

FYBSc Sem I

USMB 101 Fundamentals of Microbiology	CO 1:	development of Microbiology as a distinct branch of science
	CO 2:	biological hazards and safety measures
	CO 3:	structure and function of procaryotic and eucaryotic cells
	CO 4:	classification, structure and function of macromolecules
USMB 102 Basic techniques in Microbiology	CO 1:	principle, construction, working and application of different types of microscopes
	CO 2:	physical and chemical methods of control of microorganisms
	CO 3:	nutritional requirement, cultivation methods and preservation techniques for microorganisms
USMBP-1 Practicals	CO 1	methods of microscopy
	CO 2	observe bacteria and their cell organelles by staining procedures
	CO 3	laboratory instruments, equipments, disinfection
	CO 4	safe laboratory techniques and preventive measures
	CO 5	aseptic tranfer techniques
	CO 6	estimate biomolecules qualitatively
	CO 7	sterilize / disinfect routine laboratory requirements
	CO 8	effect of various control agents
	CO 9	prepare different types of media for bacterial cultivation
	CO 10	study characteristics of bacteria

FYBSc Sem II

USMB 201 Basics of Microbiology	CO 1:	the characteristics of different types of bacteria
	CO 2:	classification, morphology, cultivation, reproduction and significance of different groups of eucaryotic microorganisms
USMB 202 Exploring Microbiology	CO 1:	microbial interactions
	CO 2:	role of microorganisms in human health
	CO 3:	principle, construction, working and application of different instruments in microbiology
USMBP-2 Practicals	CO 1	cultivate yeast, fungi, bacteriophage
	CO 2	methods of enumeration of bacteria
	CO 3	microorganisms associated with human body, plants
	CO 4	study virulence factors
	CO 5	use of lab instruments like pH meter, colorimeter

SYBSc Sem III

USMB 301 Biomolecules and Microbial Taxonomy	CO 1	principle and procedures of methods of estimation of various biomolecules
	CO 2	nucleic acid structure, chemistry and function
	CO 3	concepts of microbial taxonomy, classical and molecular methods of identification and classification of bacteria
USMB 302 Environmental Microbiology	CO 1	importance of microorganisms in air, methods of sampling and studying air flora, air sanitation
	CO 2	various fresh and marine water environments and significance of microorganisms present in them
	CO 3	concept of potable water and methods of water purification
	CO 4	microbiological analysis of water for potability
	CO 5	methods of sewage water treatment and its monitoring
	CO 6	importance of microorganisms in soil, methods of sampling and studying soil flora
	CO 7	biogeochemical cycles
	CO 8	bioremediation
USMB 303 Option B Basic and Advanced Microbiology	CO 1	basic information about cell structure, microscopy, staining, nutrition and cultivation
	CO 2	physical and chemical methods of control of microorganisms
	CO 3	techniques used in recombinant DNA technology
	CO 4	basic bioinformatics
USMBP-3 Practicals	CO 1	quantitative estimation of biomolecules
	CO 2	classical method for bacterial identification
	CO 3	study air micro flora
	CO 4	methods for routine analysis of water and sewage
	CO 5	variety of soil micro flora
	CO 6	aseptic transfer, inoculation, cultivation of bacteria
	CO 7	methods of control of microorganisms
	CO 8	explore bioinformatics websites

SYBSc Sem IV

USMB 401 Metabolism & Basic Analytical Techniques	CO 1	metabolism, pathways, reactions, thermodynamics
	CO 2	classification and properties of enzymes and co-enzymes, their kinetics, factors affecting
	CO 3	principles, working and application of analytical techniques like chromatography, centrifugation and

		electrophoresis
USMB 402 Applied Microbiology	CO 1	host defence mechanisms like physical and chemical barriers involved in innate immunity, cells of the immune system
	CO 2	epidemiology - its tools, spread of infection and its control, nosocomial infections
	CO 3	food as a substrate for microorganisms, factors affecting, general principles of food spoilage
	CO 4	general principles of food preservation
	CO 5	methods of microbial examination of foods
	CO 6	microbiology of milk and milk products, their production
USMB 403 Option B Advances & Applications Of Microbiology and Soft Skills	CO 1	introduction, design, working and applications of biosensors, biofilms, and nanobiotechnology
	CO 2	definition, characteristics, functions, classification of research
	CO 3	basics of scientific writing and steps involved
	CO 4	basics of biostatistics required for small scale research
	CO 5	introduction, types, production and application of biopesticides, biofertilizers and bioremediation
USMBP-4	CO 1	solve problems based on bioenergetics, biostatistics
	CO 2	isolate and study different enzymes
	CO 3	study enzyme kinetics
	CO 4	use chromatography, centrifugation, electrophoresis techniques for separation and identification of biomolecules
	CO 5	study immune cells and mechanisms
	CO 6	isolate food spoilage organisms and study factors important in their control
	CO 7	analyse milk and milk products as per BIS / FSSAI standards
	CO 8	isolate organisms as biofertilizers
	CO 9	prepare nanoparticles and study their antimicrobial activity
	CO 10	study biofilms
	CO 11	abstract writing of scientific paper

TYBSc Sem V

USMB 501 Microbial Genetics	CO 1	molecular mechanisms of DNA replication in prokaryotes and eukaryotes
	CO 2	central dogma, transcription, translation
	CO 3	types of mutation, causes and effects and repair mechanisms of genetic material
	CO 4	gene transfer mechanisms in bacteria through transformation, conjugation and transduction
	CO 5	basic mechanism of homologous recombination in bacteria
USMB 502 Medical Microbiology and Immunology Part I	CO 1	virulence factors and their correlation with pathogenesis
	CO 2	morphological, cultural and biochemical characteristics of pathogens causing various diseases
	CO 3	mode of transmission and prophylaxis of diseases
	CO 4	methods of diagnosis of diseases
	CO 5	organs and tissues involved in adaptive immune response
	CO 6	role of antigen in initiating immune response
	CO 7	structure & functions of immunoglobulin
	CO 8	importance of cytokines, MHC, APCs, Cytokines, and the role in adaptive immunity
	CO 9	principle and working of various antigen – antibody reaction
USMB 503 Microbial Biochemistry Part I	CO 1	the architecture of the membrane and how solute is transported inside the cell.
	CO 2	Describe and explain the electron transport chains in prokaryotes and mitochondria and mechanism of ATP synthesis.
	CO 3	bioluminescence mechanism and its significance
	CO 4	methods of studying catabolism and anabolism and the various pathways for the breakdown of carbohydrates along with reactions in amphibolic pathways.
	CO 5	anabolic reactions in carbohydrate synthesis.
	CO 6	concepts of energetics and catabolism in biodegradation of various substrates.
USMB 504 Bioprocess Technology Part I	CO 1	applications of microbes and its strain improvement in Industrial Microbiology.
	CO 2	Application of kinetic formula to determine growth and productivity parameters of batch continuous, fed batch and solid substrate fermentations
	CO 3	design of bioreactors for different applications and its

		process parameters
	CO 4	Design media, growth conditions and techniques for producing and recovering different types of products of commercial value.
	CO 5	containment and levels of containment.
USMBP-5 Practicals	CO 1	study effect of UV as a mutagenic agents, isolate mutants
	CO 2	isolate plasmid DNA
	CO 3	study some virulence factors
	CO 4	isolate and identify etiological agent from a pathogenic sample for various disease
	CO 5	prepare antigen and study its reaction
	CO 6	special staining for identification
USMBP-6 Practicals	CO 1	isolate bioluminiscent organisms and study their properties
	CO 2	study oxidative and fermentative modes of fermentation and organisms involved
	CO 3	activity of some metabolically important enzymes
	CO 4	study various aspects of alcohol fermentation
	CO 5	estimate sugar and alcohol
	CO 6	isolate antibiotic producer and study its antimicrobial spectrum
	CO 7	study solid state fermentation for enzyme production

TYBSc Sem VI

USMB 601 rDNA Technology, Bioinformatics & Virology	CO 1	recombinant DNA molecules , also know the tools required like vectors , restriction enzymes etc.
	CO 2	use of databases and software tools for understanding biological data.
	CO 3	gene expression in prokaryotes, operon as a unit of gene regulation, regulation of gene expression in procaryotes and bacteriophages
	CO 4	general structure, life cycle and classification of viruses and their cultivation
	CO 5	study viriods, prions oncoviruses
USMB 602 Medical Microbiology and Immunology Part II	CO 1	morphological, cultural and biochemical characteristics of pathogens causing some more diseases, their diagnosis and prophylaxis
	CO 2	chemotherapeutic agents - their attributes, desirable properties

	CO 3	mode of action on cell wall, cell membrane, protein synthesis and function, DNA , metabolic activities
	CO 4	Mechanisms of drug resistance and its significance
	CO 5	structure and role of T- and B- cells in adaptive immunity
	CO 6	mechanism of adaptive immune response
	CO 7	complement system - components and activation
	CO 8	Application of the concept of immunity to prevention of disease by development of vaccines
USMB 603 Microbial Biochemistry Part II	CO 1	Metabolism of Lipids, Fatty acids, Nucleotides and Amino acids
	CO 2	Catabolism of Protein, aliphatic hydrocarbons and aromatic hydrocarbons
	CO 3	Regulation of metabolic process at various levels
	CO 4	Photosynthesis
	CO 5	Metabolism of inorganic molecules with special reference to nitrate and sulfate
	CO 6	Biological Nitrogen fixation
	CO 7	Lithotrophy
USMB 504 Bioprocess Technology Part I	CO 1	actual process involved in fermentations of important products.
	CO 2	applications of animal and plant tissue culture techniques.
	CO 3	applications of immobilized enzymes in various fields.
	CO 4	working of important instruments used in biochemical analysis and bioassay.
	CO 5	salient features of quality management and regulatory procedures
USMBP-7 Practicals	CO 1	isolate genomic DNA
	CO 2	enrich and enumerate coliphages
	CO 3	study bioinformatic databases and softwares like BLAST
	CO 4	demonstrate PCR, Western Blot, animal tissue culture
	CO 5	antibiotic sensitivity testing
	CO 6	MBC of antibiotic
	CO 7	Blood grouping
	CO 8	Coomb's test
USMBP-8 Practicals	CO 1	Screening of microorganisms producing lipase, PHB and protease
	CO 2	Detection of activity of enzymes which play an important role in amino acid and nitrate metabolism
	CO 3	Quantitative detection of important metabolic products such as protein and uric acid.
	CO 4	Quantitative detection of an important metabolic enzymes- protease

	CO 5	Bioassay of antibiotic and vitamin
	CO 6	immobilization of enzyme
	CO 7	plant tissue culture
	CO 8	viability testing
	CO 9	sterility testing