesis and Degradation: a. Chemistry, concept of polymerization of macromolecules: Polysaccharides. (Starch, and peptidoglycan) and Lipids (Fatty acids, triglycerides and phospholipids) b. Degradation of macromolecules – Polysaccharides (starch), Lipids (fatty acids oxidation e.g. β oxidation), Proteins (urea cycle)	KDM
4.	March	4. Bacterial Photosynthesis: Photosynthetic bacteria with reference to photosynthetic apparatus, energy generation, and CO₂ fixation: a. Cyanobacteria, b. Purple bacteria	KDM
5.	April (up to 10 April)	5 Chemolithotrophy: Concept and one example, Iron oxidizing bacteria .	KDM




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Teaching Plan (A.Y.2025-26), Term II

T.Y.B. Sc. Microbiology (CBCS 2019 Pattern)

Subject- MB 365 Fermentation Technology – II (Semester VI)

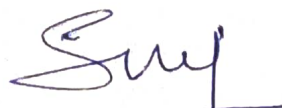
Sr. No.	Month	Topic	Teacher
1.	December (From 13 December)	Credit I : Solid state and Submerged state fermentations and Large scale fermentations : 1. Introduction to Solid State Fermentation and Submerged Fermentation: Process, production strains, media, fermentor design, fermentation conditions, applications, merits and demerits . Large scale production of (process with flow sheet, nature of the product, production pathway, applications, production strains, media, fermentation process, parameters, product recovery) a. Primary Metabolites: i. Vitamins (B12 and B2) ii. Amino acids - Glutamic acid, Lysine iii. Organic acids (Citric acid, Vinegar and Lactic acid)	KSG
2.	January	b. Secondary metabolites: i. Bioethanol ii. Alcoholic Beverages - a. Beer (Lagering, Maturation, Types of beer) b. Wine (Aging, Malo-lactic acid fermentation, types of wine, wine defects, comparison of white and red wine) iii. Antibiotics [Penicillin (natural and semi synthetic) and Streptomycin] Credit II : Large scale production of enzymes, steroids, biomass based products, milk products, vaccines, immune sera and Modern trends in microbial production : 3. Enzymes i. Amylase ii. Esterases iii. Proteases	KSG

3.	February	4. Microbial transformation of steroids . 5. Biomass based products: i. Yeast: Baker's and Distiller's yeast ii. Probiotics: <i>Lactobacillus sporogenes</i> 6. Milk products: i. Cheese (Processed, soft, semi-hard, hard ripened types- bacterial and mold) ii. Yogurt (plain, flavoured, fruit, sundae style. Stirred type, set type, probiotic yoghurt) .	KSG
4.	March	7. Vaccines i. Polio – Inactivated Polio Vaccine, Oral Polio Vaccine ii. Tetanus – Tetanus toxoid (TT) iii. Rabies – HDCC, Chick embryo cell line, Vero cell line 8. Immune sera i. Anti tetanus serum (ATS) ii. Anti rabitic serum (ARS)	KSG
5.	April (up to 10 April)	9. Modern trends in microbial production: Biosurfactant and bioemulsifier .	KSG



Prof. Gujar K.S.

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Department of Microbiology
Teaching Plan (A.Y.2025-2026)

T.Y. B. Sc. Microbiology

Course Title: MB- 366 FOOD MICROBIOLOGY

	Month	Topics	Teacher
1	DEC	Introduction to properties of food and spoilage of food 1. Classification of food- Perishable, non-perishable, and stable. Sensory characters of food- a. Definition of food b. Sensory or organoleptic factors- appearance factors-(size, shape, color, gloss, consistency, wholeness) c. Textural factors-texture changes d. Flavor factors (taste, smell, mouthfeel, temperature) 2. Factors affecting Microbial growth in food a. Intrinsic factors- pH, water activity, O-R potential, nutrient content, biological structure of food, inhibitory substances in food. b. Extrinsic factors-Temperature of storage, Relative humidity, concentration of gases.	MSJ
2	JAN	3. Sources of food spoilage microorganisms a. Contamination and spoilage of perishable foods- vegetables and fruits, Meat and meat products, Fish and other sea food, Egg and poultry products. b. Contamination and spoilage of canned foods c. Contamination and spoilage of- cereals and cereal products, sugar and sugar products, salad dressings, spices and condiments. Food Preservation and food in relation to disease 4. Principles of food preservation a. Importance of TDP, TDT, D, F, Z values b. Use of low and high temperature for food preservation. c. Use of chemicals and antibiotics in food preservation, 5. Microbial food poisoning and food infection a. Food poisoning - <i>Clostridium botulinum</i> , <i>Aspergillus flavus</i> b. Food infection- <i>Salmonella typhimurium</i> , <i>Vibrio parahaemolyticus</i>	MSJ

4	FEB	5. Microbial food poisoning and food infection a. Food poisoning -<i>Clostridium botulinum</i>, <i>Aspergillus flavus</i> b. Food infection-<i>Salmonella typhimurium</i>, <i>Vibrio parahaemolyticus</i> 5. Microbial food poisoning and food infection a. Food poisoning -<i>Clostridium botulinum</i>, <i>Aspergillus flavus</i> b. Food infection-<i>Salmonella typhimurium</i>, <i>Vibrio parahaemolyticus</i>	MSJ
5	MAR	6. Concept of Prebiotic and Probiotic and fermented food- definition, Health effects, Quality assurance, Safety, side effects and risk. Potential applications of Prebiotic, Probiotic and fermented food 7. Food sanitation and regulatory authorities (ISO, FDA, WHO)	MSJ

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Prof. M. S. JADHAV



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Department of Microbiology

Teaching Plan (A.Y.2025–2026)

T.Y. B.Sc.

Sem VI

Skilled Base Elective MB 3610 Waste Management

Sr. No	Month	Topics	Teacher
1	DEC	A. Liquid Waste Management 1. Principles of Wastewater Treatment i. The need for treatment of wastewater ii. General characteristics of liquid waste - pH, Color Turbidity, Odor, Electrical conductivity, COD, BOD, Total Solids, Total Dissolved Solids, Total Suspended Solids, Total Volatile Solids, Chlorides, Sulphates, Oil and Grease.	ADD
2	JAN	2. Microbiology of Wastewater Role of microorganisms in wastewater treatment i. Aerobic and Anaerobic digestion models; attached / anchored and suspended growth. ii. Removal of pathogenic microbes, indicator microbes, enumeration of different types of microbes	ADD
3	FEB	3. Unit operations in wastewater treatment plant i. Collection system - Methods of collection, conservancy systems, water carriage system, sewerage system. ii. Screen chamber, Grit chamber, Oil and grease removal iii. Stabilization pond, Aerated lagoon iv. Activated sludge process, Trickling filter v. Rotating biological contactors, anaerobic digestion processes, fluidized bed reactor.	ADD
4	MAR	B. Solid Waste Management and hazardous waste 4. Characterization of solid wastes: Dairy and e-waste 5. Biomedical waste: Definition, Types, Processing	ADD

4	MAR	X-ray photoelectron spectroscopy (XPS), Scanning electron microscopy (SEM), Transmission electron microscopy (TEM) and dynamic light scattering (DLS).	RSK
5	APR	4. Applications of nanoparticles: Antibacterial agent, drug delivery, biosensor, animal industry and nanotechnology in wastewater treatment.	RSK

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Prof .R.S.KOKANE



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