

MANONMANIAM SUNDARANAR UNIVERSITY

TIRUNELVELI

UG COURSES – AFFILIATED COLLEGES

B.Sc.Microbiology

(Choice Based Credit System)

(with effect from the academic year 2016-2017 onwards)

(44th SCAA meeting held on 30.05.2016)

Sem	Pt I/II/ III/IV V/VI	Sub No.	Subject status	Subject Title	Hrs/ week	Cre dits	Marks				
							Maximum			Passing minimum	
							Int.	Ext	Tot.	Ext	Tot.
V	I	33	Core - 7	Environmental and Agricultural Microbiology	4	4	25	75	100	30	40
	II	34	Core - 8	Industrial Microbiology	4	4	25	75	100	30	40
	III	35	Elective - 1	Bioinformatics	5	5	25	75	100	30	40
		36	Elective - 2	Dairy Microbiology	5	5	25	75	100	30	40
		37	Practical -5	Environmental and Agricultural Microbiology	3	-	50	50	100	20	40
		38	Practical - 6	Food and industrial Microbiology	3	-	50	50	100	20	40
		39	Practical - 7	Clinical Microbiology and Biotechnology	2	-	50	50	100	20	40
	IV	40	Skill Based subject (Common)	Personality Development / Effective Communication	4	4	25	75	100	30	40
				Subtotal	30	22					

VI	I	41	Core - 9	Food Microbiology	6	4	25	75	100	30	40
	II	42	Core - 10	Clinical Microbiology	6	4	25	75	100	30	40
	III	43	Core - 11	Microbial Microbiology	5	4	25	75	100	30	40
		44	Elective - 3	Marine Microbiology	5	5	25	75	100	30	40
		45	Practical – 5	Environmental and Agricultural Microbiology	3	4	50	50	100	20	40
		46	Practical - 6	Food and industrial Microbiology	3	4	50	50	100	20	40
		47	Practical - 7	Clinical Microbiology and Biotechnology	2	4	50	50	100	20	40
					Subtotal	30	29				

ENVIRONMENTAL AND AGRICULTURAL MICROBIOLOGY

Unit - I

Aero Microbiology - Aerosol - droplet nuclei - air pollution - sources (Microbiological) - Air quality analysis air, sampling devices - air borne pathogens.

Unit - II

Solid waste management - sources and types of solid waste, Methods of solid waste disposal (composting and sanitary landfill) - Liquid waste management, composition (BOD and COD) Primary, secondary (oxidation pond, trickling filter, activated sludge process and septic tank) and tertiary treatment.

Unit - III

Distribution of microorganisms in nature - Microbial communities in soil - physical and chemical characteristics of soil - Factors influencing the microbial density in soil - Bioleaching

Unit - IV

Microbial associations - Symbiosis - commensalism competition - amensalism - synergism - parasitism and predation - Rumen microbiology

Unit - V

Microorganisms in the decomposition of organic matter - Nitrogen cycle - carbon cycle - phosphorous and sulphur cycle, degradation - Xenobiotic degradation (Haloalkyl Propellants, Alkyl Benzyl Sulfonates)

Text books Recommended

1. Rangasamy G and Bagyaraj. D.J. (1996) - Agricultural Microbiology - Prentice - Hall of India pvt Ltd, New delhi
2. Atlas R.M and Bartha M (2003) Microbial ecology - Fundamentals and applications.

INDUSTRIAL MICROBIOLOGY

Unit - I

Brief history and developments in industrial Microbiology - Types of fermentation process - solid state and liquid state (Stationary and submerged) fermentations - batch, fed batch and continuous fermentations

Unit - II

Components of a typical bioreactor, Types of bioreactors - Laboratory, Pilot - scale and production fermenters, constantly stirred tank and air lift fermenter - Measurement and control of fermentation parameters - P^H , temperature, dissolved oxygen, foaming and aeration.

Unit - III

Sources of industrially important microbes and methods for their isolation, Preservation and maintenance of industrial strains - Strain improvement medium formulation

Unit - IV

Down stream processing - cell distruption - filtration centrifugation - solvent extraction-precipitation, lyophilization, spray drying

Unit - V

Production of Citric acid and Vinegar - Ethanol - Glutamic acid Vitamin B₁₂ - Antibiotics (Penicillin - Streptomycin), Dextran and Xanthan.

Text books recommended

1. Stanbury P.F.A. Whitakar and Hal S.J (1995) Principles of fermentation technology (2nd Edition)
2. Casida, L.E.1989 - industrial Microbiology willey Eastern Limited New delhi

MSU/2016-17/UG-Colleges/Part-III (B.Sc. Microbiology) Semester-V/Major Elective-1

BIOINFORMATICS

Unit - I

RDBMS - Definition of relational database - Mode of data transfer (FTP, SETP, SCP), advantage of encrypted data transfer

Unit - II

Biological database - nucleic acid, genome, protein sequence and structure, gene expression databases, database of metabolic pathway, Mode of data storage - File - formats - FASTA, Gene bank and Uniprot, Data submission and retrieval form NCBI, DDBJ Uniprot, PDB

Unit - III

Local and Global sequence alignment, pairwise and multiple sequence alignment, scoring an alignment, scoring matrices, PAM and BLOSUM Series of matrices - Types of Phylogenic trees - Different approaches of phylogenetic tree construction - UPGMA

Unit - IV

Diversity of Genomes : Viral, prokaryotic and eukaryotic genomes - transcriptome - proteome, 2-D gel electrophoresis, MALDI - TOF Spectrometry, Major features of completed genomes : E.Coli S. cerevisiae, Arabidopsis, Human

Unit - V

Hierarchy of protein structure - primary, secondary and tertiary structures, modeling, structural classes, Motifs, Folds and Domains, Protein structure prediction Research in bioinformatics:- Comparative analysis Homology Modeling and Drug discovery and design insilicomethod

Text books recommended

1. Saxena Sanjay (2003) A first course in computers, Vikas Publishing house
2. Pradeep and Sinha Preeti (2007) Foundations of computing 4th edition BPB Publication
3. LeskM.A(2008) introduction to Bioinformatics oxford Publication, 3rd international student edition.
4. Dr.A.John De Britto (2011) Bioinformatics .

DAIRY MICROBIOLOGY

Unit - I

Milk - Composition of milk, Protein - casein, whey proteins - Fat - Milk enzymes - Lactose (carbohydrate), milk colour, viscosity, flavor and Acidity - Nutritive value of milk - Antimicrobial systems in Raw milk (Lysozyme, Lactoferrin, Lactoferoxidase).

Unit - II

Sources of microorganisms in milk (The cow's udder, the skin of the cow, Milking utensils, Feeds, Air of the stable, Hands of milk persons, Receiving of milk)- Classification of microbes (Biochemical types, temperature characteristics and pathogenicity)

Unit - III

Dairy products - Curd - Butter milk - cheese - Yogurt - Acidophilus milk - Kefir - ice cream - sour cream

Unit - IV

Milk borne bacterial disease (Diphtheria, Pasteurellosis, Q fever, Tuberculosis, Mastitis) viral - Foot and mouth disease Fungal - Microsporam, Aspergillosis

Unit - V

Bacteriological tests for milk - Phosphatase milk - standard plate count - Direct microscopic count (DMC) - Burri smear - (clot - on - boiling) - Alizarin alcohol test - shake culture method - Rejection or platform testing - Detection of *Staphylococcus aureus* in milk

Text books recommended

1. Parihar and parihar - Dairy Microbiology (2011 Agrobios (india))
2. Adams M.R and Moss M.O (1995) Food Microbiology
3. Frazier W.C and westhoff D.C (2014) Food microbiology Tata MC Craw Hill Publishing co Ltd New delhi
4. Jay J.M (1987) Modern food Microbiology

FOOD MICROBIOLOGY

Unit - I

Food as a substrate for micro organisms (P^H , a^w value, Oxidation reduction potential, Nutrient content) - Microorganisms important in food microbiology - Mold, Bacteria and Yeast - General principles of food preservation : Asepsis, Removal, Anaerobic conditions.

Unit - II

Contamination of food (From green plant and fruits - animals - sewage - soil - water - air - during handling and processing) - Classification of foods by Ease of spoilage - Chemical changes caused by Micro organisms

Unit - III

Preservation - High temperature, Low temperature - Drying - Food additives - Sanitation - Hazard analysis, Critical control point - personal hygiene - oriental fermented food (Piden, Minchin, Fermented coffee, Soy sauce)

Unit - IV

Contamination, spoilage of foods - cereals and cereal products - vegetable and fruit - meat and meat product - milk and milk product - poultry - egg and egg products

Unit - V

Food poisoning - Food borne infections - Bacterial (Staphylococcus, Clostridium, Salmonella) - Fungal (Mycotoxins - Aflatoxin, Patulin, ochratoxin) - Viral (Hepatitis) - Rickettsia - Trichinosis

Text books recommended

1. Parihar and parihar - Dairy Microbiology (2011 Agrobios (india)
2. Adams M.R and Moss M.O (1995) Food Microbiology
3. Frazier W.C and westhoff D.C (2014) Food microbiology Tata MC Craw Hill Publishing co Ltd
New delhi
4. Jay J.M (1987) Modern food Microbiology

CLINICAL MICROBIOLOGY

Unit - I

Normal microbial flora of the human body - sources of infection : Food, water, vector and air - mode of transmission : Direct - person to person and animal to person - Indirect : Air and other modes (Food, water and insects) - Koch's postulates - control measures - Virulence factors of microbes - invasiveness and pathogenicity - Non specific resistant factors.

Unit - II

Diagnostic Microbiology - collection and transport of specimen for microbiological examination - General methods for isolation and identification of bacteria. Typing of bacterial isolates - Serodiagnosis

Unit - III

Clinical Symptoms - Epidemiology, Pathogenesis, Laboratory diagnosis, Prevention and treatment of the following bacterial infections - Streptococcal infections - Meningitis - Tuberculosis - Leprosy :Gastrointestinal disorders - Typhoid, Cholera, Bacillary dysentery : Sexually transmitted disease - Syphilis and Gonorrhoea - Anaerobic wound infection (Tetanus and gas gangrene)

Unit - IV

Clinical Symptoms - Epidemiology, Pathogenesis, laboratory diagnosis, Prevention and treatment of the following viral infections - Respiratory infections (Common cold, influenza, Measles, Mumps and Rubella) - Immunodeficiency disease (AIDS, Cytomegalovirus) and Herpes simplex virus.

Unit - V

Clinical Symptoms - Epidemiology, pathogenesis, laboratory, prevention and treatment of the following fungal and protozoan infections - systemic mycoses - subcutaneous mycoses protozoan :Amoebiasis, Malaria, Leishmaniasis - Nosocomial infections.

Text books Recommended

1. Ananthanaryanan R and Panikar J (200) Text book of Microbiology, Orient Longmans
2. Rajan (2007) Medical Microbiology MJP Publisher, Chennai
3. Kani L Mukherjee, Medical Lab technology Hill Publishing Co., Ltd., New Delhi Vol I-III

MICROBIAL BIOTECHNOLOGY

Unit - I

Milestone in biotechnology - Definition - concepts - History and achievements Principle and Application of rDNA technology

Unit - II

Transformation of DNA - Chemical method, Electroporation, Gene delivery - microinjection - biolistic method (gene gun), liposome and viral mediated delivery, agro Enzyme production technology through microbes Protein engineering and site directed mutagenesis - Enzyme immobilization and application

Unit - III

Introduction to genomics Sanger's methods of DNA Sequencing : traditional introduction to new generation sequencing - primer walking and shotgun sequencing

Unit - IV

Transgenic plants - Ti plasmid - virus, herbicide resistant plants: Transgenic animals - mice - retroviral method - embryonic stem cell method - Application - Transgenic sheep - transgenic fish - Hybridoma and monoclonal antibodies.

Unit - V

Products of microbial biotechnology - products of human therapeutic interest - insulin - hGH, antisense molecules, Bt transgenic - cotton, brinjal, Gene Therapy, recombinant vaccine.

Text books recommended

1. Stanbury P.F.A. Whitakar and Hal S.J (1995) Principles of fermentation technology (2nd Edition)
2. Casida, L.E.1989 - industrial Microbiology willey Eastern Limited New delhi

Major Elective - 3

MARINE MICROBIOLOGY

Unit – I

Classification of marine organisms – Archaeobacteria and other special groups – Marine ecosystem – intertidal Zones – Nutrient upwelling and down welling, Bacterial flora of the sea - Functions of Marine flora.

Unit – II

Habitats – Ecology of estuaries – salt marshes – mangroves – swamps – coral reefs and deep sea – Hydrothermal vent – microbial degradation of natural and synthetic waste materials

Unit – III

Conventional and modern methods of studying microorganisms – collection, enumeration, Isolation and identification based on morphological, physiological and biochemical characters, – influence of environmental factors on microbial growth and activity (Temperature, pressure, salinity, oxidation reduction potential, water activity and magnetic force)

Unit – IV

Biogeochemical cycle in marine – (water and iron cycle), Decomposition of organic matter – Food chain – Food web – primary and secondary production – Probiotic bacteria and their importance in aquaculture

Unit – V

Sea food microbiology – Normal genera associated with fish – fish spoilage – Human pathogens and contaminants – shell fish poisoning – Ciguatera poisoning – Scombroid fish poisoning – Microbial indicators of pollution – Biofouling and prevention – Bioactive compounds from sea.

Text books Recommended

1. Rangasamy G and Bagyaraj. D.J. (1996) - Agricultural Microbiology - Prentice - Hall of India pvt Ltd, New delhi
2. Atlas R.M and Bartha M (2003) Microbial ecology - Fundamentals and applications.

Major Practical - 5

ENVIRONMENTAL AND AGRICULTURAL MICROBIOLOGY

1. Determination of BOD
2. Determination of COD
3. Microbial degradation of cellulose
4. Most probable number test (MPN)
5. Membrane filter technique for the quality analysis of water
6. Estimation of total suspended solids of effluent
7. Isolation of bacteria from soil
8. Isolation of fungi from soil
9. Isolation of actinomycetes from soil
10. Testing antagonistic activity of soil microbes
11. Isolation of microbes from rhizospheres
12. Estimation of soil PH
13. Estimation of soil Nitrate
14. Estimation of soil Sulphate
15. Estimation of soil Magnesium

References:

1. J.G. Cappuccino and N.Sherman 1996 Microbiology - A laboratory manual - Benjamin Cummins, New York
2. M. Kannan 1996, Laboratory Manual in General Microbiology
3. P. Gunasekaran - Laboratory Manual in Microbiology
4. Dr.S.Rajan and Mrs.R.Selvi Christy - Experimental procedures in Life Sciences - Ajantha book house, chennai
5. Dr.S.M.Reddy and Dr.S.Ram Reddy - Microbiology A laboratory manual - BSC Publishers and Distributors - Hyderabad

Major Practical - 6

PRACTICALS FOR CORE SUBJECTS

MAJOR PRACTICAL – IV: FOOD AND INDUSTRIAL MICROBIOLOGY

1. Methylene Blue reduction test
2. Resazurin test
3. Milk phosphates test
4. Standard plate count of milk
5. Enumeration of microorganism from bread
6. Microbial examination of curd
7. Isolation and identification of microbes from fruits
8. Isolation and identification of microbes from vegetable
9. Isolation of microorganisms from grains
10. Determination of thermal death time
11. Determination of thermal death Point
12. Isolation of yeast from grapes
13. Wine production using yeast (Demonstration)
14. Production of ethanol from cane sugar using yeast cells (Demonstration)
15. Preparation of yohurt

References:

1. J.G. Cappuccino and N.Sherman 1996 Microbiology - A laboratory manual - Benjamin Cummins, New York
2. M. Kannan 1996, Laboratory Manual in General Microbiology
3. P. Gunasekaran - Laboratory Manual in Microbiology
4. Dr.S.Rajan and Mrs.R.Selvi Christy - Experimental procedures in Life Sciences - Ajantha book house, chennai
5. Dr.S.M.Reddy and Dr.S.Ram Reddy - Microbiology A laboratory manual - BSC Publishers and Distributors - Hyderabad

Major Practical - 7

PRACTICALS FOR CORE SUBJECT

MAJOR PRACTICAL – V: CLINICAL MICROBIOLOGY AND BIOTECHNOLOGY

1. Isolation of normal flora from mouth
2. Isolation of bacteria from pus
3. Isolation of bacteria from urine
4. Isolation of normal bacteria from blood
5. Antibiotic susceptibility testing by Disc diffusion method
6. Fungi - slide culture techniques
7. Parasite - iodine wet mount
8. Giemsa staining
9. Leishman staining
10. Widal test - Slide and tube test
11. ELISA technique - Demonstration
12. Vermi composting - Demonstration
13. Mushroom cultivation - Demonstration
14. Immobilization of bacterial cells and enzymes
15. Preparation of single cell protein from spirulina

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1. J.G. Cappuccino and N.Sherman 1996 Microbiology - A laboratory manual - Benjamin Cummins, New York
2. M. Kannan 1996, Laboratory Manual in General Microbiology
3. P. Gunasekaran - Laboratory Manual in Microbiology
4. Dr.S.Rajan and Mrs.R.Selvi Christy - Experimental procedures in Life Sciences - Ajantha book house, chennai
5. Dr.S.M.Reddy and Dr.S.Ram Reddy - Microbiology A laboratory manual - BSC Publishers and Distributors - Hyderabad