

K.T.S.P.MANDAL'S
SAHEBRAOJI BUTTEPATIL MAHAVIDYALAYA
RAJGURUNAGAR
SYLLABUS COMPLETION REPORT 2023-2024
DEPARTMENT OF MICROBIOLOGY
SEMESTER V
T.Y.B.Sc.

Subject –MB 351: Medical Microbiology- I

Teacher Name –Prof.R.R.Jadhav

Month	Unit	Topics
September 2023	1	<p>Introduction to infectious diseases of following human body systems:</p> <p>(Brief anatomy and physiology, Diseases, Pathogens and Symptoms)</p> <p>a. Respiratory system</p> <p>b. Gastrointestinal system</p> <p>c. Kidney and Liver</p> <p>d. Genital system</p> <p>e. Central nervous system</p>
September- 2023	2	<p>Epidemiology:</p> <p>a. Definition, scope and applications</p> <p>b. Incidence and prevalence rates, mortality and morbidity rates</p> <p>c. Disease distribution based on time, place and person</p> <p>d. Case control and cohort studies – study design and application</p> <p>e. Principle and methods – Clinical trials of drugs and vaccines</p>

		<p>(Randomized control trials Concurrent parallel and cross-over trials)</p> <p>f. Epidemiology of infectious diseases</p> <p>i. Sources and reservoirs of infection</p> <p>ii. Modes of transmission of infections</p> <p>iii. Disease prevention and control measures</p>
October 2023		<p>-- Study of following groups of bacterial pathogens: (with respect to -</p> <p>Classification and Biochemical characters, Antigenic structure, Viability</p> <p>characteristics, Pathogenicity, Pathogenesis, Symptoms, Laboratory</p> <p>diagnosis, Epidemiology, Prophylaxis and Chemotherapy</p> <p><i>a. Salmonella, Vibrio</i></p> <p><i>b. Streptococcus pneumoniae, Streptococcus pyogenes, Neisseria meningitidis and Neisseria gonorrhoeae</i></p> <p><i>c. Pseudomonas aeruginosa</i></p> <p><i>d. Treponema, Leptospira</i></p> <p><i>e. Clostridium tetani</i></p> <p><i>f. Mycobacterium tuberculosis and Mycobacterium leprae</i></p> <p><i>g. Orientiatsutsugamushiand Rickettsia rickettsii</i></p>
October 2023		<p>Revision And Assignment</p>

As per above syllabus completed theory First Semester. We have completed theory successfully.

Prof.R.R.Jadhav

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DEPARTMENT OF MICROBIOLOGY
SEMESTER V
T.Y.B.Sc.

Subject -MB 354: Genetics

Teacher Name – Prof.R.R.Jadhav

Month	Unit	Topics
September 2023	1	<p>DNA Replication and Gene Expression</p> <p>1. Process of prokaryotic DNA replication</p> <p>a. Single replicon b. Bidirectional movement of replication fork c. Ori C d. Pre-priming and Priming reaction. e. DNA polymerases, DNA synthesis of leading, lagging strand Okazaki fragments. f. Termination- Ter sequence, Tus protein</p>
September 2023	2	<p>2.Prokaryotic and Eukaryotic Transcription</p> <p>Transcription in Prokaryotes</p> <p>a. Structure of promoter b. Structure and function of RNA polymerase c. Steps of transcription: Initiation, Elongation and termination</p> <p>Transcription in eukaryotes with respect to protein coding Gene:</p> <p>a. Promoter, promoter proximal elements and enhancers b. Transcription regulatory proteins c. RNA polymerases d. Steps in transcription: Initiation, Elongation, Termination</p>

		e. Post transcriptional modifications: 5' capping, 3' polyadenylation and introduction to RNA splicing
October 2023		<p>3. Regulation of transcription: Concept and components of operon: Lac operon: Inducible operon</p> <p>4. Translation in prokaryotes and eukaryotes a. Structure and role of m-RNA, t-RNA and Ribosomes in Translation b. Role of Aminoacyl t-RNA synthetase in translation c. Steps in translation: Initiation, elongation, translocation and termination of protein synthesis d. Salient features of Eukaryotic translation</p> <p>Gene transfer and mapping techniques</p> <p>5. Gene transfer by Transformation a. Discovery of Transformation b. Natural transformation Systems- <i>Streptococcus pneumoniae</i> and <i>Haemophilus influenzae</i>. c. Factors affecting transformation i. Competence development ii. Size of DNA iii. Concentration of DNA</p>
October 2023		<p>6. Gene transfer by Conjugation a. Discovery of Conjugation, b. Properties of F plasmid, F⁺, F⁻, Hfr and F' strains c. Process of conjugation between F⁺ and F⁻, Hfr and F⁻, F' and F⁻</p> <p>7. Gene transfer by Transduction a. Discovery of Transduction b. Generalized transduction mediated by P22 c. Specialized transduction mediated by lambda phage</p> <p>8. An introduction to Gene mapping a. Gene linkage and concept of genetic recombination b. Recombination mapping: Map unit, recombination frequency c. Mapping of genes by co-transformation d. Mapping of genes by co-transduction e. Mapping by interrupted mating experiment</p>

		f. Numerical problems based on co-transformation, co-transduction and interrupted mating Revision And Assignment
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SYLLABUS COMPLETION REPORT 2023-2024

DEPARTMENT OF MICROBIOLOGY

SEMESTER V

T.Y.B.Sc.

Subject – MB 355 Fermentation Technology– I

Teacher Name –Prof. Indais A.A.

Month	Unit	Topics
August - 2023	1	<p>Upstream processes of fermentations</p> <p>1. Strain Improvement:</p> <p>a. Objectives of strain improvement</p> <p>b. Methods for strain improvement:</p> <p>i. Types of mutants used in strain improvement (altered cell permeability mutants, auxotrophs, analogue resistant mutants, revertants)</p> <p>ii. Selection of different types of mutants (replica plate method, filtration enrichment, penicillin enrichment method, gradient plate technique)</p> <p>iii. Application of rDNA technology (significance, technique for commercial recombinant products like insulin)</p> <p>2. Media optimization</p> <p>a. Objectives of media optimization</p> <p>b. Methods of media optimization:</p> <p>i. Classical approach – One factor at a time, Full factorial design</p> <p>ii. Plackett and Burman Design (with example) (Numerical problems of PBD can be discussed using software)</p> <p>iii. Response Surface Methodology (RSM)</p>
September -2023		<p>3. Sterilization of Media:</p> <p>a. Methods of sterilization</p> <p>b. Batch sterilization and Continuous sterilization (direct and indirect methods)</p> <p>c. Concept and derivation of Del factor</p> <p>d. Filter sterilization of liquid media</p>

		<p>4. Scale-up and Scale-down:</p> <p>a. Objectives of scale-up</p> <p>b. Levels of fermentation (laboratory, pilot-plant and production level – flowsheet to explain scale up)</p> <p>c. Criteria of scale-up for critical parameters [Aeration (kLa Volumetric Mass transfer coefficient), Agitation (P/V ratio, N_{Re} Reynolds number, N_p Power number, N_{Fr} Froudes number), Sterilization and broth rheology (Newtonian and non Newtonian fluids - bacterial and mycelia fungal fermentations)]</p> <p>d. Scale-down (example of any one commercial fermentation)</p>
September – October 2023	2	<p>Downstream processing and Quality assurance of fermentation products</p> <p>5. Downstream processing of fermentation products: (method, principle, types, examples of fermentations, factors affecting, merits and demerits at large scale operation)</p> <p>a. Cell disruption methods</p> <p>b. Filtration</p> <p>c. Centrifugation</p> <p>d. Liquid-liquid extraction</p> <p>e. Distillation</p> <p>f. Drying</p>
October 2023		<p>6. Quality assurance of fermentation products (as per IP, USP)</p> <p>a. Methods of detection and Quantification of the fermentation product: physicochemical, biological and enzymatic methods</p> <p>b. Sterility testing (direct inoculation method, membrane filtration method)</p> <p>c. Bioburden test</p> <p>d. Microbial limit test</p> <p>e. Pyrogen testing: Endotoxin detection (LAL test)</p> <p>f. Ames test and modified Ames test</p> <p>g. Toxicity testing (Acute toxicity)</p> <p>h. Shelf life determination</p> <p>7. Fermentation economics:</p> <p>a. Contribution of various expense heads to a process (Recurring and nonrecurring expenditures) citing any suitable example.</p> <p>b. Introduction to Intellectual Property Rights – Types of IPR (patenting in fermentation industry)</p> <p>c. Concept of validation(significance of SOPs)</p>

		Revision And Assignment
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Prof. Indais A.A.

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SEMESTER V
T.Y.B.Sc.

Subject – MB 356: Agricultural Microbiology
Teacher Name –Prof. P.P.Chaudhary

Month	Unit	Topics

<p>August 2023</p>	<p>1</p>	<p>Plant Pathology</p> <p>1. Plant growth improvement and Stages in development of a disease a. Plant growth improvement with respect to disease resistance b. Stages in development of a disease: Infection, invasion, colonization, dissemination of pathogens and perennation</p> <p>2. Classification of disease based on symptoms (with one example of the following): Canker, Downy mildew, Mosaic</p> <p>3. Plant disease epidemiology Concepts of monocyclic, polycyclic and polyetic diseases with one example of each, disease triangle and forecasting of plant diseases.</p>
<p>August - September 2023</p>	<p>2</p>	<p>4. Methods of plant disease control i. Eradication ii. Chemical control iii. Biological control (employing bacterial and fungal cultures) iv. Integrated pest management v. Genetic engineering for disease resistant plants</p> <p>Microorganisms in sustainable Agriculture and tools in plant genetic engineering</p> <p>5. Microorganisms in sustainable Agriculture a. Soil Micro biome (plant Micro biome): Concept, Composition, functioning and methods to study plant Micro biome b. Conservation of soil health: Role of microorganisms in soil health c. Phytonutrient availability by soil microorganisms Mechanism of diazotrophy, Phosphate solubilization, Potassium mobilization, micronutrient availability</p>
<p>September 2023</p>		<p>d. Biofilm in plant surfaces, Biofilm formation; Biofilm in Phyllosphere and rhizosphere, Examples of plant- microbe interactions in biofilms, Biotechnological applications of plant biofilms</p>
<p>October-2023</p>	<p>3</p>	<p>6 Microorganisms in plant genetic engineering: a. Concept of GM crops (Transgenic crops) w.r.t. to edible vaccines, insecticide resistance, herbicide resistance, improved varieties, new variants, disease resistance</p>

		<p>b. Tools and techniques:</p> <ul style="list-style-type: none">i. Microorganisms as tools in plant genetic engineering (Shuttle vectors)ii Technology of BT resistant cropsiii. Concept of edible vaccinesiv Technique of use of plant viruses in genetic engineering <p>c. RNAi Technology and antisense RNA technology in disease resistant plant varieties</p> <p>Revision And Assignment</p>
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Prof. P.P.Chaudhary

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SEMESTER V
T.Y.B.Sc.

Subject –MB 3510 Marine Microbiology
Teacher Name – Prof. P.P.Chaudhary

Month	Unit	Topics
September 2023	1	1. Marine ecology and sampling a. Marine Habitats – estuaries, mangroves, coral reefs, salt marshes, coastal ecosystems, deep sea, hydrothermal vents, Polar habitat –Arctic, Antarctica, Southern Ocean b. Physiology of marine microorganisms – metabolic diversity, marine loop, marine snow, Role of marine microorganisms in biogeochemical cycles, nutrient cycling and hydrocarbon degradation c. Sampling methods– water sampling (Niskin sampler) and sediment sampling (Grab sampler, box corer, gravity corer), Culturing methods – VBNC, biofilm, mats from vents and estuarine sample.

October-2023	2	<p>2. Marine microbes, role in bioremediation and bioprospecting</p> <p>a. Extremophilic microorganisms – econiches, different types with examples and significance</p> <p>b. Archaea –biodiversity, stress response, adaptation and significance</p> <p>c. Marine mycology – econiche, types of marine fungi and significance</p> <p>d. Bioremediation – heavy metals, hydrocarbon pollutants – tar ball and oil spills</p>
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AsperabovesyllabuscompletedtheoryFirst Semester. Wehavecompleted successfully.

Prof. P.P.Chaudhary

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SYLLABUS COMPLETION REPORT 2023-2024

SEMESTER V

T.Y.B.Sc.

Subject – MB 3511 Dairy Microbiology
Teacher Name –Prof.K.D.Mandge

Month	Unit	Topics
September 2023	1	<p>1. Definition, types, microflora and pathogens:</p> <ul style="list-style-type: none"> i. Definition of milk, Composition and physicochemical properties of Milk of different animals. Difference between colostrum and milk. ii. Types of milk: whole, toned, double toned, homogenized, and skimmed milk, dehydrated milk iii. Microflora associated with milk and its importance. iv. Sources of contamination of raw milk and relative importance in influencing quality of milk during production, collection, transportation, and storage, milk borne diseases.
September – October 2023	2	<p>2. Processing Techniques and naturally occurring preservatives</p> <ul style="list-style-type: none"> i. Bacteriological aspects of processing techniques like bactofugation, thermisation, pasteurization (in detail process is expected), sterilization and boiling. ii. Naturally occurring preservative systems in milk like LP system, immunoglobulins, Lysozyme, Lactoferrin etc. <p>3. Spoilage of Milk</p> <ul style="list-style-type: none"> i. Spoilage of Milk

		<ul style="list-style-type: none"> ii. Succession of microorganisms in milk leading to spoilage iii. Stormy fermentation, ropiness, sweet curdling iv. Color and flavor defects v. Preservation of Milk and Milk products by physical (irradiation) and Chemical agents, food grade bio preservatives (GRAS), Bacteriocins of LAB
October 2023	3	<p>4. Microbiological aspects of quality control and quality assurance in production of milk and milk products.</p> <ul style="list-style-type: none"> i. Good Manufacturing Practices, ii. Sanitary standard operating procedures, iii. Total quality management and application of HACCP program in dairy industry. iv. Safety concern of biofilm formation on equipment surfaces and their control measures

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Prof.K.D.Mandge

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Subject – MB 353: Enzymology
Teacher Name –Prof. S. P. Takale

Month	Unit	Topics
August 2023	1	<p>Enzymes:</p> <p>1. Structure of enzymes:</p> <p>a. Methods to determine amino acid residues at active site (Physical method e.g. x-ray crystallography and chemical methods such as trapping of ES complex, use of inhibitors, use of pseudo-substrate, change of pH)</p> <p>b. Role of vitamins in metabolism:</p> <p>Occurrence, Structure and Biochemical functions of the following:</p> <p>i. Thiamine (Vitamin B1) and Thiamine Pyrophosphate</p> <p>ii. Vitamin D</p>
September- 2023	2	<p>2. Enzyme assays:</p> <p>a. Principles of enzyme assays and calculation of enzyme unit, specific activity</p> <p>b. Enzymes assays with examples by:</p> <p>i. Spectrophotometric methods</p> <p>ii. Radioisotope assay</p> <p>3. Principles and Methods of Enzyme purification:</p> <p>a. Methods of cell fractionation</p> <p>b. Principles and methods of enzyme purification:</p> <p>i. Based on molecular size</p> <p>ii. Based on charge</p> <p>iii. Based on solubility differences</p> <p>iv. Based on specific binding property and selective adsorption</p> <p>c. Construction of enzyme purification chart</p> <p>Enzyme Kinetics, metabolic regulation and Immobilized Enzymes:</p>
October-2023	3	<p>4. Enzyme Kinetics:</p> <p>a. Concept and use of initial velocity</p>

		<p>b. MichaelisMenton equation for the initial velocity of single substrate enzyme catalyzed reaction. Brigg's Haldane modification of MichaelisMenton equation. MichaelisMenton plot, Lineweaver and Burk plot. Definition with significance of K_m, K_s, V_{max}</p> <p>5. Metabolic Regulations:</p> <p>a. Enzyme compartmentalization at cellular level</p> <p>b. Allosteric enzymes</p> <p>c. Feedback mechanisms</p> <p>d. Covalently modified regulatory enzymes (Glycogen phosphorylase)</p> <p>e. Proteolytic activation of zymogens</p> <p>f. Isozymes - concept and examples</p> <p>g. Multienzyme complex e.g. Pyruvate dehydrogenase complex(PDH)</p>
October-2023	4	<p>6. Immobilization of enzymes: Concept, methods of immobilization and applications</p> <p>Revision And Assignment</p>

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SYLLABUS COMPLETION REPORT 2023-2024

DEPARTMENT OF MICROBIOLOGY

SEMESTER V

T.Y.B.Sc.

Subject -MB-352 Immunology- I

Teacher Name –Prof. K.A. Bendale

Month	Unit	Topics
August 2023	1	Organs of immune system, Innate immunity, Antigen and Immunoglobulins 1. Organs of immune system: a. Primary lymphoid organs (Thymus and Bone Marrow): Thymus – structure, thymic education (positive and negative selection) Bone marrow –Structure and Negative selection b. Secondary lymphoid organs – structure and function of spleen and lymph node, mucous associated lymphoid tissue, lymphatic system and lymph circulation
August - September 2023	2	2. Innate immunity: Non-specific mechanisms of defense: Second line of defense: a. Humoral components: Defensins, pattern recognition proteins (PRP) and pathogen associated molecular patterns (PAMPs), complement, kinins, and acute phase reactants. b. Cellular components: Phagocytic cells – PMNL, macrophages (reticulo- endothelial cell system) and dendritic cells c. Phagocytosis (oxygen dependent and independent systems), Complement

		activation (Classical, Alternative and lectin pathway), Inflammation (cardinal signs, mediators, vascular and cellular changes, role of Toll-like receptors)
September 2023	3	<p>3. Antigen:</p> <p>a. Factors affecting immunogenicity</p> <p>b. Antigenic determinants, haptens and cross-reactivity, Carrier, Adjuvants</p> <p>c. Types of antigens: Thymus-dependent and thymus-independent antigens, Synthetic antigens, Soluble and particulate antigens, Autoantigens, Isoantigens</p> <p>4. Immunoglobulins:</p> <p>a. Characteristic of domain structure, functions of light and heavy chain domains and antigenic nature of immunoglobulin molecules</p> <p>b. Molecular basis of antibody diversity (kappa, lambda and heavy chain)</p> <p>Antigen- Antibody Interactions, Major Histocompatibility Complex, Transplantation and Immunity and Hybridoma Technology and Monoclonal Antibodies</p>
October -2023	4	<p>5. Antigen- Antibody Interactions:</p> <p>A. Principles of interactions: Antibody affinity and avidity, ratio of antigen antibody, lattice hypothesis and two stage theory, antigen-antibody reaction kinetics (dialysis equilibrium experiment)</p> <p>B. Visualization of antigen antibody complexes:</p> <p>a. Precipitation reactions: in fluid and in gel, immunoelectrophoresis</p> <p>b. Agglutination reactions: hemagglutination, bacterial agglutination, passive agglutination and agglutination-inhibition</p> <p>c. Immunofluorescence techniques: direct and indirect, fluorescence-activated cell sorting (FACS)</p> <p>d. Enzyme-linked immunosorbent assay (ELISA), biotin-avidin system and enzyme-linked immune absorbent spot (ELISpot) assay</p> <p>e. Radioimmunoassay RIA</p> <p>6. Major Histocompatibility Complex:</p> <p>a. Structure of MHC in man and mouse</p> <p>b. Structure and functions of MHC class-I and class-II molecules</p>

		<p>c. MHC antigen typing (microcytotoxicity and mixed lymphocyte reaction)</p> <p>7. Transplantation and Immunity;</p> <p>a. Types of Grafts, Allograft rejection mechanisms</p> <p>b. Prevention of allograft rejection</p> <p>Revision And Assignment</p>
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Prof. K.A. Bendale

K.T.S.P.MANDAL'S

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SYLLABUS COMPLETION REPORT

A.Y. 2023-2024

SEMESTER VI

T.Y.B.Sc.

Subject – MB 361: Medical Microbiology II

Teacher Name –Prof. A.A.Indais and Prof P.P.Tilekar

Month	Unit	Topics
Janaury 2024	1	Chemotherapy 1. Routes of drug administration. 2. Mode of action of antimicrobial agents on: a. Bacteria: i. Cell wall: Beta lactams: 1 st to 6 th Generation- e.g. Meropenem, Imipenem, Piperacillin, Tazobactam ii. Cell membrane: Polymyxin iii. Protein synthesis: Streptomycin, Tetracycline iv. Nucleic acids: Fluroquinolones, Rifamycin v. Enzyme inhibitors: Trimethoprim, Sulfomethaxazole b. Fungi: Griseofulvin, Amphotericin B, Anidulafungin, Vericonazole c. Viruses: Acyclovir, Oseltamivir, Remdecivir d. Protozoa: Metronidazole, Chloroquine
Febraury- March 2024	2	3. Mechanisms of drug resistance on: a. Genetic basis: i. Mutations in gene(s) ii. Acquisition of foreign DNA coding for resistance determinants through horizontal gene transfer. b. Mechanisms of drug resistance by: i. Limiting uptake of a drug. ii. Modification of a drug target. iii. Inactivation of a drug. iv. Active efflux of a drug. Human and Animal Viruses, Fungal and Protozoal Pathogens over trials) f. Epidemiology of infectious diseases i. Sources and reservoirs of infection ii. Modes of transmission of infections iii. Disease prevention and control measures

<p>March - April 2024</p>	<p>3</p>	<p>4. Introduction to cultivation of viruses</p> <p>5. Study of following groups of viral pathogens:</p> <p>a. Human viruses (with respect to – Virion, Characteristics, Viability characteristics, Pathogenicity, Pathogenesis, Symptoms, Laboratory diagnosis including serological diagnosis, Epidemiology, Prophylaxis and Chemotherapy):</p> <p>i. Respiratory Viruses: Influenza Virus, Corona Virus</p> <p>ii. Hemorrhagic Virus: Dengue</p> <p>iii. Hepatic Virus: Hepatitis A Virus</p> <p>iv. Gastrointestinal Virus: Rotavirus</p> <p>v. Cutaneous Viruses: Human papillomavirus</p> <p>vi. Neurological Viruses: Japanese Encephalitis Virus</p> <p>b. Animal Viruses: FMD Virus and Rinderpest Virus</p> <p>6. Study of following groups of parasites (with respect to – Classification, Lifecycle, Morphological characteristics, Viability characteristics, Pathogenicity, Pathogenesis, Symptoms, Laboratory diagnosis (Serological diagnosis wherever applicable), Epidemiology, Prophylaxis and Chemotherapy):</p> <p>a. Plasmodium</p> <p>b. Entamoeba</p> <p>7. Study of following groups of yeast and fungal pathogens (With respect to – Morphological and cultural characteristics, Classification, Pathogenicity, Pathogenesis, Symptoms, Laboratory diagnosis,</p>
<p>April 2024</p>	<p>4</p>	<p>Epidemiology, Prophylaxis and Chemotherapy)</p> <p>a. <i>Aspergillus</i> species (Pathogenic)</p> <p>b. <i>Cryptococcus neoformans</i></p> <p>c. <i>Histoplasma capsulatum</i></p> <p>Revision And Assignment</p>

Prof. A.A.Indais

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SYLLABUS COMPLETION REPORT

A.Y. 2023-2024

SEMESTER VI

T.Y.B.Sc.

Subject -MB 362 Immunology– II

Teacher Name –Prof. P.P.Tilekar

Month	Unit	Topics
Janaury 2024	1	Cytokines, Adaptive / Acquired Immunity, Hypersensitivity, Autoimmunity and Autoimmune diseases and Immunodeficiency 1. Cytokines: a. Concept- Cytokines, lymphokines, monokines, interleukines, chemokines, interferons and tumor necrosis factor b. Properties, Attributes and biological functions of cytokines 2. 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
Febraury 2024	2	B. Cell Mediated Immune Response i. Activation and differentiation of T cells, role of cytokines in activation 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
March –2024	3	Hypersensitivity, Autoimmunity and Autoimmune diseases and Immunodeficiency 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) 4. Autoimmunity and Autoimmune diseases:

		<ul style="list-style-type: none"> 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
April 2024	4	<p>5. Immunodeficiency:</p> <ul style="list-style-type: none"> i. Complement deficiencies ii. Introduction to congenital immunodeficiency disorders: Common Variable Immune Deficiency (CVID) and acquired immunodeficiency: Immune mechanisms in AIDS <p>Revision And Assignment</p>

Prof. P.P.Tilekar

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Subject – MB 363: Metabolism
Teacher Name –Prof. S.P.Takale

Month	Unit	Topics
Janaury 2024	1	<p>Membrane transport and Bioenergetics</p> <p>1. Membrane transport mechanisms:</p> <ul style="list-style-type: none"> 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 <p>2. Bioenergetics:</p> <ul style="list-style-type: none"> 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 synthatase, inhibitors and uncouplers of ETC and oxidative phosphorylation, energetics of mitochondrial electron transport chain
Febraury – 2024	2	<p>Metabolic pathways and Autotrophy</p> <p>3. Biosynthesis and Degradation:</p> <ul style="list-style-type: none"> 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)
March – 2024	3	<p>4. Bacterial Photosynthesis: Photosynthetic bacteria with reference to photosynthetic apparatus, energy generation, and CO₂ fixation</p> <ul style="list-style-type: none"> a. Cyanobacteria, b. Purple bacteria
April 2024	4	<p>4. Bacterial Photosynthesis: Photosynthetic bacteria with reference to photosynthetic apparatus, energy generation, and CO₂ fixation</p> <ul style="list-style-type: none"> a. Cyanobacteria, b. Purple bacteria <p>5 Chemolithotrophy:</p>

		Concept and one example, Iron oxidizing bacteria
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Prof. S.P.Takale

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SEMESTER VI
T.Y.B.Sc.

Subject – -MB-364: Molecular Biology
Teacher Name –Prof. A.A.Indais

Month	Unit	Topics
January 2024	1	<p>Genetic Recombination and Bacteriophage Genetics.</p> <p>1. Gene linkage and crossing over</p> <p>a. Mendel's laws: Eukaryotic Cell cycle, Mitosis, Meiosis</p> <p>b. Holliday model for Homologous recombination, Role of Rec and Ruv proteins</p> <p>c. Genetic mapping by Tetrad analysis in <i>N. crassa</i> (Numerical Calculations using PD, TT and NPD)</p> <p>d. Genetic Mapping by Parasexual cycle in <i>A. nidulans</i></p> <p>2. Bacteriophage Genetics</p> <p>a. Lytic cycle: Virulent phages, T-series phages, Concept and formation of plaque, Lysogenic cycle: Temperate phage (□ phage)</p> <p>b. Bacteriophage mutants: Plaque morphology (r type), Host range, Conditional lethal mutants (Ts and Am)</p> <p>c. Concept of Genetic Complementation and Cis-trans test of genetic function. (Intergenic- rII locus of T4 phage, Mechanism of Intragenic complementation.)</p> <p>d. Fine structure mapping of rII locus of T4 phage using Benzer's spot tests and deletion mapping</p>
February – 2024	2	<p>DNA damage and repair mechanisms, Recombinant DNA technology</p> <p>3. DNA damage and Repair mechanisms</p> <p>a. DNA damage by hydrolysis, deamination, alkylation, oxidation, Radiation (X rays and UV rays)</p> <p>b. DNA repair by Photo reactivation</p> <p>c. DNA repair by Mismatch repair mechanism</p> <p>d. DNA repair by Excision repair mechanisms (BER/NER)</p>

<p>March – 2024</p>	<p>3</p>	<p>4. Recombinant DNA Technology Tools and basics of recombinant DNA technology</p> <p>a. Introduction to recombinant DNA technology</p> <p>b. Restriction enzymes: Concept, Nomenclature, properties and types with examples (Eco R1, Sma I, Pst I).</p> <p>c. Vectors: Features of an ideal vector</p> <p>i. Plasmids: pBR322</p> <p>ii. Bacteriophage vectors: Lambda</p> <p>iii. Cosmids</p> <p>iv. High capacity vectors: YACs, BACs</p> <p>v. Expression vectors</p> <p>d. Joining of DNA molecules- DNA Ligases (<i>E. coli</i> and T4 phage), Use of Linker / Adaptor / Homopolymer tailing</p> <p>e. Methods to transfer recombinant DNA into bacterial host cells (Physical – Electroporation, Gene gun, Chemical – CaCl₂ mediated, liposome mediated)</p> <p>f. Methods of screening recombinants using selective markers and Blue-white screening</p>
<p>April- 2024</p>	<p>4</p>	<p>5. Molecular techniques used in RDT</p> <p>a. Isolation of genomic DNA</p> <p>b. Principle and methodology of Agarose gel electrophoresis and its applications</p> <p>c. Concept, Methodology and applications of Southern, Northern and Western blotting and non recurring expenditures) citing any suitable example.</p> <p>Introduction to Intellectual Property Rights (IPR) - Types of IPR</p> <p>Revision And Assignment</p>

Prof. A.A.Indais

K.T.S.P.MANDAL'S

SAHEBRAOJI BUTTEPATIL MAHAVIDYALAYA

RAJGURUNAGAR

SYLLABUS COMPLETION REPORT

A.Y. 2023-2024

SEMESTER VI

T.Y.B.Sc.

Subject – MB 365 Fermentation Technology – II

Teacher Name – Prof. M.S.Jadhav

Month	Unit	Topics
Febraury 2024	1	<p>Solid state and Submerged state fermentations and Large scale fermentations</p> <p>1. Introduction to Solid State Fermentation and Submerged Fermentation: Process, production strains, media, fermentor design, fermentation conditions, applications, merits and demerits</p> <p>2. Large scale production of (process with flow sheet, nature of the product, production pathway, applications, production strains, media, fermentation process, parameters, product recovery)</p> <p>a. Primary Metabolites:</p> <ul style="list-style-type: none">i. Vitamins (B12 and B2)ii. Amino acids - Glutamic acid, Lysineiii. Organic acids (Citric acid, Vinegar and Lactic acid) <p>b. Secondary metabolites:</p> <ul style="list-style-type: none">i. Bioethanol
Febraury – March 2024	2	<ul style="list-style-type: none">ii. Alcoholic Beverages -<ul style="list-style-type: none">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] <p>Large scale production of enzymes, steroids, biomass based products, milk products, vaccines, immune sera and Modern trends in microbial production</p> <p>3. Enzymes</p> <ul style="list-style-type: none">i. Amylaseii. Esterasesiii. Proteases

<p>March – April 2024</p>	<p>3</p>	<p>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)</p>
<p>April 2024</p>	<p>4</p>	<p>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) 9. Modern trends in microbial production: Biosurfactant and bioemulsifier</p> <p>Revision And Assignment</p>

Prof. M.S.Jadhav

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SYLLABUS COMPLETION REPORT

A.Y. 2023-2024

SEMESTER VI

T.Y.B.Sc.

Subject – MB 366: Food Microbiology

Teacher Name –Prof. K.D.Mandge

Month	Unit	Topics
Febraury 2024	1	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.
March 2024	2	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. ii. Stability of enzyme activity at pH and temperature
March – April 2024	3	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, d. Canning

		<p>e. Dehydration f. Use of radiation g. Tetra pack technology h. Food grade bio preservatives</p> <p>5. Microbial food poisoning and food infection</p> <p>a. Food poisoning -<i>Clostridium botulinum, Aspergillus flavus</i> b. Food infection-<i>Salmonella typhimurium, Vibrio parahaemolyticus</i></p>
April 2024	4	<p>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</p> <p>7. Food sanitation and regulatory authorities (ISO, FDA, WHO)</p>

Prof. K.D.Mandge

K.T.S.P.MANDAL'S
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SYLLABUS COMPLETION REPORT
A.Y. 2023-2024
SEMESTER VI

T.Y.B.Sc.

Subject – MB 3610 Waste Management

Teacher Name –Prof. M.S.Jadhav

Month	Unit	Topics
Febrary – March 2024	1	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. 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
March 2024	2	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.
April 2024	3	B. Solid Waste Management and hazardous waste 4. Characterization of solid wastes: Dairy and e-waste 5. Biomedical waste: Definition, Types, Processing 6. Solid biodegradable waste processing: Composting, Vermi composting, Biogas production 7. Post-processing by-products of municipal solid waste treatment: leachate refused-derived fuel (RDF)

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Prof. M.S.Jadhav

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A.Y. 2023-2024
SEMESTER VI

T.Y.B.Sc.

Subject – MB 3611 Nano-biotechnology

Teacher Name –Prof. S.P.Takale

Month	Unit	Topics
Febraury – March 2024	1	1. Introduction to Nano-biotechnology: a. Introduction to nanoscale, nanomaterials, nanoscience and nanotechnology b. Nanoscale bioassemblies c. Liposomes, viruses, DNA, polysaccharides and proteins (Protein nanotubes, nanofibers, peptide nanoparticles). d. Biomedical applications of bioassemblies e. Cell targeting, drug delivery, bioimaging and vaccine development.
March 2024	2	2. Microbial mediated metallic nanoparticles synthesis: a. Gold nanoparticles (AuNPs) b. Silver nanoparticles (AgNPs) c. Au-Ag alloy nanoparticles d. Oxide nanoparticles e. Magnetic nanoparticles f. Non-magnetic oxide nanoparticles g. Sulfide nanoparticles etc.
April –2024	3	3. Characterization techniques for nanomaterials: UV-visual spectroscopy, Fourier transform infrared (FTIR), X-ray diffraction (XRD), X-ray photoelectron spectroscopy (XPS), Scanning electron microscopy (SEM), Transmission electron microscopy (TEM) and dynamic light scattering (DLS). 4. Applications of nanoparticles:

		Antibacterial agent, drug delivery, biosensor, animal industry and nanotechnology in wastewater treatment.
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Prof. S.P.Takale