

KTSPM
Sahebraoji Buttepatil Mahavidyalaya, Rajgurunagar

Science Faculty

Academic Calendar 2022-23

Month	Tentative Dates	Description
June	15 June 2022	Commencement of First term
	15 June 2022	Meeting of teaching and non-teaching staff for planning for academic year
	21 June 2022	Celebration of International Yoga Day
	3 rd and 4 th week of June	Undergraduate Admission Process (First year)
July	First week	Updation of BCUD and College Profile
	Second week	Display of Various Committees
	Third Week	Conduction of Univ Exam-2021-22
August	First week	Commencement of lectures for FYBSc classes
	15 th August 2022	Independence Day
	3 rd and 4 th week	Commencement of UG practical
September	First week	Commencement of lectures for SY and TY BSc classes Celebration of Teacher's Day
	Second week	Commencement of UG practical Conduction od Avishkar-22 Conduction of Field Visit
October	2 nd Oct 2022	Gandhi Jayanti
	Second week	UG Internal Examinations

	Third and Fourth Week	Diwali Vacation
November	First week	Term end meeting of teaching and non-teaching staff
	26 th November	Constitution of India day
December	First week	Commencement of Second Term
	Third and Fourth Week	Departmental Cultural , co curricular and extra and extra- curricular activities / annual Social gathering
January	Second week	Annual Social Gathering
	26th January 23	Republic Day
February	First week	Annual Prize Distribution
	Third and Fourth week	UG Internal Examinations
	28 th February	Science Day
March	Second and Third Week	UG Practical Examination FYBSc
April	-	UG Practical Examination SYBSc and TYBSC
May	1 st May 2023	Celebration of Maharashtra Din
	4th May 2023	Term end meeting
		End of Semester

Coordinator, IQAC

Principal

Date : 1st July 2022

**K.T.S.P.MANDAL'S
SAHEBRAOJI BUTTEPATIL MAHAVIDYALAYA,
RAJGURUNAGAR, TAL- KHED, DIST- PUNE**

DEPARTMENT OF MICROBIOLOGY

TEACHING PLAN

**F. Y. B. SC. -MICROBIOLOGY: 2022-2023
Paper I:MB-111 Introduction to Microbial World
Semester I**

SR. NO	MONTH	TOPICS	TEACHER
Credit I	SEPTEMBER	Amazing world of Microbiology Development of microbiology as a discipline - Discovery of microscope and Microorganisms (Anton von Leeuwenhoek and Robert Hooke), Abiogenesis v/s biogenesis (Aristotle's notion about spontaneous generation, Francesco Redi's experiment, Louis Pasteur's & Tyndall's experiments)	KDG
	SEPTEMBER AND OCTOBER	Golden Era of Microbiology Contributions of - Louis Pasteur (Fermentation, Rabies, Pasteurization and Cholera vaccine-fowl cholera experiment) Robert Koch (Koch's Postulates, Germ theory of disease, Tuberculosis and Cholera-isolation and staining techniques of causative agent) Ferdinand Cohn (Endospore discovery), Discovery of viruses (TMV and Bacteriophages), River's Postulates Contribution of Joseph Lister (antiseptic surgery), Paul Ehrlich (Chemotherapy), Elie Metchnikoff (Phagocytosis), Edward Jenner (Vaccination) and Alexander Fleming (Penicillin) in establishment of fields of medical microbiology and immunology, Discovery of Streptomycin by Waksman Contribution of Martinus W. Beijerinck (Enrichment culture technique, Rhizobium), Sergei N. Winogradsky (Nitrogen fixation and Chemo-lithotrophy) in the development of the field of soil microbiology Modern Era of Microbiology Carl Woese classification based on 16S rRNA Signification and Application of Human Microbiome, Nano-biotechnology and Space Microbiology	KDG
Credit II	OCTOBER	Types of Microorganism and their differentiating characters -- Prokaryotes, Eukaryotes, three domain and five domain system of classification --Bacteria (Eubacteria and Archaeobacteria) --Protozoa	KDG

		--Fungi --Algae	
	NOVEMBER	--Viruses, Viroids and Prions --Actinomycetes Beneficial and Harmful effects of microorganisms: Medical Microbiology (Enlist diseases caused by various microorganisms, vaccines and antibiotics) Environmental Microbiology (Eutrophication, red tide, Sewage treatment, bioremediation)	KDG
	DECEMBER	Food and Dairy Microbiology (Food spoilage, food borne diseases, Probiotics and fermented food) Agriculture Microbiology (Plant diseases and Biofertilizers and Bio-control agents) Industrial Microbiology (Production of antibiotics, enzymes, solvents and contaminants-bacteria and phages) Immunology (Normal flora, Three lines of defence) ASSIGNMENT AND REVISION	KDG

KAJAL D. GOKULE
TEACHER

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RAJGURUNAGAR, TAL - KHED, DIST- PUNE**

DEPARTMENT OF MICROBIOLOGY

TEACHING PLAN

F. Y. B. SC. -MICROBIOLOGY: 2022-2023

**PAPER II: MB-112 BASIC TECHNIQUES IN MICROBIOLOGY
SEMESTER I**

SR. NO	MONTH	TOPICS	TEACHER
Credit I	SEPTEMBER	I. Units of measurement – Introduction to Modern SI units	AAI
	SEPTEMBER AND OCTOBER	Microscopy: 1. Bright field microscopy: <ul style="list-style-type: none"> • Electromagnetic spectrum of light • Structure, working of and ray diagram of a compound light microscope; concepts of magnification, numerical aperture and resolving power. • Types, ray diagram and functions of – condensers (Abbe and cardioid) eyepieces and objectives • Concept of aberrations in lenses - spherical, chromatic, comma and astigmatism 2. Principle, working and ray diagram of <ol style="list-style-type: none"> i. Phase contrast microscope ii. Fluorescence Microscopy iii. Electron Microscopy – TEM, SEM 	AAI
	OCTOBER	II. Staining Techniques: <ul style="list-style-type: none"> • Definition of Stain; Types of stains (Basic and Acidic), Properties and role of Fixatives, Mordants, Decolourisers and Accentuators • Monochrome staining and Negative (Relief) staining • Differential staining - Gram staining and Acid-fast staining • Special staining- Capsule, Cell wall, Spore, Flagella, Lipid granules, metachromatic granules 	AAI
Credit II	NOVEMBER	Sterilization and Disinfection 1. Sterilization <ul style="list-style-type: none"> • Physical Agents - Heat, Radiation, Filtration • Checking of efficiency of sterilization (Dry and Moist) – Biological and Chemical Indicators 	AAI
	DECEMBER	2. Disinfection: <ul style="list-style-type: none"> • Chemical agents and their mode of action - 	AAI

		<p>Aldehydes, Halogens, Quaternary ammonium compounds, Phenol and phenolic compounds,</p> <ul style="list-style-type: none">• Heavy metals, Alcohol, Dyes, Detergents and Ethylene oxide.• Characteristics of an ideal disinfectant• Checking of efficiency of disinfectant - Phenol Coefficient (Rideal-Walker method) <p>ASSIGNMENT AND REVISION</p>	
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ARTI A. INDAIS
TEACHER

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DEPARTMENT OF MICROBIOLOGY

TEACHING PLAN

**S. Y. B. SC. -MICROBIOLOGY: 2022-2023
MB-231: MEDICAL MICROBIOLOGY AND IMMUNOLOGY
(SEMESTER III)
(2 CREDITS; 36 LECTURES)**

SR. NO	MONTH	TOPICS	TEACHER
Credit I	SEPTEMBER	Medical Microbiology Definitions: Incubation period, Viability, Susceptibility, Pathogenicity	JCS
	SEPTEMBER AND OCTOBER	Virulence, Pathogenesis, Lab diagnosis, Epidemic, Sporadic, Endemic, Pandemic Study of following pathogens with respect to – Classification, Morphological, Cultural and Biochemical characters, Antigenic structure, Viability characteristics, Pathogenicity, Pathogenesis, Symptoms, Laboratory diagnosis, Epidemiology, Prophylaxis and Chemotherapy: Bacteria: a) <i>Escherichia coli</i> b) <i>Staphylococcus aureus</i> Fungi: a) <i>Candida</i> b) <i>Dermatophytes</i>	JCS
	OCTOBER	Introduction to Chemotherapy i i. Selective toxicity, Bioavailability, MIC, MBC, LD50 ii ii. Antagonism and synergism in drug administration iii iii. Antibiotic sensitivity iv iv. Antibiotic misuse/antibiotic overuse v v. Concept of drug resistance (e.g. MRSA, ESBL)	JCS
Credit II	NOVEMBER	Immunology Immunity: Definition, Types (Innate and acquired, active and passive, humoral and cell mediated) Immunity: Definition, Types (Innate and acquired, active and passive, humoral and cell mediated) Antigens and antibodies: definition and concept	JCS
	DECEMBER	Immunoematology i i. ABO and Rh blood group systems ii ii. Bombay blood group iii iii. Biochemistry of blood group substances iv iv. Inheritance of ABH antigens v v. Medico legal applications of blood groups	JCS

	<p>Active and Passive Immunization</p> <p>i. Active Immunization -Whole organism vaccines a) Attenuated vaccines b) Inactivated Vaccines</p> <p>ii. Passive Immunization</p> <p>Transfer of preformed antibodies</p> <p>i iii. Latest Immunization schedule in India</p> <p>Immunoematology</p> <p>vi i. ABO and Rh blood group systems vii ii. Bombay blood group viii iii. Biochemistry of blood group substances ix iv. Inheritance of ABH antigens x v. Medico legal applications of blood groups</p> <p>Active and Passive Immunization</p> <p>i. Active Immunization -Whole organism vaccines a) Attenuated vaccines b) Inactivated Vaccines</p> <p>ii. Passive Immunization</p> <p>Transfer of preformed antibodies</p> <p>iii. Latest Immunization schedule in India</p> <p>ASSIGNMENT AND REVISION</p>	
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J. C. Shelar
TEACHER

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DEPARTMENT OF MICROBIOLOGY

TEACHING PLAN

S. Y. B. SC. -MICROBIOLOGY: 2022-2023

**MB-232: BACTERIAL PHYSIOLOGY AND FERMENTATION
TECHNOLOGY**

[2 CREDITS; 36 LECTURES] SEMESTER III

SR. NO	MONTH	TOPICS	TEACHER
Credit I	SEPTEMBER	Enzymes i. Introduction to Enzymes: Properties of enzymes, Nature of active site, Structure of active site, commonly occurring amino acids at active site. Ribozymes, coenzymes, apoenzymes, prosthetic group and cofactors.	SPT
	SEPTEMBER AND OCTOBER	ii. Nomenclature and classification as per IUB (upto class level iii. Models for catalysis– a) Lock and key b) Induced fit c) Transition state. iv. Effect of pH and temperature, substrate concentration and enzyme concentration, activators and inhibitors of enzyme	SPT
	OCTOBER	Bacterial Physiology i. Definitions of Metabolism, catabolism, anabolism, respiration and fermentation ii. Metabolic pathways (with structures) a) Embden Meyerhof Parnas pathway (Glycolysis) b) Hexose monophosphate pathway c) Entner Doudoroff pathway d) Phosphoketolase pathway(Pentose and hexose) e) TCA cycle (with emphasis on amphibolism) and Glyoxylate by pass f) Gluconeogenesis and its significance	SPT
Credit II	NOVEMBER	Concept of fermentation technology i. Microbial biomass- based fermentation (Biofertilizer, biopesticide and Probiotics) ii. Production of Primary metabolites (Organic acids, amino acids, vitamins and enzymes) iii. Production of Secondary metabolites (Antibiotics)	SPT

		iv. Production of recombinant products (insulin and growth hormones) v. Production of Fermented food products (Cheese, yoghurt) vi. Microbial biotransformation (Steroid transformation) Strains of industrially important microorganisms: i. Desirable characteristics of industrial strain ii. Principles and methods of primary and secondary screening iii. Master, working and seed culture; development of inoculum iv. Preservation and maintenance of industrial strains.	
	DECEMBER	Design of a Fermenter (typical CSTR Continuous stirred Tank Reactor): Different parts and their working Monitoring of different fermentation parameters (Temperature, pH, aeration, agitation, foam) Types of fermentations: Batch, continuous and dual Media for industrial fermentations: Constituents of media (Carbon source, nitrogen source, amino acids, vitamins, minerals, water, buffers, antifoam agents, precursors, inhibitors and inducers) Contamination: Sources, precautions and consequences ASSIGNMENT AND REVISION	SPT

Sonakshi P. Takale
TEACHER

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DEPARTMENT OF MICROBIOLOGY

TEACHING PLAN

T. Y. B. SC. -MICROBIOLOGY: 2022-2023

MB 351: MEDICAL MICROBIOLOGY- I

[2 CREDITS; 36 LECTURES] SEMESTER V

SR. NO	MONTH	TOPICS	TEACHER
Credit I	SEPTEMBER	Introduction to infectious diseases and Epidemiology	AAI
	SEPTEMBER AND OCTOBER	1. Introduction to infectious diseases of following human body systems: (Brief anatomy and Physiology, Diseases, Pathogens, common symptoms) a. Respiratory system b. Gastrointestinal system and liver c. Urogenital system d. Central nervous system	AAI
	OCTOBER	2. Epidemiology: a. Case control and cohort studies – Study design and application b. Principle and methods – Clinical trials of drugs and vaccines (Randomized control trials Concurrent parallel and cross-over trials)	AAI

Credit II	NOVEMBER	<p>c. Epidemiology of infectious diseases i. Sources and Reservoirs of Infection ii. Modes of Transmission of Infections iii. Disease Prevention and Control Measures, Vaccine-preventable</p> <p>bacterial diseases and nonvaccine-preventable bacterial diseases)</p> <p>3. Study of following groups of bacterial pathogens: (With respect to- Classification and Biochemical characters, Antigenic structure, Viability characteristics, Pathogenicity, Pathogenesis, Symptoms, Laboratory diagnosis, Epidemiology, Prophylaxis and Chemotherapy): a. <i>Salmonella</i>, <i>Vibrio</i></p>	AAI
	DECEMBER	<p>b. <i>Streptococcus pneumoniae</i>, <i>Streptococcus pyogenes</i>, <i>Neisseriameningitidis</i> and <i>Neisseria gonorrhoeae</i> c. <i>Pseudomonas aeruginosa</i> d. <i>Treponema</i>, <i>Leptospira</i> e. Clostridium tetani f. <i>Mycobacterium tuberculosis</i> and <i>Mycobacterium leprae</i> g. Rickettsial diseases - Scrub typhus, Spotted fevers</p> <p>ASSIGNMENT AND REVISION</p>	AAI

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T. Y. B. SC. -MICROBIOLOGY: 2022-2023

MB-352 Immunology- I

[2 CREDITS; 36 LECTURES] SEMESTER V

SR. NO	MONTH	TOPICS	TEACHER
Credit I	SEPTEMBER	<p>Organs of immune system, Innate immunity, Antigen and Immunoglobulins</p> <p>1. Organs of immune system:</p> <p>a. Primary lymphoid organs (Thymus and Bone Marrow): Thymus – structure, thymic education (positive and negative selection)</p>	KDG
	SEPTEMBER AND OCTOBER	<p>Bone marrow –Structure and Negative selection</p> <p>b. Secondary lymphoid organs – structure and function of spleen and lymph node, mucous associated lymphoid tissue, lymphatic system and lymph circulation</p> <p>2. Innate immunity: Non-specific mechanisms of defense: Second line of defense:</p> <p>a. Humoral components: Defensins, pattern recognition proteins (PRP) and pathogen associated molecular patterns (PAMPs), complement, kinins, and acute phase reactants.</p> <p>b. Cellular components: Phagocytic cells – PMNL, macrophages (reticulo- endothelial cell system) and dendritic cells</p> <p>c. Phagocytosis (oxygen dependent and independent systems), Complement</p> <p>activation (Classical, Alternative and lectin pathway), Inflammation (cardinal signs, mediators, vascular and cellular changes, role of Toll-like receptors)</p>	KDG
	OCTOBER	<p>3. Antigen:</p> <p>a. Factors affecting immunogenicity</p>	KDG

		<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>	
Credit II	NOVEMBER	<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>	KDG
	DECEMBER	<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>ASSIGNMENT AND REVISION</p>	KDG

**KAJAL D.GOKULE
TEACHER**

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DEPARTMENT OF MICROBIOLOGY

TEACHING PLAN

T. Y. B. SC. -MICROBIOLOGY: 2022-2023

MB 353: Enzymology

[2 CREDITS; 36 LECTURES] SEMESTER V

SR. NO	MONTH	TOPICS	TEACHER
Credit I	SEPTEMBER	<p>1. Structure of enzymes: 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>	SPT
	SEPTEMBER AND OCTOBER	<p>b. Role of vitamins in metabolism: Occurrence, Structure and Biochemical functions of the following: i. Thiamine (Vitamin B1) and Thiamine Pyrophosphate ii. Vitamin D</p> <p>2. Enzyme assays: a. Principles of enzyme assays and calculation of enzyme unit, specific activity b. Enzymes assays with examples by: i. Spectrophotometric methods ii. Radioisotope assay</p>	SPT
	OCTOBER	<p>3. Principles and Methods of Enzyme purification: a. Methods of cell fractionation b. Principles and methods of enzyme purification: i. Based on molecular size ii. Based on charge iii. Based on solubility differences iv. Based on specific binding property and selective adsorption c. Construction of enzyme purification chart</p>	SPT

Credit II	NOVEMBER	<p>4. Enzyme Kinetics:</p> <p>a. Concept and use of initial velocity</p> <p>b. Michaelis Menton equation for the initial velocity of single substrate enzyme catalyzed reaction. Brigg's Haldane modification of Michaelis Menton equation. Michaelis Mentonplot, Lineweaver and Burk plot. Definition with significance of Km, Ks, Vmax</p> <p>5. Metabolic Regulations:</p> <p>a. Enzyme compartmentalization at cellular level</p> <p>b. Allosteric enzymes</p>	SPT
	DECEMBER	<p>c. Feedback mechanisms</p> <p>d. Covalently modified regulatory enzymes (Glycogenphosphorylase)</p> <p>e. Proteolytic activation of zymogens</p> <p>f. Isozymes - concept and examples</p> <p>g. Multienzyme complex e.g. Pyruvate dehydrogenasecomplex(PDH)</p> <p>6. Immobilization of enzymes:</p> <p>Concept, methods of immobilization and applications</p> <p>ASSIGNMENT AND REVISION</p>	SPT

S. P. Takale
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DEPARTMENT OF MICROBIOLOGY

TEACHING PLAN

T. Y. B. SC. -MICROBIOLOGY: 2022-2023

MB 354: Genetics I

[2 CREDITS; 36 LECTURES] SEMESTER V

SR. NO	MONTH	TOPICS	TEACHER
Credit I	SEPTEMBER	DNA Replication and Gene Expression 1. Process of prokaryotic DNA replication a. Single replicon b. Bidirectional movement of replication fork c. Ori C	JCS
	SEPTEMBER AND OCTOBER	d. Pre-priming and Priming reaction. e. DNA polymerases, DNA synthesis of leading, lagging strand Okazaki fragments. f. Termination- Ter sequence, Tus protein 2. Prokaryotic and Eukaryotic Transcription i. Transcription in Prokaryotes a. Structure of promoter b. Structure and function of RNA polymerase c. Steps of transcription: Initiation, Elongation and termination	JCS
	OCTOBER	ii. Transcription in eukaryotes with respect to protein coding Gene: a. Promoter, promoter proximal elements and enhancers b. Transcription regulatory proteins c. RNA polymerases d. Steps in transcription: Initiation, Elongation, Termination e. Post transcriptional modifications: 5' capping, 3' polyadenylation and introduction to RNA splicing 3. Regulation of transcription: Concept and components of operon: Lac operon: Inducible operon	JCS

Credit II	NOVEMBER	<p>4. Translation in prokaryotes and eukaryotes</p> <p>a. Structure and role of m-RNA, t-RNA and Ribosomes in Translation</p> <p>b. Role of Aminoacyl t-RNA synthetase in translation</p> <p>c. Steps in translation: Initiation, elongation, translocation and termination of protein synthesis</p> <p>d. Salient features of Eukaryotic translation</p> <p>5. Gene transfer by Transformation</p> <p>a. Discovery of Transformation</p> <p>b. Natural transformation Systems- <i>Streptococcus pneumoniae</i> and <i>Haemophilus influenzae</i>.</p> <p>c. Factors affecting transformation</p> <p>i. Competence development</p> <p>ii. Size of DNA</p> <p>iii. Concentration of DNA</p>	JCS
	DECEMBER	<p>6. Gene transfer by Conjugation</p> <p>a. Discovery of Conjugation,</p> <p>b. Properties of F plasmid, F⁺, F⁻, Hfr and F' strains</p> <p>c. Process of conjugation between F⁺ and F⁻, Hfr and F⁻, F' and F⁻</p> <p>7. Gene transfer by Transduction</p> <p>a. Discovery of Transduction</p> <p>b. Generalized transduction mediated by P22</p> <p>c. Specialized transduction mediated by lambda phage</p> <p>8. An introduction to Gene mapping</p> <p>a. Gene linkage and concept of genetic recombination</p> <p>b. Recombination mapping: Map unit, recombination frequency</p> <p>c. Mapping of genes by co-transformation</p> <p>d. Mapping of genes by co-transduction</p> <p>e. Mapping by interrupted mating experiment</p> <p>f. Numerical problems based on co-transformation, co-transduction and interrupted mating</p> <p>ASSIGNMENT AND REVISION</p>	JCS

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DEPARTMENT OF MICROBIOLOGY

TEACHING PLAN

T. Y. B. SC. -MICROBIOLOGY: 2022-2023

MB 355 Fermentation Technology– I

[2 CREDITS; 36 LECTURES] SEMESTER V

SR. NO	MONTH	TOPICS	TEACHER
Credit I	SEPTEMBER	<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>	JCS
	SEPTEMBER AND OCTOBER	<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> <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>	JCS
	OCTOBER	<p>4. Scale-up and Scale-down:</p> <p>a. Objectives of scale-up</p> <p>b. Levels of fermentation (laboratory, pilot-plant and</p>	JCS

		<p>production level – flow sheet 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>	
Credit II	NOVEMBER	<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> <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>	JCS
	DECEMBER	<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> <p>ASSIGNMENT AND REVISION</p>	JCS

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DEPARTMENT OF MICROBIOLOGY

TEACHING PLAN

**T. Y. B. SC. -MICROBIOLOGY: 2022-2023
MB 356: AGRICULTURAL MICROBIOLOGY
[2 CREDITS; 36 LECTURES] SEMESTER V**

SR. NO	MONTH	TOPICS	TEACHER
Credit I	SEPTEMBER	<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</p> <p>b. Stages in development of a disease: Infection, invasion, colonization, dissemination of pathogens and perennation</p>	SPT
	SEPTEMBER AND OCTOBER	<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>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>	SPT
	OCTOBER	<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) b. Concept, Composition, functioning and methods to study: i. Conservation of soil health: Role of microorganisms in soil health ii. Phytonutrient availability by soil microorganisms Mechanism of diazotrophy, Phosphate solubilization, Potassium mobilization, micronutrient availability</p>	SPT

		<p>iii. Biofilm in plant surfaces, Biofilm formation; Biofilm in Phyllosphere and rhizosphere, Examples of plant- microbe interactions in biofilms, Biotechnological applications of plant biofilms</p>	
Credit II	NOVEMBER	<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 b. Tools and techniques:</p>	SPT
	DECEMBER	<p>i. Microorganisms as tools in plant genetic engineering (Shuttle vectors) ii Technology of BT resistant crops iii. Concept of edible vaccines iv Technique of use of plant viruses in genetic engineering c. RNAi Technology and antisense RNA technology in disease resistant plant varieties</p> <p>ASSIGNMENT AND REVISION</p>	SPT

S. P. Takale
TEACHER

K.T.S.P.MANDAL'S
SAHEBRAOJI BUTTEPATIL MAHAVIDYALAYA
RAJGURUNAGAR
TEACHING PLAN 2022-23
SEMESTER II
F.Y.B.Sc.

Subject –MB 121: Bacterial Cell and Biochemistry

Teacher Name – Prof. K.D.Gokule

Month	Unit	Topics
March 2023	1	<p>1. Bacterial Cytology Microbial cell size, shape and arrangements</p> <p>2. Structure, chemical composition and functions of the following components in bacterial cell:</p> <p>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 inclusions (Gas vesicles, carboxysomes, PHB granules, metachromatic granules, glycogen bodies, starch granules, magnetosomes, sulfur granules, chlorosomes)</p>
March – April 2023	2	<p>3. Chemical Basis of Microbiology</p> <p>a. Atom, Biomolecules, types of bonds (covalent, coordinate bond, non-covalent) and linkages (ester, phosphodiester, peptide, glycosidic) b. Chemistry of Biomolecules: Structure, organization and functions</p> <p>4. Carbohydrates: Definition, classification</p> <p>a. Monosaccharides: Classification based on aldehyde and ketone groups; structure of Ribose, Deoxyribose, Glucose, Galactose and Fructose. b. Disaccharides: Glycosidic bond, structure of lactose and sucrose. c. Polysaccharides: Structure and types</p> <p>Examples-Starch, glycogen, Peptidoglycan, chitin</p>

April –May 2023	3	<p>5. Lipids: Definition, classification</p> <p>a. Simple lipids – Triglycerides, Fats and oils, waxes. b. Compound lipids – Phospholipid, Glycolipids c. Derived lipids – Steroids, Cholesterol</p> <p>6. Proteins: Definition, classification</p> <p>a. General structure of amino acids, peptide bond. b. Types of amino acids based on R group c. Structural levels of proteins: primary, secondary, tertiary and quaternary d. Study of Hemoglobin, flagellin and cytoskeletal proteins</p> <p>7. Nucleic acids: Definition, classification</p> <p>a. DNA – structure and composition b. RNA – Types (m-RNA, t-RNA, r-RNA), structure and functions.</p> <p>8. Classification of Bacteria: Introduction to Bergey’s Manual of Determinative and Systemic Bacteriology</p> <p>9. Classification of Viruses: ICTV nomenclature</p>
May 2023	4	<p>Revision And Assignment</p>

Prof. K.D.Gokule

K.T.S.P.MANDAL'S
SAHEBRAOJI BUTTEPATIL MAHAVIDYALAYA
RAJGURUNAGAR
TEACHING PLAN 2022-23
SEMESTER II
F.Y.B.Sc.

Subject – MB 122: Microbial cultivation and growth

Teacher Name – Prof. A.A.Indais

Month	Unit	Topics
March 2023	1	<p>1. Cultivation of Microorganisms:</p> <p>a. Nutritional requirements and nutritional classification.</p> <p>b. Design and preparation of media: Common ingredients of media and types of media.</p> <p>c. Methods for cultivating photosynthetic, extremophilic and chemo-lithotrophic bacteria, anaerobic bacteria, algae, fungi, actinomycetes and viruses.</p> <p>d. Concept of Enrichment, Pure Culture, Isolation of culture by streak plate, pour plate, spread plate.</p> <p>e. Maintenance of bacterial and fungal cultures using different techniques.</p> <p>f. Culture collection centres and their role.</p> <p>g. Requirements and guidelines of National Biodiversity Authority for culture collection centres.</p>

<p>March – April 2023</p>	<p>2</p>	<p>2. Bacterial growth:</p> <p>a. Kinetics of bacterial growth (Exponential growth model)</p> <p>b. Growth curve and Generation time</p> <p>c. Diauxic growth</p> <p>d. Measurement of bacterial growth- Methods of enumeration:</p> <p>e. Microscopic methods (Direct microscopic count, counting cells using improved Neubauer, Petroff-Hausser’s chamber)</p> <p>f. Plate counts (Total viable count)</p>
<p>April – May 2023</p>	<p>3</p>	<p>g. Turbidometric methods (including Nephelometry)</p> <p>h. Estimation of biomass (Dry mass, Packed cell volume)</p> <p>i. Chemical methods (Cell carbon and nitrogen estimation)</p> <p>j. Factors affecting bacterial growth [pH, Temperature, Solute Concentration (Salt and Sugar)] and Heavy metals</p>
<p>May 2023</p>	<p>4</p>	<p>Revision And Assignment</p>

Prof. A.A.Indais

**K.T.S.P.MANDAL'S
SAHEBRAOJI BUTTEPATIL MAHAVIDYALAYA
RAJGURUNAGAR
TEACHING PLAN 2022-23
SEMESTER IV
S.Y.B.Sc.**

Subject –

MB-241: Bacterial Genetics

Teacher Name –Prof. S.C.Shelar

Month	Unit	Topics
March 2023	1	<p>Understanding DNA:</p> <p>i. Experimental evidence for nucleic acid as genetic material.</p> <p>a. Discovery of transforming material (hereditary material):</p> <p>b. Griffith's experiment</p> <p>c. Avery and MacLeod experiment</p> <p>d. Gierer and Schramm</p> <p>e. Fraenkel-Conrat and Singer experiment (TMV virus)</p> <p>f. Hershey and Chase experiment</p>
March – April 2023	2	<p>ii. Types of nucleic acids (DNA and RNAs)</p> <p>iii. Structure of DNA</p> <p>a. Structure of Nitrogen bases, Nucleoside, Nucleotide and polynucleotide chain</p> <p>b. Bonds involved in DNA structure</p> <p>c. Different forms of DNA</p>

<p>April – May 2023</p>	<p>3</p>	<p>iv. Prokaryotic DNA replication</p> <p>a. Models of DNA replication (Conservative, semi-conservative and Dispersive)</p> <p>b. Meselson and Stahl’s experiment (semi-conservative)</p> <p>c. Six basic rules of DNA replication</p> <p>d. Enzymes, proteins and other factors involved in DNA replication.</p> <p>e. Modes of DNA replication Rolling circle mechanism, theta and linear DNA replication</p> <p>i. Gene expression</p> <p>a. Concept of Genetic code and its properties</p> <p>b. Concept of transcription and translation</p>
<p>April – May 2023</p>	<p>4</p>	<p>ii. Mutations and reversions</p> <p>Concept of Mutation and Types of mutations: Nonsense, Missense, Silent, Conditional lethal-temperature sensitive, Amber, Reverse, suppressor</p> <p>a. Spontaneous Mutation</p> <ul style="list-style-type: none"> <input type="checkbox"/> Discovery of spontaneous mutation (Fluctuation test) <input type="checkbox"/> Mechanism of spontaneous mutation <input type="checkbox"/> Isolation of Mutants: Replica plate technique <p>b. Concept of Induced Mutations</p> <ul style="list-style-type: none"> <input type="checkbox"/> Base pair substitution (Transitions, Transversions), Insertions and deletions-Frame / Phase shift mutations <input type="checkbox"/> Physical Mutagenic agent: UV and X-ray <input type="checkbox"/> Chemical mutagenic agents <input type="checkbox"/> Base analogues (2 amino purine, 5 bromouracil), <input type="checkbox"/> HNO₂, Alkylating agents <input type="checkbox"/> Intercalating agents (EtBr, acridine orange) <p>amino acids vitamins, minerals, water, buffers, antifoam agents, precursors, inhibitors, and inducers)</p>

May 2023	5	iii. Plasmid genetics a. Types of plasmids b. Properties of Plasmid c. Plasmid replication d. Plasmid incompatibility e. Plasmid curing f. Plasmid amplification Concept Revision and assignment
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Prof. J.C.Shelar

**K.T.S.P.MANDAL'S
SAHEBRAOJI BUTTEPATIL MAHAVIDYALAYA
RAJGURUNAGAR
TEACHING PLAN 2022-23
SEMESTER IV
S.Y.B.Sc.**

Subject –
MB – 242: Air, Water and Soil Microbiology

Teacher Name – Prof. S.P.Takale

Month	Unit	Topics
	1	Air Microbiology and Water Microbiology
		<p>i. Air Microbiology</p> <p>a. Air flora <input type="checkbox"/></p> <p>Transient nature of air flora <input type="checkbox"/></p> <p>Droplet, droplet nuclei and aerosols</p> <p>b. Methods of Air sampling and types of air samplers <input type="checkbox"/></p> <p>Impaction on solids <input type="checkbox"/></p> <p>Impingement in liquid <input type="checkbox"/></p> <p>Sedimentation <input type="checkbox"/></p> <p>Centrifugation</p> <p>c. Air sanitation: Physical and chemical methods</p> <p>d. Airborne infections</p>
March – April 2023		<p>ii. Water Microbiology</p> <p>b. Recommended Bacteriological standards of Water Quality</p> <p><input type="checkbox"/> Maharashtra Pollution Control Board (MPCB) Main Functions of MPCB</p> <p>Water quality standards for best designated usages</p> <p><input type="checkbox"/> Central Pollution Control Board (CPCB) Main Functions of CPCB</p> <p>Designated Best Use Water Quality Criteria</p> <p>c. Water purification methods</p> <p>d. Water borne Infections</p> <p>e. Indicators of faecal pollution: <i>Escherichia coli, Bifidobacterium, Streptococcus faecalis, Clostridium perfringens,</i> New indicators: <i>Campylobacter</i> and <i>Pseudomonas</i></p> <p>f. Bacteriological analysis of water for potability</p> <p>i. Bacteriological standards of potable water: Bureau of Indian standards (BIS)</p> <p>ii. World Health Organization (WHO)</p> <p>iii. Presumptive coliform count</p> <p>iv. Confirmed test</p> <p>v. Completed test</p> <p>vi. Eijkman test</p> <p>vii. Membrane filter technique</p>

<p>April – May 2023</p>	<p>3</p>	<p>Soil Microbiology</p> <p>a. Rhizosphere microflora and its role in the rhizosphere</p> <p>b. Role of microorganisms in composting and humus formation</p> <p>c. Biofertilizers: Bacterial, Cyanobacterial, fungal and their large-scale production</p> <p>d. Biocontrol agents: Bacterial, Viral, Fungal and their large-scale production</p> <p>e. Brief account of microbial interactions: Symbiosis, Neutralism, Commensalism, Competition, Ammensalism, Synergism, Parasitism and Predation</p> <p>f. Role of microorganisms in elemental cycles in nature: Carbon, Nitrogen</p> <p>Revision and assignment</p>
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Prof. S.P.Takale

K.T.S.P.MANDAL'S
SAHEBRAOJI BUTTEPATIL MAHAVIDYALAYA
RAJGURUNAGAR
TEACHING PLAN 2022-23
SEMESTER VI
T.Y.B.Sc.

Subject – MB 361: Medical Microbiology II

Teacher Name –Prof. A.A.Indais

Month	Unit	Topics
Febraury 2023	1	<p>Chemotherapy</p> <p>1. Routes of drug administration.</p> <p>2. Mode of action of antimicrobial agents on:</p> <p>a. Bacteria:</p> <p>i. Cell wall: Beta lactams: 1st to 6th Generation- e.g. Meropenem, Imipenem, Piperacillin, Tazobactam</p> <p>ii. Cell membrane: Polymyxin</p> <p>iii. Protein synthesis: Streptomycin, Tetracycline</p> <p>iv. Nucleic acids: Fluroquinolones, Rifamycin</p> <p>v. Enzyme inhibitors: Trimethoprim, Sulfomethaxazole</p> <p>b. Fungi: Griseofulvin, Amphotericin B, Anidulafungin, Vericonazole</p> <p>c. Viruses: Acyclovir, Oseltamivir, Remdecivir</p> <p>d. Protozoa: Metronidazole, Chloroquine</p>
Febraury- March 2023	2	<p>3. Mechanisms of drug resistance on:</p> <p>a. Genetic basis:</p> <p>i. Mutations in gene(s)</p> <p>ii. Acquisition of foreign DNA coding for resistance determinants through horizontal gene transfer.</p> <p>b. Mechanisms of drug resistance by:</p> <p>i. Limiting uptake of a drug.</p> <p>ii. Modification of a drug target.</p> <p>iii. Inactivation of a drug.</p> <p>iv. Active efflux of a drug.</p> <p>Human and Animal Viruses, Fungal and Protozoal Pathogens 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>

<p>March - April 2023</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> <ul style="list-style-type: none"> i. Respiratory Viruses: Influenza Virus, Corona Virus ii. Hemorrhagic Virus: Dengue iii. Hepatic Virus: Hepatitis A Virus iv. Gastrointestinal Virus: Rotavirus v. Cutaneous Viruses: Human papillomavirus vi. Neurological Viruses: Japanese Encephalitis Virus <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> <ul style="list-style-type: none"> a. Plasmodium b. Entamoeba <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>May 2023</p>	<p>4</p>	<p>Epidemiology, Prophylaxis and Chemotherapy)</p> <ul style="list-style-type: none"> a. <i>Aspergillus</i> species (Pathogenic) b. <i>Cryptococcus neoformans</i> c. <i>Histoplasma capsulatum</i> <p>Revision And Assignment</p>

Prof. A.A.Indais

K.T.S.P.MANDAL'S
SAHEBRAOJI BUTTEPATIL MAHAVIDYALAYA
RAJGURUNAGAR
TEACHING PLAN 2022-23
SEMESTER VI
T.Y.B.Sc.

Subject -MB 362 Immunology– II
Teacher Name –Prof. K.A.Bendale

Month	Unit	Topics
Febraury 2023	1	<p>Cytokines, Adaptive / Acquired Immunity, Hypersensitivity, Autoimmunity and Autoimmune diseases and Immunodeficiency</p> <p>1. Cytokines:</p> <p>a. Concept- Cytokines, lymphokines, monokines, interleukines, chemokines, interferons and tumor necrosis factor</p> <p>b. Properties, Attributes and biological functions of cytokines</p> <p>2. Adaptive / Acquired Immunity (Third line of defense):</p> <p>A. Humoral Immune Response</p> <p>i. Primary and secondary response kinetics, significance in vaccination programs</p> <p>ii. Response of secondary lymphoid organs to antigen</p> <p>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</p>
Febraury – March 2023	2	<p>B. Cell Mediated Immune Response</p> <p>i. Activation and differentiation of T cells, role of cytokines in activation</p> <p>ii. Mechanism of Cytotoxic T lymphocytes (CTL) mediated cytotoxicity, Antibody-dependent cellular cytotoxicity (ADCC)</p> <p>iii. Significance of Cell Mediated Immune Response (CMI)</p> <p>iv. Immune response against tumors and foreign transplanted cells</p>
March – April 2023	3	<p>Hypersensitivity, Autoimmunity and Autoimmune diseases and Immunodeficiency</p> <p>3. Hypersensitivity</p> <p>a. General principles of different types of hypersensitivity reactions</p> <p>b. Gell and Coomb's classification of hypersensitivity – mechanism with examples for type I (Immediate), II, III and IV (delayed)</p> <p>4. Autoimmunity and Autoimmune diseases:</p> <p>a. Immunological tolerance</p> <p>b. Types of autoimmune diseases</p> <p>c. Factors contributing development of autoimmune diseases</p>

		<p>d. Immunopathological mechanisms</p> <p>e. Diagnosis and treatment of autoimmune diseases: Myasthenia gravis and Rheumatoid arthritis</p> <p>f. Therapeutic immunosuppression for autoimmunity</p>
<p>May 2023</p>	<p>4</p>	<p>5. Immunodeficiency:</p> <p>i. Complement deficiencies</p> <p>ii. Introduction to congenital immunodeficiency disorders: Common Variable Immune Deficiency (CVID) and acquired immunodeficiency: Immune mechanisms in AIDS</p> <p>Revision And Assignment</p>

Prof. K.A.Bendale

K.T.S.P.MANDAL'S
SAHEBRAOJI BUTTEPATIL MAHAVIDYALAYA
RAJGURUNAGAR
TEACHING PLAN 2022-23
SEMESTER VI
T.Y.B.Sc.

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

Month	Unit	Topics
Febraury 2023	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 – March 2023	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 – April 2023	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

May 2023	4	4. Bacterial Photosynthesis: Photosynthetic bacteria with reference to photosynthetic apparatus, energy generation, and CO₂ fixation a. Cyanobacteria, b. Purple bacteria 5 Chemolithotrophy: Concept and one example, Iron oxidizing bacteria
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Prof. S.P.Takale

K.T.S.P.MANDAL'S
SAHEBRAOJI BUTTEPATIL MAHAVIDYALAYA
RAJGURUNAGAR
TEACHING PLAN 2022-23
SEMESTER VI
T.Y.B.Sc.

Subject – -MB-364: Molecular Biology

Teacher Name –Prof. J.C.Shelar

Month	Unit	Topics
Febraury 2023	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>
Febraury – March 2023	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 – April 2023</p>	<p>3</p>	<p>4. Recombinant DNA Technology Tools and basics of recombinant DNA technology</p> <ul style="list-style-type: none"> 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 <ul style="list-style-type: none"> 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 (<i>E. coli</i> and T4 phage), Use of Linker / Adaptor / Homopolymer tailing e. Methods to transfer recombinant DNA into bacterial host cells (Physical – Electroporation, Gene gun, Chemical – CaCl₂ mediated, liposome mediated) f. Methods of screening recombinants using selective markers and Blue-white screening
<p>May 2023</p>	<p>4</p>	<p>5. Molecular techniques used in RDT</p> <ul style="list-style-type: none"> 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 and non recurring expenditures) citing any suitable example. <p>Introduction to Intellectual Property Rights (IPR) - Types of IPR</p> <p>Revision And Assignment</p>

Prof. J.C.Shelar

K.T.S.P.MANDAL'S
SAHEBRAOJI BUTTEPATIL MAHAVIDYALAYA
RAJGURUNAGAR
TEACHING PLAN 2022-23
SEMESTER VI
T.Y.B.Sc.

Subject – MB 365 Fermentation Technology – II

Teacher Name – Prof. J.C.Shelar

Month	Unit	Topics
Febraury 2023	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: i. Vitamins (B12 and B2) ii. Amino acids - Glutamic acid, Lysine iii. Organic acids (Citric acid, Vinegar and Lactic acid)</p> <p>b. Secondary metabolites: i. Bioethanol</p>
Febraury – March 2023	2	<p>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]</p> <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 i. Amylase ii. Esterases iii. Proteases</p>

<p>March – April 2023</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>May 2023</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. J.C.Shelar

K.T.S.P.MANDAL'S
SAHEBRAOJI BUTTEPATIL MAHAVIDYALAYA
RAJGURUNAGAR
TEACHING PLAN 2022-23
SEMESTER VI
T.Y.B.Sc.

Subject – MB 366: Food Microbiology

Teacher Name –Prof. A.A.Indais

Month	Unit	Topics
Febraury 2023	1	<p>Introduction to properties of food and spoilage of food</p> <p>1. Classification of food- Perishable, non-perishable, and stable. Sensory characters of food-</p> <p>a. Definition of food</p> <p>b. Sensory or organoleptic factors- appearance factors-(size, shape, color, gloss, consistency, wholeness)</p> <p>c. Textural factors-texture changes</p> <p>d. Flavor factors (taste, smell, mouthfeel, temperature)</p> <p>2. Factors affecting Microbial growth in food</p> <p>a. Intrinsic factors- pH, water activity, O-R potential, nutrient content, biological structure of food, inhibitory substances in food.</p> <p>b. Extrinsic factors-Temperature of storage, Relative humidity, concentration of gases.</p>
March 2023	2	<p>3. Sources of food spoilage microorganisms</p> <p>a. Contamination and spoilage of perishable foods- vegetables and fruits, Meat and meat products, Fish and other sea food, Egg and poultry products.</p> <p>b. Contamination and spoilage of canned foods</p> <p>c. Contamination and spoilage of- cereals and cereal products, sugar and sugar products, salad dressings, spices and condiments.</p> <p>ii. Stability of enzyme activity at pH and temperature</p>
March – April 2023	3	<p>Food Preservation and food in relation to disease</p> <p>4. Principles of food preservation</p> <p>a. Importance of TDP, TDT, D, F, Z values</p> <p>b. Use of low and high temperature for food preservation.</p> <p>c. Use of chemicals and antibiotics in food preservation,</p> <p>d. Canning</p> <p>e. Dehydration</p> <p>f. Use of radiation</p> <p>g. Tetra pack technology</p> <p>h. Food grade bio preservatives</p>

		<p>5. Microbial food poisoning and food infection</p> <p>a. Food poisoning -<i>Clostridium botulinum</i>, <i>Aspergillus flavus</i> b. Food infection-<i>Salmonella typhimurium</i>, <i>Vibrio parahaemolyticus</i></p>
May 2023	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. A.A.Indais

K.T.S.P.MANDAL'S
SAHEBRAOJI BUTTEPATIL MAHAVIDYALAYA
RAJGURUNAGAR
TEACHING PLAN 2022-23
SEMESTER VI
T.Y.B.Sc.

Subject – MB 3610 Waste Management

Teacher Name –Prof. K.A.Bendale

Month	Unit	Topics
Febraury – March 2023	1	<p>A. Liquid Waste Management</p> <p>1. Principles of Wastewater Treatment</p> <p>i. The need for treatment of wastewater</p> <p>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.</p> <p>2. Microbiology of Wastewater</p> <p>Role of microorganisms in wastewater treatment</p> <p>i. Aerobic and Anaerobic digestion models; attached / anchored and suspended growth.</p> <p>ii. Removal of pathogenic microbes, indicator microbes, enumeration of different types of microbes</p>
March 2023	2	<p>3. Unit operations in wastewater treatment plant</p> <p>i. Collection system - Methods of collection, conservancy systems, water carriage system, sewerage system.</p> <p>ii. Screen chamber, Grit chamber, Oil and grease removal</p> <p>iii. Stabilization pond, Aerated lagoon</p> <p>iv. Activated sludge process, Trickling filter</p> <p>v. Rotating biological contactors, anaerobic digestion processes, fluidized bed reactor.</p>

April – May 2023	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. K.A.Bendale

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TEACHING PLAN 2022-23
SEMESTER VI
T.Y.B.Sc.

Subject – MB 3611 Nano-biotechnology

Teacher Name –Prof. S.P.Takale

Month	Unit	Topics
Febraury – March 2023	1	<p>1. Introduction to Nano-biotechnology:</p> <ul style="list-style-type: none"> 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 2023	2	<p>2. Microbial mediated metallic nanoparticles synthesis:</p> <ul style="list-style-type: none"> 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 – May 2023	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