



DEPARTMENT OF MICROBIOLOGY, PALAMURU UNIVERSITY
M. Sc. MICROBIOLOGY
CHOICE BASED CREDIT SYSTEM (CBCS)
Schedule for Instruction and Examination
(Proposed Scheme for Academic year 2022onwards)

SEMESTER-I						
Syllabus Ref. No.	Subject	Credits	Teaching Hours	Marks		
				Internal Assessment	Semester Exam	Total
THEORY						
MB101	General Microbiology & Microbial Physiology (Core)	4	4	20	80	100
MB102	Virology (Core)	4	4	20	80	100
MB103	Research Methodology & Techniques (Core)	4	4	20	80	100
MB104	Microbial Biochemistry (Core)	4	4	20	80	100
PRACTICALS						
MB151	General Microbiology & Microbial Physiology	2	4	--	50	50
MB152	Virology	2	4	--	50	50
MB153	Research Methodology & Techniques	2	4	--	50	50
MB154	Microbial Biochemistry	2	4	--	50	50
Total		24	32	80	520	600

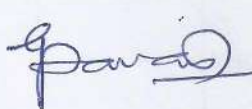
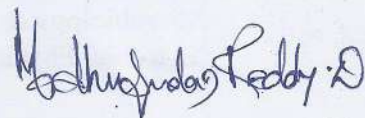
Dr

Dr

Dr. Mahalingam Reddy

SEMESTER- II						
Syllabus RefNo	Subject	Credits	Teaching Hours	Marks		
				Internal Assessment	Semester Exam	Total
THEORY						
MB201	Food Microbial Technology (Core)	4	4	20	80	100
MB202	Environmental & Agriculture Microbiology(Core)	4	4	20	80	100
MB203	Immunology (Core)	4	4	20	80	100
MB204	Pharmaceutical Microbiology (Core)	4	4	20	80	100
PRACTICALS						
MB251	Food Microbial Technology	2	4	--	50	50
MB252	Environmental & Agriculture Microbiology	2	4	--	50	50
MB253	Immunology	2	4	--	50	50
MB254	Pharmaceutical Microbiology	2	4	--	50	50
	Total	24	32	80	520	600



M.Sc. I Semester (CBCS)
Paper I General Microbiology and Microbial Physiology (Core) (CBCS)
(4 HPW-4 Credits)

Unit I

Pioneers of Microbiology.

Microscopy - Principles, working and applications of bright field microscope, fluorescent microscope, Phase contrast microscope, electron microscope.

Microbial Cell Structure: Prokaryotic cell, Eukaryotic cell, Organization and function of cellular organelles. Bacterial endospore structure, biochemistry and genetics of sporulation

Unit II

Methods of sterilization and disinfection: Physical methods and chemical methods.

Microbiological media - Autotrophic media, defined synthetic mineral media, heterotrophic media. The concept of prototrophs and auxotrophs, prototrophic (minimal media) complex media (undefined media).

Cultivation of Bacteria, Fungi and Algae: Routine and special culture methods.

Isolation of pure cultures.

Preservation and Maintenance of Microbial Cultures: Routine methods and Liquid nitrogen preservation, freeze-drying (lyophilization), etc.

Unit III

Identification methods and classification of bacteria: -

Microscopic identification characteristics, staining methods. Ecological identification methods, Nutritional (cultural) identification characters, biochemical identification methods, immunological characteristics, Molecular and genetic characteristics identification (16s rRNA).

Principles of bacterial taxonomy and classification: - Numerical taxonomy, Bergy's manual and its importance, general properties of bacterial groups.

Microbial nutrition and metabolism: autotrophy – Photoautotrophy and bacterial photosynthesis
Chemoautotrophy and heterotrophic metabolism.

Unit IV

Microbial growth: The concept of growth and definition, formation of protoplasm, building of macromolecules from elemental nutrients, supramolecules, organelles of cell and cellular components. Cell cycle in microbes and generation time.

Growth phases of bacteria – Lag phase, exponential (logarithmic) phase, stationary (ideo) phase, decline and survival of microbial cells. Importance of each growth phase.

Synchronous cultures – Methods of synchronous culturing, Continuous culturing methods, factors effecting growth.

Methods of growth measurement.

Dr. Shrestha, Gaurav, Balakrishnan, Reddy

I Semester Practical Paper I
General Microbiology & Microbial physiology (CBCS)
(4 HPW-2 Credits)

1. General instructions, Microbiology laboratory and its discipline
2. Handling of microscopes, Calibration and measurement of microscopic objects
3. Staining techniques for bacteria – simple, differential and special stainings
4. Sterilization procedures/methods
5. Preparation of microbiological media. Autotrophic media, minimal media, basic media, enriched media, enrichment media, differential media.
6. Isolation and cultivation of pure cultures
7. Identification methods of bacteria
8. Isolation and culturing of fungi (yeasts and molds) and algae
9. Culturing methods of microbes – slant and stab cultures, tube culture, flask cultures, shake flask cultures
10. Anaerobic culturing methods – anaerobic jar and its use, pyrogallol method, thioglycollate media culturing, anaerobic glove box and its application
11. Microbial growth experiments – Viable count of growing cultures and generation time determination
12. Study of bacterial growth curve
13. Factors effecting the microbial growth (pH and temperature)

Recommended books

Microbiology by Pelczar M.J., Ried, RD and Chan, ECS.
Microbiology by Gerard J. Tortora, Berdell Ra. Funke and Christine L. Case. Publ: Pearson Education Inc.
Text book of Microbiology by M. Burrows
General Microbiology by Stainier, Deudroff and Adelberg
Review of medical microbiology by Jawitz, Melnick and Adelberg
Bacterial and Mycotic infections of man. Ed. Dubos and Hirst Lipincott
Principles of Microbiology and Immunology by Davis, Dulbecco, Eison, Ginsberg and Wood.
Structure and Reproduction of Algae, Vol. I & II by Fritsch, F.E.
Introduction to Algae by Morris, I.
Products and Properties of Algae by Zizac.
Fresh water algae of the United States by Smith, GM.
Introductory Mycology, by Alexopolus, C.J.
Dispersal in Fungi by Ingold, CT
Microbial Physiology by Moat,
Laboratory Experiments in Microbiology by Gopal Reddy et al
Microbes in Action by Seoley HW and Van-Demark, PJ
Brock's Biology of microorganisms by Madigan, MT et al

①

shut

Gopal Reddy

M. Madigan et al

M. Sc. I Semester Microbiology (CBCS)
Paper II Virology (Core) (CBCS)
(4 HPW - 4 Credits)

Unit I

History of virology (latest Scientific investigations), Viral classification and nomenclature (Baltimore and ICTV system of classification). Virus structure and morphology. Detection of viruses: physical, biological, immunological, serological and molecular methods.

Propagation, purification, isolation, characterization, identification and quantification of bacteriophages, plant viruses and animal viruses.

Sub-viral particles: Discovery, structure, replication and diseases caused by satellites virus, viroids and prions. General idea about cyanophages, actinophages and mycophages.

Evolutionary importance of virus. Metagenomics for virus characterization: RNA-DNA hybrid virus

Unit II

Virus replication Strategies: Principal events involved in replication: Adsorption, penetration, uncoating nucleic acid and protein synthesis, intracellular trafficking, assembly, maturation and release, viral-host interaction, Host response to viral infection. Cellular interactions—clathrin coated pits, lipid rafts, endocytosis and virus uncoating mechanisms. Comparison of Lytic cycle and lysogeny cycle (T2 Bacteriophage, Lambda).

Morphology, Ultrastructure, Genome organization and Replication strategies of Group I Adenovirus; Group II – Banana bunchy top virus, Group III – Reovirus, Group IV- TMV, Group V – Influenza virus, Group VI – HIV, Group VII – HBV.

Unit –III

Recombination in phages, multiplicity reactivation and phenotypic mixing

General account of Tumor virus (RNA and DNA).

Viral Interference and Interferons. Nature and source of interferons, Classification of interferons.

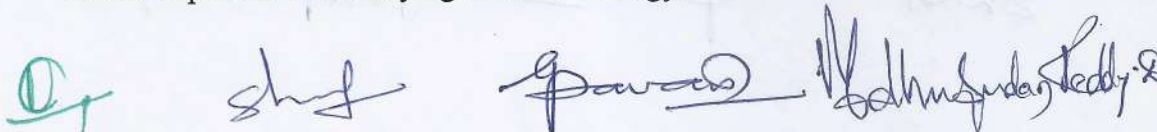
Induction of interferons. Antiviral agents (chemical and biological) and their mode of actions

Unit –IV

Introduction to viral vaccines, preparation of vaccines. Viruses as cloning vectors. Vectors used for cloning and sequencing: λ phage, M 13, retro viruses. CaMV 35S promoter and its application.

Baculovirus System for insect cell lines and its importance

Silver lining: viruses as therapeutic agents, viruses for gene delivery, viruses to destroy other viruses. Importance of studying modern virology.



I Semester Practical Paper II
Virology (CBCS)
(4 HPW - 2Credits)

1. Isolation of phage from different soil samples using laboratory bacterial cultures (*Staphylococcus, Bacillus*)
2. Isolation of phage from sewage using *Pseudomonas* and *E. coli* as host.
3. Cultivation and preservation of phages.
4. Quantification of phages
5. Growth phages of phage and burst size (Demonstration)
6. Phage induction
7. Cultivation of animal viruses in egg allantoic, amniotic and CAM
8. Symptomatic observations / slides plant viral infections
9. Demonstration of cytopathological changes of animal virus (slides/pictures)

Recommended Books

Recent publications: Research papers and review articles
General Virology by Luria and Darnel
Virology and Immunology by Jokli
Text book of Virology by Rhodes and Van Royen
Plant Virology by Smith
Genetics of bacteria and their viruses by W. Hayes
Molecular Biology of the gene by Watson, Roberts, Staitz and Weiner
A laboratory guide in virology by Charles H. Lunningham
Basic lab procedures in diagnostic virology by Marty Cristensen
Review of medical microbiology by Jawitz et al
Medical laboratory manual for tropical countries Vol I & II by Monica Cheesbrough
Text Book of Microbiology by Ananthanarayanan and Jayaram Paniker
Viral and Rickettsial infections of Man by Horsfall and Jam
Text book of Virology by Rhodes and Van Royan
Virological Procedures by Mitchal hasking
Virology by Wilson and Topley

Dr. Shree Ganesha V. J. Reddy

M.Sc. Microbiology I Semester (CBCS)
Paper III Research Methodology & Techniques (Core) (CBCS)
(4 HPW-4 Credits)

Unit I

Optical methods: colourimetry and spectrophotometry, fluorimetry, optical rotation
Circular dichroism, NMR, ESR spectroscopy, x-ray diffraction, types of mass spectrometry.
Electrophoretic techniques and application, counter current distribution.

Unit II

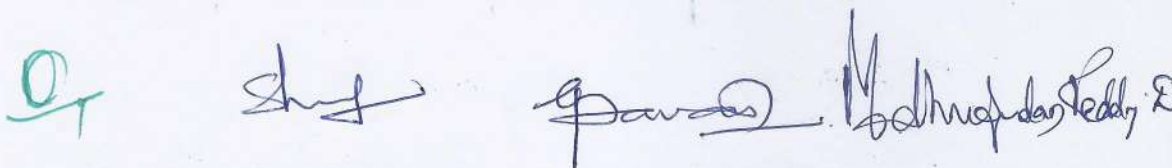
Separation methods: Chromatographic techniques – HPLC, FPLC paper, thin layer, ion exchange, gel filtration and affinity chromatography.
Diffusion, dialysis, cell disruption methods, centrifugation techniques, cell free extracts and their use in metabolic studies.
Radio isotopes – detection and measurement of radioactivity – scintillation counters, autoradiography, stable isotopes and their use. Safety precautions. General method of study of intermediary metabolism in microbes. Uses of mutants in study of metabolism.

Unit III

Population, samples and sampling procedures, variables, variations and frequency distributions, measures of central tendency and dispersion, element of probability, gaussian or normal distribution, binomial distribution, poisson distribution, 't' distribution, 'F' distribution and Chi-square distribution, correlation and linear regression.
Normal curve test, 't' test, 'F' test, ANOVA, analysis of covariance, Chi-square test, and confidence intervals. DMRT and its use in biological experiments. Experimental designs using statistical tools.

Unit IV

Introduction to Computers
Introduction to disk operating systems (DOS): Sample commands, DIR-CD-RD-DEL-COPY-MOVE-REN-TYPE-EDIT (Editor) CE-DATE and TIME.
Introduction to Windows: Word Processing: Electronic Spread Sheet
Data collection, Data representation, Manuscript preparation, Plagiarism, Research ethics, QA, QC, GLP, GMP, Patents & IPR



I Semester Practical Paper III
Research Methodology and Techniques (CBCS)
(4 HPW-2Credits)

1. Creating documents using word processor
2. Usage of spread sheet to biological applications
3. Biochemistry calculations and statistics
4. Absorption maxima of proteins, NA, tyrosine and riboflavin (Determination of molar extinction coefficient, calculations based on Beer Lambert's Law)
5. Estimation of inorganic and organic phosphate by Fiske-Subbarow method
6. Estimation of protein concentration by UV-vis spectrophotometry and Folin Lowry method
7. Differential centrifugation
8. Paper chromatography of amino acids
9. Dialysis for desalting of proteins
10. Demonstration of Gel filtration technique
11. Demonstration of electrophoresis of proteins and DNA

Recommended books

Biochemistry by Lehninger

Outlines of Biochemistry by Cohn and Stumph

Biological Chemistry by Mullar and Cards

Biochemistry by White, Handler and Smith

Methods in Enzymology series

The Cell – Bratch and Mirsky series

Laboratory experiments in Microbiology by Gopal Reddy et al

Biochemistry lab manual by Jayaraman

Introduction to the theory of statistics by Alexander, M Mood and Franklin

Fundamentals of Biometry by L.N. Balam

Statistical methods by Snedecor and Cochran

Introduction to computer and its application by Chae C. Chien

Basic Programming language by Bajaraman

Biostatistics – A manual of statistical methods for use in Health, Nutrition and Anthropology by K. Vishveshwar Rao



M.Sc. Microbiology I Semester (CBCS)
Paper IV Microbial Biochemistry (Core) (CBCS)
(4 HPW - 4Credits)

Unit I

pH and its biological relevance

Determination of pH, preparation of buffers

Concept of entropy, free-energy, free energy changes, high energy compounds. Equilibrium constants, Redox potentials, Biological redox systems, Biological oxidation, biological membranes, electron transport, oxidative phosphorylation and mechanism.

Unit II

Lipids classification: Bacterial lipids, prostaglandins, structure, function, Major steroids of biological importance.

Carbohydrates: Classification, basic chemical structure, monosaccharides, aldoses, and ketoses, cyclic structure of monosaccharides, stereoisomerism, anomers and epimers.

Sugar derivatives, deoxy sugars, amino sugars, and sugar acids.

Nucleic acids: Structure and properties of purines, pyrimidines, nucleosides and nucleotides.

Metabolism of purines and pyrimidines - Biosynthesis and degradation

Unit III

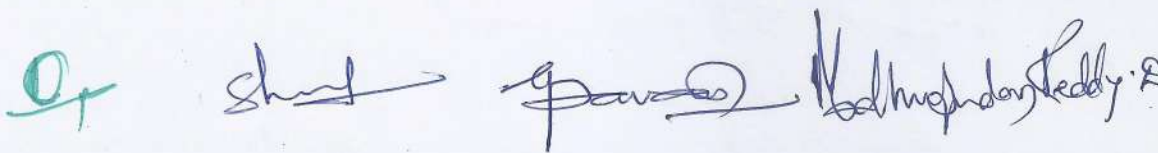
Proteins and amino acids: Properties of amino acids, structure, confirmation and properties of proteins, metabolism of amino acids, biosynthesis and degradation – an overview.

Enzymes nomenclature, classification methods for determination of enzyme activity. Isolation and purification of enzymes. Enzyme kinetics: Effect of pH, substrate concentration, temperature and inhibitors.

Unit IV

Control of enzymes. Mechanism of enzyme action – Action of Hydrolases, Oxidases and reductases. Coenzyme catalysis (pyridoxal phosphate and TPP). Isoenzymes. Competitive and non-competitive inhibition. Methods for increased microbial enzymes production and activity.

Enzyme engineering. Control of enzymes. Regulation of enzyme activity: allosteric enzymes and feedback mechanisms. Metabolic compartmentalization in relation to enzyme, enzymes and secondary metabolites

A series of handwritten signatures in blue ink, including a large initial 'Q', followed by several names in cursive script.

**I Semester Practical Paper IV
Microbial Biochemistry (CBCS)
(4 HPW - 2Credits)**

1. Safety and good lab practices
2. Preparation of buffers and adjustment of pH
3. Qualitative tests for carbohydrates and analysis of unknowns
4. Qualitative tests for amino acids and analysis of unknowns
5. Tests for lipids (qualitative)
6. Quantitative estimation of glucose and fructose
7. Determination of saponification value of fats
8. Partial purification of enzymes (β -amylase, urease and catalase)
9. Effect of substrate concentration, pH, time and temperature on enzyme activity
10. Calculation of K_m for partially purified enzyme
11. Study for inhibition of enzyme activity

Recommended Books

Biochemistry by Lehninger
Outlines of Biochemistry by Cohn and Stumph
Biochemistry of Nucleic acids by Davidson
Biological Chemistry by Mullar and Cards
Biochemistry by White, Handler and Smith
Methods in Enzymology series
The Cell – Bratch and Mirsky series
Biochemistry lab manual by Jayaraman

Dr. [Signature] [Signature] [Signature] [Signature]

M.Sc. Microbiology II Semester (CBCS)
Paper I Food Microbial Technology (Core) (CBCS)
(4 HPW-4Credits)

Unit I

Introduction to fermented foods; Health aspects of fermented foods; Fermented vegetables: Processing and fermentation of Sauerkraut and pickles; Cereal and legume based fermented products-bread, Soya Sauce, Tempeh; Microbiology of bread and idly; Production and significance of Silage; Mushrooms – production and cultivation of different types of mushrooms.

Unit II

Dairy Microbiology - Types of microorganisms in milk, significance of microorganisms in milk, Microbial products of milk- Acidophilus Milk, Bifidus Milk, Bulgarian milk, Kefir, Kumiss, Microbiology of cheese, butter, yogurt; microbiological examination of milk, control of microbial flora of milk; Probiotics and Prebiotics: Properties and beneficial effects of probiotics and prebiotics; Screening methods of Probiotics; Genetically Modified Probiotics.

Unit III

Spoilage of foods and factors governing the spoilage; Microbial Food poisoning, risks and hazards; Mycotoxins: Groups of mycotoxins, effects on human and animal health, Detoxification Methods (Physical, Chemical and biological) and Mechanism of toxicity; Food preservation methods and food safety issues.

Unit IV

Food Quality: Importance and functions of quality control. Methods of quality assessment of foods-Sampling, qualitative and quantitative microbiological analysis; Bacteriological examination of fresh and canned foods; Screening and Enumeration of spoilage microorganisms. Detection of pathogens in food.

Dr. Shree, Pawan, N. Balakrishna, Reddy. D

II Semester Practical

Food Microbial Technology (CBCS) (4 HPW-2Credits)

1. Microbiological examination of fresh and canned foods
2. Microbiological examination of spoiled foods and fruits
3. Microbiological examination of milk by Breeds method
4. Microbiological quality testing of milk (MBRT test)
5. Extraction of Mycotoxins from contaminated grains/foods.
6. Detoxification of mycotoxins.
7. Isolation, Screening and Identification of bacterial probiotics like LAB
8. Isolation, Screening and Identification probiotic yeast
9. Microbiological examination of mushrooms

Recommended books

Food Microbiology by Frazier

Biotechnology: Food Fermentation: Microbiology, Biochemistry, and Technology by VK Joshi and Ashok Pandey

Bibek Ray and Arun Bhunia (2008) Fundamental Food Microbiology 4th Ed. CRC Press.

Adams M R and Moss M O (2008) Food Microbiology 3rd Ed. RSC Publishing.

Microbial Ecology – A conceptual approach by Lynch and Poole

Basic food microbiology (Abridged edition) by George J. Banwart

Brock's Biology of Microorganisms by Madigan et al

Probiotics 3 by R. Fuller, G. Perdigon (Kluwer Academic Publishers)

Probiotics and Prebiotics: Scientific Aspects by Gerald W. Tannock *University of Otago, Dunedin, New Zealand* (Caister Academic Press)

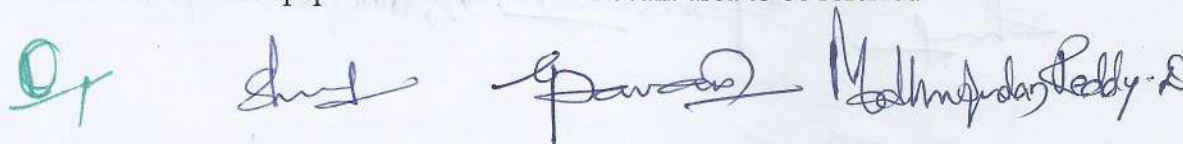
Biotoxicology by Kamal Narayan and Vohra.

Laboratory experiments in microbiology by Gopal Reddy et al

Food Quality Assurance: Principles and Practices by Inteaz Alli (CRC Press)

Foodborne Pathogens and Food Safety by Md. Latiful Bari, Dike O. Ukuku (CRC Press)

Recent Published papers on advances in relevant area to be referred

A series of handwritten signatures in blue ink, including a green 'Dr' on the left and several names, likely the authors or reviewers of the syllabus.

M.Sc. Microbiology II Semester (CBCS)
Paper II Environmental and Agricultural Microbiology (Core) (CBCS)
(4 HPW – 4 Credits)

Unit I

Microorganisms in air and their importance (brief account); Microorganisms and water pollution
Water-borne pathogenic microorganisms and their transmission; Sanitary quality of water; Water
pollution due to degradation of organic matter; Aerobic sewage treatment – Oxidation ponds, trickling
filters, activated sludge treatment; Anaerobic sewage treatment – Septic tank.

Unit II

Soil properties (physical, chemical and biological), Soil microorganisms, Methods of enumeration and
activity of microbes in environment/soil; Microbes and plant interactions – Rhizosphere, Phyllosphere
and Mycorrhizae; Strategies for bioremediation technologies, Microbial degradation of organic
pollutants with a special emphasis on pesticides like DDT and 2,4-D.

Unit III

Degradation of carbonaceous materials in soil – cellulose, hemicellulose and lignin decomposition,
factors governing the decomposition and biochemistry of decomposition, Soil humus formation,
Ammonification, Nitrification – Microbes involved, factors influencing nitrification, nitrifying bacteria
and biochemical mechanism. Denitrification – microbes involved, factors influencing and the
mechanism of denitrification. Nitrate pollution.

Unit IV

Nitrogen fixation – Asymbiotic and symbiotic nitrogen fixation, microorganisms involved,
biochemistry and genetics of nitrogen fixation, measurement of nitrogen fixation, ecological
and economic importance of nitrogen fixation. Biofertilizers – bacterial fertilizers and
production of rhizobial inoculants and blue-green algae, quality control tests.

Dr

Shree

Paras

M. Johny J. Kelly, D

II Semester Practical Paper II
Environmental and Agricultural Microbiology (CBCS)
(4 HPW-2Credits)

1. Isolation and observation of air microflora
2. Enumeration of soil microorganisms (bacteria, actinomycetes, fungi) by standard plate count
3. Estimation of soil microbial activity by CO₂ evolution
4. Estimation of BOD
5. Testing for microbial sanitary quality of water (coliform test)
6. Bioremediation of organic pollutants and their effect on soil microbial activity
7. Isolation of cellulose decomposing microbes and estimation of cellulase activity
8. Estimation of ammonifiers, nitrifiers and denitrifiers in soil by MPN METHOD
9. Isolation and culturing of Rhizobium sp from root nodules and Azospirillum from grasses (Cyanodon)
10. Isolation and observation of phyllosphere microflora
11. Isolation and observation of rhizosphere microflora
12. Observation for Mycorrhizae

Recommended Books

Recent Published papers on advances in relevant area to be referred

Soil Microbiology by Alexander Martin

Microbial ecology, Fundamentals and Applications Ed. Benjamin-Cummings Environmental Biotechnology-Fundamentals and applications. By Parihar (Agrobios india – publishers)

Soil Microbiology by Singh, Purohit, Parihar published by student edition.

Soil Biotechnology by JM Lynch

Microbial Ecology: Organisms, Habitats, and Activities by Stolp, H. Soil Microbiology and Biochemistry by Paul E. and PE Clank

Microbial Ecology: Principles, Methods and Applications by Lavin, Seidler, Rogul Biological Nitrogen Fixation by Quispel

Soil Microorganisms and Plant Growth by N.S. Subba Rao.

Laboratory experiments in microbiology by Gopal Reddy et al

Experiments in Microbiology, Plant pathology, Tissue culture and Mushroom production technology by K R Aneja

Biofertilizers for sustainable Agriculture by Arun K. Sharma Environmental Microbiology by K. Vijaya Ramesh (MJP Publishers) Brock Biology of Microorganisms by Madigan et al

Waste water microbiology by Bitton, G.

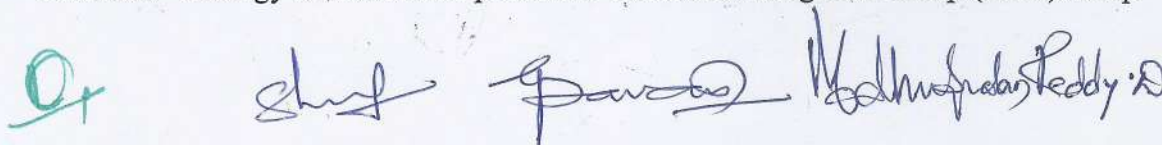
Waste water treatment – Biological and chemical process by Henze, M.

Biodegradation and Bioremediation second edition by Martin Alexander (Academic Press 2001)

Bioremediation - Principles and Applications by Ronald L Crawford and Don L Crawford , Cambridge University Press

J.M. Helawell - Biological indicators of freshwater pollution and environmental management. Elsevier Applied Science Publishers, London. (1986). 546p

F. Mason - Biology of freshwater pollution. Third edit. Longman Group (1996). 356p



M.Sc. Microbiology II Semester (CBCS)
Paper III Immunology (Core) (CBCS)
(4 HPW-4Credits)

Unit I

History of immunology. Hematopoiesis, Cell lineage, components of immune system, cells and organs of immune system.
Antigens –Nature, properties and types. Haptens
Antibody -Structure, functions and classification. Isotypes, allotypes and idiotypes.
Immunoglobulin genes. Generation of antibody diversity. Clonal nature of the immune response - clonal selection theory.
Generation of T cell receptor diversity by genomic rearrangement
Structure of B and T cell receptors

Unit II


Overview of Innate and adaptive immunity
Toll-like receptors, cell-mediated and humoral immune responses, inflammation.
Major Histocompatibility Complex (MHC). Human leucocyte antigen (HLA) restriction
Processing and presentation of antigen by MHC. Transplantation immunity,
Immune response during bacterial (tuberculosis), parasitic (malaria) and viral (HIV) infections,
Congenital and acquired immunodeficiencies.
Immunological tolerance-central and peripheral.

Unit III

Auto immunity and Hypersensitivity - immediate and delayed type hypersensitivity reactions.
Classical and alternate Complement pathways
Antigen and antibody reactions–Agglutination, Precipitation, neutralization, and function. Labeled antigen-antibody reactions- ELISA, RIA, immune blotting, CFT, immunofluorescence. Flow cytometry (Fluorescence activated cell sorter) and its applications in Immunology. Development of immuno diagnostic kits.

UNIT IV

Types of conventional vaccines and principles of Immunization.
Modern vaccines; peptide, DNA, recombinant / vector, and anti-idiotypic vaccines
Schedules of common vaccination, Benefits and adverse consequences of vaccination.
Production of polyclonal antibodies; Animals models for production of antibodies
Hybridoma techniques and monoclonal antibody production. Applications of monoclonals in biomedical research, clinical diagnosis and treatment. Chimeric Antibodies.
Immunosuppression and its mechanism of action.
Immune evasion by bacteria and viruses.
Tumor immunology. Immuno diagnosis and immune therapy of cancer



II Semester Practical Paper III
Immunology (CBCS)
(4 HPW- 2 Credits)

1. Agglutination reactions – Widal, VDRL, HA, Blood typing – tube method
Precipitation test: Ring interphase, single radial diffusion.
2. Ouchterlony double diffusion.
3. Immuno-electrophoresis.
4. Neutralization test – Plaque neutralization, Haemadsorption test.
5. WBC and RBC count and differential blood picture.
6. Separation of serum proteins.
7. Blot transfer and detection of protein on blot by staining.
8. ELISA
9. Purification of IgG from serum
10. Lymphocyte culture, viable staining and haemocytometer count.
11. Indirect agglutination (Pregnancy hCG Ag)

Recommended Books

Kuby Immunology

Cellular and molecular immunology by Abul K. Abbas et al

Test book of Immunology by Barret

Immunology – The science of self-non self discrimination by Jan Klein

Essential Immunology by Roitt, IM

Immunology by Tizard

The elements of Immunology by Fahim Halim Khan

Immunology and immunopathology by Stewart Sell

M.Sc. Microbiology II Semester (CBCS)
Paper IV Pharmaceutical Microbiology (Core) (CBCS)
(4 HPW - 4 Credits)

Unit I

Microorganisms affecting pharmaceutical industry – The atmosphere, water, skin & respiratory flora of personnel, raw-materials, packing, equipment, building, utensils etc. Types of microorganisms occurring in pharmaceutical products.

Microbiological spoilage prevention of pharmaceutical products.

Preservation of pharmaceutical products; antimicrobial agents used as preservatives, evaluation of the microbial stability of formulation

The sterilization in pharmaceutical industry

Good manufacturing practices in pharmaceutical industry

Unit II

History of chemotherapy – plants and arsenicals as therapeutics, Paul Ehrlich and his contributions, selective toxicity and target sites of drug action in microbes. Development of synthetic drugs – Sulphanamides, antitubercular compounds, nitrofurans, nalidixic acid, metronidazole group of drugs.

Antibiotics - The origin, development and definition of antibiotics as drugs, types of antibiotics and their classification. Non-medical uses of antibiotics.

Cosmetics microbiology- testing methods and preservation

Antimicrobial preservation efficacy and microbial content testing

Unit III

Principles of chemotherapy – Clinical and lab diagnosis, sensitivity testing, choice of drug, dosage, route of administration, combined/mixed multi drug therapy, control of antibiotic/drug usage.

Mode of action of important drugs – Cell wall inhibitors (Betalactam – eg. Penicillin), membrane inhibitors (polymyxins), macromolecular synthesis inhibitors (streptomycin), antifungal antibiotics (nystatin)

Unit IV

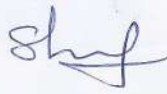
The drug resistance – The phenomenon, clinical basis of drug resistance, biochemistry of drug resistance, genetics of drug resistance in bacteria.

Microbiological assays: Assays for growth promoting substances, nutritional mutants and their importance, vitamin assay, amino acid assay

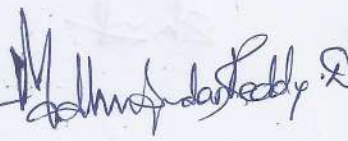
Assay for growth inhibiting substances – Assay for non-medicinal antimicrobials (Phenol coefficient/RWC). Drug sensitivity testing methods and their importance. Assay for antibiotics – Determination of MIC, the liquid tube assay, solid agar tube assay, agar plate assay (disc diffusion, agar well and cylinders cup method).

Introduction to pharmacokinetics and pharmacogenomics.









II Semester Practical Paper IV
Pharmaceutical Microbiology (CBCS)
(4 HPW- 2 Credits)

1. Sterility testing methods for pharmaceutical and cosmetic products
2. Tests for disinfectants (Phenol coefficient/RWC)
3. Determination of antibacterial spectrum of drugs/antibiotics
4. Chemical assays for antimicrobial drugs
5. Testing for antibiotic/drug sensitivity/resistance
6. Determination of MIC valued for antimicrobial chemicals
7. Microbiological assays for antibiotics (Liquid tube assay, agar tube assay, agar plate assays)
8. Efficacy testing of preservatives like parabens

Reference/Recommended Books for MB Pharmaceutical Microbiology

Disinfection, sterilization and preservation. Block, S.S. (ed). Lea and Febigor, Baltimore
Pharmaceutical Microbiology. Hüge, W.B. and Russel, AD. Blackwell Scientific, Oxford
Principles and methods of sterilization in health sciences. Perkins, JK. Pub: Charles C. Thomas, Springfield.

Compendium of methods for the microbiological examination of foods. Vanderzant, C. and Splittstoesser, D. Pub: American Public Health Association, Washington, D.C.

Disinfectants: Their use and evaluation of effectiveness. Collins, CH., Allwood, MC., Bloomfield, SF. And Fox, A. (eds). Pub: Academic Press, New York

Inhibition and destruction of microbial cell by Hugo, WB. (ed). Pub: Academic Press, NY

Manual of Clinical Microbiology. Lennette, EH. (ed). Pub: American Society for Microbiology, Washington.

Principles and Practices of disinfection. Russell, AP., Hugo, WB., and Ayliffe, GAJ. (eds). Publ. Blackwell Sci.

Biochemistry of antimicrobial action. Franklin, DJ. and Snow, GA. Pub: Chapman & Hall.

Antibiotics and Chemotherapy. Garrod, L.P., Lambert, HP. And C'Grady, F. (eds). Publ: Churchill Livingstone.

Antibiotics. Lancini, G. and Parenti, F. publ: Springer-Verlag.

The Molecular Basis of antibiotic action. Ga.e, EF. Et al. Publ: Wiley, New York.

Antimicrobial Drug action. Williams, RAD., Lambart, PA. & Singleton, P. Pub: Bios Sci.

Microbiological Assays. Hewitt.

Antiviral Drugs. Kargor, S.

Burger's Medicinal chemistry Vol. I – III. Ed. Nanfield E. World.

The control of antibiotic resistant bacteria. Stuart, Harris and Harris.

Indian Pharmacopea; United States Pharmacopea; British Pharmacopea.

Dr. shaf, gawad, Mahapatra, Reddy