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ACADEMIC PLANNER & UNITIZATION OF SYLLABUS

ACADEMIC YEAR/SEMESTER	**2023-24**	**II Semester**
DEPARTMENT	**MICROBIOLOGY**	
SUBJECT/PAPER	**MBL 102: Microbial Biochemistry and Physiology**	

MONTH -1 (April)

WEEK	DAY	PORTIONS PLANNED FOR 1 HOUR	FACULTY
1	1	Major Elements of life and their primary characteristics	MS
	2	Carbohydrates – Definition, classification, structure	KM
	3	Atomic and Chemical bonds – covalent & Non-covalent	MS
	4	Carbohydrates – Properties, functions	KM
2	1	Amino acids & proteins – definition, structure, classification	KM
	2	Atomic and Chemical bonds – Ionic, hydrogen & van der waals	MS
	3	Amino acids & proteins – properties, functions	KM
	4	Biological solvents – structure and properties of water, water as universal solvent	MS
3	1	Lipids & fats - definition, structure, classification	KM
	2	Water – polarity, hydrophobic and hydrophilic interactions	MS
	3	Lipids & fats - properties, functions	KM
	4	Porphyrins & Vitamins - definition, structure, properties	MS
4	1	Microbial Growth – definition, growth curve, phases of growth	MS
	2	Porphyrins & Vitamins – Importance of Chlorophyll, cytochromes & hemoglobin	KM
	3	pH & buffers, Henderson-Hasselbalch equation	MS
	4	Bioenergetics – Free energy, enthalpy, entropy	KM
TEST 1			

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MONTH -2 (May)			
WEEK	**DAY**	**PORTIONS PLANNED FOR 1 HOUR**	**FACULTY**
1	1	Growth Kinetics, Generation time	MS
	2	Laws of thermodynamics	KM
	3	Synchronous culture, continuous culture (chemostat & turbidostat)	MS
	4	High energy compounds – classification, structure, significance	KM
2	1	Coulter cultures, diauxic growth	MS
	2	Oxidation reduction reactions, equilibrium constant, redox potential	KM
	3	Measurement of growth – DMC, Hemocytometer, viable count	MS
	4	Microbial respiration – Electron transport chain	KM
3	1	Membrane filtration, electronic counting	MS
	2	Protein translocation	KM
	3	Measurement of cell mass	MS
	4	Oxidative &Substrate level phosphorylation	KM
4	1	Turbidity measurements – Nephelometer & Spectrophotometer	MS
	2	Inhibitors of ETC	KM
	3	Influence of environmental factors on growth	MS
	4	Measurement of cell constituents, Growth yield	
TEST 2			

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MONTH -3 (June)			
WEEK	**DAY**	**PORTIONS PLANNED FOR 1 HOUR**	**FACULTY**
1	1	ATP synthase – structure & function, ATP synthesis	KM
	2	Microbial Nutrints – macro & micro	MS
	3	Homolactate fermentation	KM
	4	Heterolactate fermentation	KM
2	1	Membrane transport – Biological membranes	MS
	2	Light reaction, light harvesting pigments	KM
	3	Passive, facilitated and active transport	MS
	4	Group translocation, membrane bound protein transport system	KM
3	1	Photophosphorylation	MS
	2	CO2 fixation pathways – Calvin cycle	KM
	3	Carrier models, liposomes	MS
	4	CO2 fixation pathways – CODH pathway	KM
4	1	Ion channels, Na+ K+ ATPase	MS
	2	CO2 fixation pathways – Reductive TCA pathway	KM
	3	Revision	MS
	4	Discussion of old University question papers	KM

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ACADEMIC PLANNER & UNITIZATION OF SYLLABUS

ACADEMIC YEAR/SEMESTER	**2023-24**	**IV Semester**
DEPARTMENT	**MICROBIOLOGY**	
SUBJECT/PAPER	**MBL 104: Microbial Enzymology and Metabolism**	

MONTH -1 (April)

WEEK	DAY	PORTIONS PLANNED FOR 1 HOUR	FACULTY
1	1	EMP pathway	KM
	2	Introduction to enzymes. Definition, enzyme unit, specific activity and turnover number	MS
	3	HMP pathway	KM
	4	Properties of enzymes	MS
2	1	ED & PK pathway	KM
	2	Classification of enzymes	MS
	3	TCA cycle	KM
	4	Exo/endo enzymes, constitutive/ induced enzymes, isozymes	MS
3	1	Fermentation balance, concept of linear and branched fermentation pathways	KM
	2	Monomeric, Oligomeric and Multimeric enzymes	MS
	3	Alcohol fermentation and Pasteur effect	KM
	4	Multienzymecomplex: pyruvate dehydrogenase; isozyme: lactate dehydrogenase	MS
4	1	Butyric acid and Butanol-Acetone Fermentation, Mixedacidand2,3-butanediolfermentation	KM
	2	Ribozymes, Abzymes	MS
	3	Propionic acid Fermentation, acetate fermentation.	KM
	4	Apoenzyme and cofactors	MS
TEST 1			

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MONTH -2 (May)			
WEEK	**DAY**	**PORTIONS PLANNED FOR 1 HOUR**	**FACULTY**
1	1	Chemolithotrophy-Oxidation of Hydrogen, Sulphur	KM
	2	Prosthetic group-TPP, coenzyme, NAD, metalcofactors	MS
	3	Chemolithotrophy-Oxidation of Iron & Nitrogen	KM
	4	Mechanism of action of enzymes	MS
2	1	Anaerobic respiration- dissimilatory nitrate education and sulphate reduction.	KM
	2	Activesite, transition state complex and activation energy	MS
	3	Nitrogen fixation, Ammonia assimilation.	KM
	4	Lock and key hypothesis and Induced Fit hypothesis	MS
3	1	Assimilatory nitrate reduction, dissimilatory nitrate reduction, denitrification	KM
	2	Multi substrate reactions- Ordered, Random and Ping-pong	MS
	3	Biosynthesis of nucleic acids : De novo pathway	KM
	4	Enzyme Kinetics: Kinetics of one substrate reactions	MS
4	1	Biosynthesis of nucleic acids : Salvage pathway	KM
	2	i. Equilibrium assumptions ii. Steady-state Assumptions iii. Lineweaver-Burk, Hanes-Woolf, Eadie-Hofstee equations and plots.	MS
	3	Aminoacid degradation and biosynthesis	KM
	4	Kinetics of enzyme inhibition. Competitive, non-competitive and uncompetitive inhibition.	MS
TEST 2			

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MONTH -3 (June)			
WEEK	**DAY**	**PORTIONS PLANNED FOR 1 HOUR**	**FACULTY**
1	1	β-oxidation of palmitic acid;	KM
	2	Effect of changes in pH and temperature on enzyme catalyzed reaction.	MS
	3	Biosynthesis of palmitic acid.	KM
	4	Kinetics of two substrate reactions. Pre steady state kinetics.	MS
2	1	Acetogens: Autotrophic pathway of acetate synthesis	KM
	2	Kinetics of immobilized enzymes	MS
	3	Ethanol oxidation, sugar alcohol oxidation.	KM
	4	Enzyme regulation: Allosteric enzyme - general properties, Hill equation, Koshland Nemethy and Filmer model	MS
3	1	Glyoxylate and glycolate metabolism	KM
	2	Monod Wyman and Changeux model	MS
	3	Dicarboxylic acid cycle	KM
	4	Covalent modification by variousmechanisms. Regulation by proteolytic cleavage - blood coagulation cascade.	MS
4	1	Glycerate pathway	KM
	2	Regulation of multi-enzyme complex- Pyruvate dehydrogenase. Feedback inhibition.	MS
	3	Beta hydroxyl aspartate pathway	KM
	4	Oxalate as carbon and energy source	MS

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ACADEMIC YEAR/SEMESTER	**2023-24**	**VI Semester**
DEPARTMENT	**MICROBIOLOGY**	
SUBJECT/PAPER	**MBL106-I; Immunology and Medical Microbiology**	

MONTH -1 (April)

WEEK	DAY	PORTIONS PLANNED FOR 1 HOUR	FACULTY
1	1	Importance of normal microflora, normal microflora of skin, throat, gastrointestinal tract, urogenital tract	MS
	2	Historical perspective of immunology	KM
	3	Host pathogen interaction: Definitions:Infection, Invasion, Pathogen, Pathogenicity, Virulence, Toxigenicity	MS
	4	Immunity: Natural (active and passive) and artificial (active and passive)	KM
2	1	Host pathogen interaction: Carriers and their types, Opportunistic infections, Nosocomial infections. Transmission of infection.	MS
	2	Innate and acquired, Humoral and cell mediated.	KM
	3	Bacterial diseases: Haemophilus influenzae, Mycobacterium tuberculosis	MS
	4	Cells and organs of immune system	KM
3	1	Bacterial diseases: Mycobacterium tuberculosis	MS
	2	Cells and organs of immune system	KM
	3	Bacterial diseases: Salmonella typhi	MS
	4	Hematopoiesis, cytokines	KM
4	1	Bacterial diseases: Vibrio cholera	MS
	2	Properties and functions of B and T Lymphocytes	KM
	3	Bacterial diseases: Bacillus anthracis, Clostridium tetani	MS
	4	Natural killer (NK) cells, Granulocytes (Neutrophils, Eosinophils and Basophils)	KM
TEST 1			

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MONTH -2 (May)			
WEEK	**DAY**	**PORTIONS PLANNED FOR 1 HOUR**	**FACULTY**
1	1	Viral diseases: Hepatitis	MS
	2	Monocytes and macrophages, Dendritic cells and Mast cells	KM
	3	Viral diseases: Rabies	MS
	4	Primary lymphoid organs; Bone marrow and Thymus	KM
2	1	Viral diseases: Dengue, Chikungunya	MS
	2	Secondary lymphoid organs; Spleen and Lymph nodes.	KM
	3	Viral diseases: AIDS	MS
	4	Antigen: Immunogenicity and antigenicity	KM
3	1	Viral diseases: Corona, Influenza	MS
	2	Epitopes, B and T cell epitopes, Haptens	KM
	3	Protozoan diseases: Malaria	MS
	4	Properties and Chemical nature of antigen.	KM
4	1	Fungal infection: Pedis (Athlete's foot)	MS
	2	Antibody: Basic structure of antibody, light and heavy chain, variable and constant region, hinge region, Fab and Fc.	KM
	3	Fungal infections: Candidiasis.	MS
	4	Structure and functions of different types of antibodies (IgM, IgG, IgA, IgE, and IgD).	KM
TEST 2			

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MONTH -3 (June)			
WEEK	**DAY**	**PORTIONS PLANNED FOR 1 HOUR**	**FACULTY**
1	1	Antimicrobial agents: General characteristics & classification	MS
	2	Antibody dependent cell mediated cytotoxicity (ADCC).	KM
	3	Inhibitors of C ell wall, Cell membrane	MS
	4	Antigenic determinants on immunoglobulins: Isotype, allotype and idiotype.	KM
2	1	Inhibitors of Nucleic acid and Protein synthesis; Inhibitors of metabolism.	MS
	2	Monoclonal antibody production by hybridoma technology	KM
	3	Mechanism of action of Amphotericin B, Cephalosporin, Penicillin	MS
	4	Affinity and avidity.	KM
3	1	Mechanism of action of Tetracyclin, Griseofulvin Amantadine	MS
	2	Immunoprecipitation; Radial (Mancini) and double (Ouchterlony) immunodiffusion	KM
	3	Mechanism of action of Acyclovir, Azidothymidine	MS
	4	Agglutination reactions: Hemagglutination and Bacterial agglutination.	KM
4	1	Antibiotic resistance microbes	MS
	2	Enzyme linked immune-sorbent assay (ELISA).	KM
	3	Hypersensitivity reactions: Definition and Classification	KM
	4	Discussion of Old question papers & Revision	MS

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DEPARTMENT	**MICROBIOLOGY**	
SUBJECT/PAPER	**MBL106-I; Microbial Genetic Engineering and Industrial Microbiology**	

MONTH -1 (April)

WEEK	DAY	PORTIONS PLANNED FOR 1 HOUR	FACULTY
1	1	Definition of genetic engineering, milestones in genetic engineering, scope of genetic engineering.	KM
	2	Introduction to Industrial microbiology : Scope and concepts	MS
	3	Mode of action and applications of restriction enzymes, DNA polymerases, methylases, Terminal deoxynucleotidyl transferase	KM
	4	Criteria for selection of industrially important microbes	MS
2	1	Kinases, Phosphatases and DNA ligases in genetic engineering	KM
	2	Fermentor: Basic features; design and components of a typical fermentor	MS
	3	Definition, uses and properties of Plasmid vectors	KM
	4	Sterilization of fermentor, Control of air, temperature, pH, foaming andfeed.	MS
3	1	pBR and pUC series	KM
	2	Fermentation media: Strategies for media formulation; Natural and synthetic media	MS
	3	Bacteriophage lambda, cosmids.	KM
	4	Role of buffers, precursors, inhibitors, inducers and micronutrients.	MS
4	1	Cloning in Escherichia coli and Saccharomyces cerevisiae.	KM
	2	Types of fermentation process: Submerged fermentation	MS
	3	Gene Library: Construction of cDNA library, genomic library.	KM
	4	Types of fermentation process: Solid state fermentation (Koji)	MS
TEST 1			

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MONTH -2 (May)			
WEEK	**DAY**	**PORTIONS PLANNED FOR 1 HOUR**	**FACULTY**
1	1	Isolation of DNA	KM
	2	Objectives and significance of downstream processing	MS
	3	Restriction digestion and ligation of DNA	KM
	4	Overview of steps in product extraction andpurification	MS
2	1	Agarose gel electrophoresis	KM
	2	Biomass separation- Filtration and centrifugation	MS
	3	Blotting techniques- Southern blotting, DNA microarray analysis.	KM
	4	cell disruption- Physical, chemical andbiological methods	MS
3	1	PCR techniques and applications.	KM
	2	Product extraction, purification	MS
	3	DNA transfer methods: Microinjection, Electroporation	KM
	4	Recovery and product testing	MS
4	1	Liposome mediated DNA transfer	KM
	2	Industrial production of microbial products: Antibiotics (Penicillin)	MS
	3	Identification and selection of recombinants.	KM
	4	Industrial production of microbial products: Enzymes (Amylase)	MS
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1	1	Application of recombinant microorganisms in basic research, industry	KM
	2	Industrial production of microbial products: anti-cholesterolcompounds	MS
	3	Application of recombinant microorganisms in medicine, agriculture, environment	KM
	4	Industrial production of microbial products: , anti-cancerous compounds	MS
2	1	Products of recombinant DNA technology	KM
	2	Industrial production of microbial products: hormones (Insulin).	MS
	3	Products of human therapeutic interest - insulin, hGH	KM
	4	Bt transgenic - cotton, brinjal	MS
3	1	Gene therapy	KM
	2	Recombinant vaccines	MS
	3	Gene therapy	KM
	4	Biological, ethicaland social issues of gene cloning	MS
4	1	IPR	KM
	2	Revision	MS
	3	Class Test	KM
	4	Discussion of University Question papers	MS