



SLN DEGREE COLLEGE

Alamur Road, Anantapuramu

Affiliated to S.K. University

DEPARTMENT OF MICROBIOLOGY

The Department of MICROBIOLOGY was started in the year 2017 with an UG Course B.M.C (Bio-Technology, Microbiology, Chemistry).

The department is having well qualified and experienced faculty members. The faculty is a perfect blend of different specializations in MICROBIOLOGY and applications to impart their expertise in handling diversified courses of the UG programs. The teaching methodology in the department goes beyond fulfilling the syllabus requirements of the University, to meet the today's industry needs. Faculty motivates and guides the students to do mini projects in core subjects. Special focus will be given to develop Communication and Soft Skills. The Department adopted and made the ICT in teaching techniques effectively.

Vision & Mission

Microbiology as a Basic and Applied Science has been considered as an important discipline of Science, which has implications in various aspects of human welfares like Medicine, Agriculture, Biotechnology and Bioinformatics. Twenty first century is considered to be the period of Biotechnology. In all facets of human life, this discipline is bringing drastic changes. Microorganisms and microbial techniques are the basic tools of Biotechnology. Basic and Industrial research all over the world give prime importance to this discipline. More than fifty percent of the Global investments in industrial research are in this field; which is a signboard to say that future industrial growth is going to be in this direction. The consciousness about the environmental aspects and search for eco-friendly technologies ultimately leads to the biological methods. Agriculture, pest control, vector control, and waste management practices were once heavily depending on chemical industries. Now more and more microbial alternatives have been developed and they are replacing chemical methods.

In the present world scenario education is orienting to have a job value and Universities and academic institutions are remodeling their curriculum to satisfy this social demand.

Microbiology as a subject of high relevance and scope, students can choose industrial, academic or research career. They can choose their further studies in the area of Medical Microbiology, Industrial Microbiology, Plant or Animal Biotechnology, Food and Dairy Microbiology, Immunology, Clinical Virology, Sanitation Microbiology, Biochemistry, Pharmaceutical Microbiology, Environmental Microbiology, Genetic Engineering, Molecular Biology or Bioinformatics. They can also choose a career in any of these disciplines, since there are many industries related to these, which require Microbiologists. Further, if they are interested in Research career, they can choose it without any hesitation since most of the modern Biological researches directly or indirectly need expertise in Microbiological methods.

Our primary vision while starting this course was to channelize Biology education to this important branch of Biology in Kerala. The recent history of the state reflects the fulfilling of this objective as many institutions including two Govt. colleges had started the same course after the establishment of this department. However, the objective of the course is reflected in the curriculum that gives a strong basic knowledge both in theory and practical to the graduating students.

It gives an opportunity for hands on training in various applied aspects of the disciplines like analysis of food samples, clinical samples, isolation and identification of microorganisms, their cultivation, preservation etc.

Our mission is to produce skilled graduates who can choose research fields or professional career as Microbiologist in various industries even though the institution is located in Kasaragod, which is one of the backward districts of Kerala.

Since majority of the students are from financially and socially backward, their primary aim is to get a job after their studies with minimum financial expenditure. Our alumni profiles reflect the achievement of this objective as most of them selected their career in the fields of Microbiology and related ones.

Courses / Programs offered:

Level	Course
UG	B.M.C

MICROBIOLOGY CBCS PATTERN

B.Sc MICROBIOLOGY (CBCS) REVISED SYLLABUS – 2020-2021

YEAR	SEMESTER	PAPER	TITLE	MARKS	Hours/Week Theory/ Practical	CREDITS
I	I	MBT - I	INTRODUCTION TO MICROBIOLOGY AND MICROBIAL DIVERSITY	100	3	3
		MBP – I	INTRODUCTION TO MICROBIOLOGY AND MICROBIAL DIVERSITY	50	3	2
	II	MBT – II	MICROBIAL PHYSIOLOGY AND BIOCHEMISTRY	100	3	3
		MBP – II	MICROBIAL PHYSIOLOGY AND BIOCHEMISTRY	50	3	2
II	III	MBT –III	MOLECULAR BIOLOGY AND MICROBIAL GENETICS	100	3	3
		MBP – III	MOLECULAR BIOLOGY AND MICROBIAL GENETICS	50	3	2
	IV	MBT - IV	IMMUNOLOGY AND MEDICAL MICROBIOLOGY	100	3	3
		MBP – IV	IMMUNOLOGY AND MEDICAL	50	3	2

			MICROBIOLOGY			
		MBT - V	MICROBIAL ECOLOGY AND INDUSTRIAL MICROBIOLOGY	100	3	3
		MBP - V	MICROBIAL ECOLOGY AND INDUSTRIAL MICROBIOLOGY	50	3	2
III	V	MBT -6A	MICROBIAL QUALITY CONTROL IN FOOD AND PHARMACEUTICAL INDUSTRIES	100	3	3
		MBP -6A	MICROBIAL QUALITY CONTROL IN FOOD AND PHARMACEUTICAL INDUSTRIES	50	3	2
		MBT -7A	MICROBIAL BIOTECHNOLOGY	100	3	3
		MBP -7A	MICROBIAL BIOTECHNOLOGY	50	3	2
		MBT -6B	HUMAN MICROBIAL DISEASES	100	3	3
		MBP - 6B	HUMAN MICROBIAL DISEASES	50	3	2
		MBT -7B	DIAGNOSIS AND MANAGEMENT OF HUMAN MICROBIAL DISEASES	100	3	3
		MBP -7B	DIAGNOSIS AND MANAGEMENT OF HUMAN MICROBIAL DISEASES	50	3	2

		MBT – 6C	MICROBIOLOGY FOR SELF-SUSTENANCE	100	3	3
		MBP – 6C	MICROBIOLOGY FOR SELF-SUSTENANCE	50	3	2
		MBT –7C	PLANT MICROBIAL DISEASES AND MANAGEMENT	100	3	3
		MBP -7C	PLANT MICROBIAL DISEASES AND MANAGEMENT	50	3	2
Note: ONE PAIR OF SKILL ENHANCEMENT COURSES EITHER A, B OR C SHALL BE CHOSEN. PAIR SHALL NOT BE BROKEN.						
Note: THIRD PHASE OF APPRENTICESHIP IN ENTIRE 6TH SEMESTER						

MBT- I: INTRODUCTION TO MICROBIOLOGY AND MICROBIAL DIVERSITY

Course Outcomes: By the completion of the course the learner should able to–

- CO1** Recognize, name members of the microbial world. Describe important milestones in the field of Microbiology.
- CO2** Identify and illustrate prokaryotic and eukaryotic cell structures. Compare and contrast the three cell types Bacteria, Archaea and Eucarya.
- CO3** Define basic terms and understand principles of microscopy, recognize, illustrate and label various components of a microscope
- CO4** Explain principle that apply to different staining methods
- CO5** Explain principle that of sterilisation and be able to identify appropriate method of sterilisation/ disinfection

Syllabus

TOTAL HOURS: 60

CREDITS: 3

UNIT-I: History of Microbiology & Place of Microorganisms in the living world

No. of hours: 12

History of Microbiology- Theory of spontaneous generation-Biogenesis and abiogenesis; in the context of contributions of Anton von Leeuwenhoek, Edward Jenner, Louis Pasteur, Robert Koch, Ivanowsky, Martinus Beijerinck and Sergei Winogradsky Importance and applications of microbiology
Place of Microorganisms in the Living World Haeckels three Kingdom concept, Whittakers five kingdom concept, three domain concept of Carl Woese

UNIT-II: Prokaryotic microorganisms and Viruses

No. of hours: 12

Ultra structure of Prokaryotic cell- cell wall (in detail); Structure and/Functions (in brief) of cell membrane, cytoplasm, nucleoid, plasmid, inclusion bodies, flagella (brief structure and arrangement), pili, capsule, endospore
General characteristics of Bacteria (Size, shape, arrangement, reproduction); few examples of heterotrophic, autotrophic, parasitic, obligate intracellular parasitic bacteria.
General characteristics of Archaea
General characteristics of viruses, Cultivation of Viruses (in brief)
Morphology, Structure and replication of TMV and Lambda

UNIT-III: Eukaryotic microorganisms

No. of hours: 12

Fungi - Habitat, nutrition, vegetative structure and modes of reproduction; outline classification
Algae- Habitat, thallus organization, photosynthetic pigments, storage forms of food, reproduction.
Protozoa–Habitat, cell structure, nutrition, locomotion, excretion, reproduction, encystment, outline classification

UNIT-IV: Principles of Microscopy, Sterilization & Disinfection No. of hours: 12

Principles of microscopy - Bright field and Electron microscopy (SEM and TEM).

Staining Techniques - Simple and Differential staining techniques (Gram staining, spore staining, Acid fast staining).

Sterilization and disinfection techniques –

Physical methods- autoclave, hot- air oven, pressure cooker, laminar air flow, filter sterilization, Radiation methods - UV rays, Gamma rays.

Chemical methods alcohols, aldehydes, fumigants, phenols, halogens and hypochlorites.

UNIT-V: Isolation and Culture of Bacteria and Fungi No. of hours: 12

Isolation of Microorganisms from natural habitats.

Growth media- Natural, synthetic and semi synthetic media, Basal and complex media, selective, enrichment, enriched and differential media

Pure culture techniques- dilution-plating, Streak-plate, Spread-plate, Pour-Plate and micromanipulator. Preservation of microbial cultures - sub culturing, overlaying cultures with mineral oils, lyophilization, sand cultures, storage at low temperature.

MBP- I: INTRODUCTION TO MICROBIOLOGY AND MICROBIAL

DIVERSITY

Course Outcomes: By the completion of the course the learner should be able to—

CO1 Employ safe laboratory practices and follow the rules of biosafety.

CO2 To prepare media for growth of bacteria and fungi

CO3 To sterilise media and various items used for experimentation

CO4 Cultivate and observe microbes, stained and unstained (motility) using light microscope

CO5 To enumerate organisms by colony count and preserve them in the lab

CO6 To acquire skills of aseptic transfer

Syllabus

TOTAL HOURS: 30

CREDITS:

2

1. Microbiology Good Laboratory Practices and Biosafety.
2. Preparation of culture media for cultivation of bacteria
3. Preparation of culture media for cultivation of fungi
4. Sterilization of medium using Autoclave
5. Sterilization of glassware using Hot Air Oven
6. Light compound microscope and its handling
7. Microscopic observation of bacteria (Gram +ve bacilli and cocci, Gram -ve bacilli), Algae and Fungi.
8. Simple staining
9. Grams staining
10. Hanging-drop method.
11. Isolation of pure cultures of bacteria by serial dilution and streak/spread/pour plate method.
12. Preservation of bacterial cultures by various techniques.
13. Observation of electron micrographs of bacterial cells

SUGGESTED READING:

- Pelczar, M.J., Chan, E.C.S. and Kreig, N.R. (1993). Microbiology. 5th Edition, Tata McGraw Hill Publishing Co., Ltd., New Delhi.
- Dube, R.C. and Maheswari, D.K. (2000) General Microbiology. S Chand, New Delhi.
Edition), Himalaya Publishing House, Mumbai.
- Power, C.B. and Dagainawala, H.F. (1986). General Microbiology Vol I & II
- Prescott, M.J., Harley, J.P. and Klein, D.A. (2012). Microbiology. 5th Edition, WCB McGrawHill, New York.
- Reddy, S.M. and Reddy, S.R. (1998). Microbiology □ Practical Manual, 3 rd Edition, SriPadmavathi Publications, Hyderabad.
- Singh, R.P. (2007). General Microbiology. Kalyani Publishers, New Delhi.
- Stanier, R.Y., Adelberg, E.A. and Ingram, J.L. (1991). General Microbiology, 5th Ed., Prentice Hall of India Pvt. Ltd., New Delhi.
- Microbiology Edited by Prescott
- Jaya Babu (2006). Practical Manual on Microbial Metabolisms and General Microbiology. Kalyani Publishers, New Delhi.
- Gopal Reddy *et al.*, Laboratory Experiments in Microbiology

MBT II: MICROBIAL PHYSIOLOGY AND BIOCHEMISTRY

Course Outcomes: By the completion of the course the learner should be able to–

- CO1** Understand the structure and functions of biomolecules; Distinguish between their roles in the cell
- CO2** Explain the properties of enzymes, their classes, and understand the factors affecting their activity
- CO3** Define and understand principles of various analytical techniques and where they are applied
- CO4** State nutritional requirements of microorganisms, give examples of nutritional types of microbes and give examples of microbes that fall in each type.
- CO5** Describe bacterial growth curve, explain and illustrate different methods of microbial growth measurement.
- CO6** Describe the processes of respiration and photosynthesis in bacteria and differentiate between fermentation and respiration.

Syllabus

TOTAL HOURS: 60

CREDITS: 3

UNIT-I: Biomolecules

No. of hours: 12

General characters and outline classification of Carbohydrates (Monosaccharides- Glucose, fructose, ribose, Disaccharides- Sucrose, Lactose, Polysaccharides- Starch, glycogen, Cellulose)

General characters and outline classification of Lipids and fatty acids (phospholipids, polyβ hydroxy alkanes)

General characteristics of amino acids and proteins. Amino acids in peptidoglycan

Structure of Nucleic acid

UNIT-II: Enzymes

No. of hours: 12

Properties and classification of Enzymes.

Biocatalysis- induced fit and lock and key models.

Coenzymes and Cofactors.

Inhibition of enzyme activity- competitive, noncompetitive, uncompetitive and allosteric.

Factors effecting enzyme activity

UNIT – III: Analytical Techniques

No. of hours: 12

Principle and applications of -
Colorimetry
Chromatography (paper, thin-layer and column),
Spectrophotometry (UV & visible),
Centrifugation and
Gel Electrophoresis (Agarose and SDS).

UNIT IV: Microbial Nutrition and growth

No. of hours: 12

Nutritional requirements of Microorganisms
Methods of uptake of nutrients by cells
Nutritional groups of microorganisms- autotrophs, heterotrophs, lithotrophs,
organotrophs, phototrophs, chemotrophs
Microbial Growth- different phases of growth in batch cultures; Synchronous,
continuous, biphasic growth.
Factors influencing microbial growth
Methods for measuring microbial growth – Direct microscopy, viable count estimates,
turbidometry and biomass.

UNIT- V : Microbial metabolism

No. of hours: 12

Aerobic respiration - Glycolysis, TCA cycle, ED Pathway, Electron transport
Oxidative and substrate level phosphorylations.
Anaerobic respiration (Nitrate and sulphate respiration)
Fermentation-lactic acid and ethanol fermentations
Outlines of oxygenic and anoxygenic photosynthesis in bacteria

MBP II: MICROBIAL PHYSIOLOGY AND BIOCHEMISTRY

Course Outcomes: By the completion of the course the learner should be able to–

CO1 Perform basic tests for qualitative analysis of carbohydrates/ amino acids

CO2 Use the laboratory centrifuge for separation of simple mixtures

CO3 Acquire skill of using colorimeter for quantitative estimation

CO4 Understand the working of column chromatography

CO5 Design simple experiments to evaluate the effect of temperature/pH on bacterial growth and present results graphically

CO6 Enumerate bacterial growth

Syllabus

TOTAL HOURS: 30

CREDITS: 2

1. Qualitative Analysis of Carbohydrates.
2. Qualitative Analysis of Aminoacids.
3. Colorimetric estimation of proteins by Biuret / Lowry method.
4. Separation of components of a given mixture using a laboratory scale centrifuge.
5. Separation of mixtures by paper / thin layer chromatography.
6. Demonstration of column packing in any form of column chromatography.
7. Effect of temperature/pH on bacterial growth
8. Demonstration of electrophoretic technique
9. Study and plot the growth curve of E. coli by turbidometric and standard plate count methods

SUGGESTED READING:

- Berg JM, Tymoczko JL and Stryer L (2011) Biochemistry, W.H.Freeman and Company Caldwell, D.R. (1995). Microbial Physiology and Metabolism, W.C. Brown Publications, Iowa, USA.
- Lehninger, A.L., Nelson, D.L. and Cox, M.M. (1993). Principles of Biochemistry, 2 nd Edition, CBS Publishers and Distributors, New Delhi.
- Sashidhara Rao, B. and Deshpande, V. (2007). Experimental Biochemistry: A student Companion. I.K. International Pvt. Ltd.
- Tymoczko JL, Berg JM and Stryer L (2012) Biochemistry: A short course, 2nd ed., W.H.Freeman
- Voet,D. and Voet J.G (2004) Biochemistry 3rd edition, John Wiley and Sons
White, D. (1995). The Physiology and Biochemistry of Prokaryotes, Oxford University Press, New York.

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MBT III: MOLECULAR BIOLOGY AND MICROBIAL GENETICS

Course Outcomes: By the completion of the course the learner should be able to—

- CO1** Describe, draw and differentiate between the structures of DNA and RNA, compare different forms of RNA. Illustrate and explain organization of DNA in prokaryotic
- CO2** Explain the experiments which established DNA as genetic material. Illustrate the process of DNA replication and describe the enzymes involved in the process.
- CO3** Illustrate and explain the process of transcription and translation. Predict the polypeptide sequence of a given DNA fragment.
- CO4** Describe various types of mutations, reasons and types of DNA damage and its repair
- CO5** Define and explain the basic procedures of genetic engineering and appreciate its applications

Syllabus

TOTAL HOURS: 60

CREDITS: 3

UNIT- I: Nucleic acids

No. of hours: 12

DNA and RNA – Role in heredity-The central dogma
Watson and Crick model of DNA
Types of RNA, structure and functions
Organization of DNA in prokaryotes

UNIT- II : Genetic material and replication

No. of hours: 12

Experiments which established DNA as genetic material
RNA as genetic material
Mechanism of DNA Replication in Prokaryotes
Proof of semi conservative mechanism of replication (Messelson - Stahl Experiment)
Extra chromosomal genetic elements - Plasmids and transposons

UNIT- III: Gene expression and regulation

No. of hours: 12

Concept of gene - Muton, recon and cistron; One gene- one polypeptide, one gene- one enzyme and one gene-one product hypothesis. Genetic code Structure of ribosomes Protein synthesis – Transcription and translation in Prokaryotes
Regulation of gene expression in bacteria – *lac* operon

UNIT- IV: Mutations, damage and repair

No. of hours: 12

Outlines of DNA damage and repair mechanisms

Mutations - spontaneous and induced, base pair changes, frame shifts, deletions, inversions, tandem duplications, insertions

Mutagens - Physical and Chemical mutagens

Bacterial recombination – Transformation, Conjugation, Transduction (Generalized and specialized transductions)

UNIT- V: Genetic engineering

No. of hours: 12

Basic principles of genetic engineering. Restriction endonucleases, DNA polymerases and ligases. Vectors. Outlines of gene cloning methods. Polymerase chain reaction.

Genomic and cDNA libraries. General account on application of genetic engineering in industry, agriculture and medicine.

MBP III: MOLECULAR BIOLOGY AND MICROBIAL GENETICS

Course Outcomes: By the completion of the course the learner should be able to–

CO1 Solve basic problems in replication, Transcription and translation

CO2 Isolate DNA from bacteria

CO3 Visualize DNA and proteins by electrophoresis

CO4 Examine and identify the photomicrographs of replication, transcription and translation

TOTAL HOURS: 30

CREDITS: 2

1. Study of different types of DNA and RNA using micrographs and model / schematic representations.
2. Study of semi-conservative replication of DNA through micrographs / schematic representations
3. Isolation of genomic DNA from *E. coli*
4. Estimation of DNA using UV spectrophotometer.
5. Resolution and visualization of DNA by Agarose Gel Electrophoresis.
6. Resolution and visualization of proteins by Polyacrylamide Gel Electrophoresis (SDS - PAGE).
7. Problems related to DNA and RNA characteristics, Transcription and Translation.
8. Induction of mutations in bacteria by UV light.
9. Instrumentation in molecular biology - Ultra centrifuge, Transilluminator, PCR

SUGGESTED READING:

- Freifelder, D. (1990). Microbial Genetics. Narosa Publishing House, New Delhi.
Freifelder, D. (1997). Essentials of Molecular Biology. Narosa Publishing House, New Delhi.

- Glick, B.P. and Pasternack, J. (1998). *Molecular Biotechnology*, ASM Press, Washington D.C., USA.
- Lewin, B. (2000). *Genes VIII*. Oxford University Press, England.
- Maloy, S.R., Cronan, J.E. and Freifelder, D. (1994). *Microbial Genetics*, Jones and Bartlett Publishers, London.
- Ram Reddy, S., Venkateshwarlu, K. and Krishna Reddy, V. (2007) *A text Book of Molecular Biotechnology*. Himalaya Publishers, Hyderabad.
- Sinnot E.W., L.C. Dunn and T. Dobzhansky. (1958). *Principles of Genetics*. 5 th Edition. McGraw Hill, New York.
- Smith, J.E. (1996). *Biotechnology*, Cambridge University Press.
- Snyder, L. and Champness, W. (1997). *Molecular Genetics of Bacteria*. ASM press, Strickberger, M.W. (1967). *Genetics*. Oxford & IBH, New Delhi.
- Verma, P.S. and Agarwal, V.K. (2004). *Cell Biology, Genetics, Molecular Biology, Evolution and Ecology*. S. Chand & Co. Ltd., New Delhi.

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MBT – IV: MEDICAL MICROBIOLOGY AND IMMUNOLOGY

Course Outcomes: By the completion of the course the learner should be able to

CO1 Outline the organization of the immune system and demonstrate an understanding of key concepts in immunology.

CO2 Examine major events in immune response, Humoral and Cell mediated.

CO3 Explain the stepwise process of infection and disease

CO4 Differentiate various diagnostic methods and the procedure of sample collection

CO5 Explain principles of vaccination and the mode of action of different antibiotics

Syllabus

TOTAL HOURS: 60

CREDITS: 3

UNIT-I: Immune System No. of hours: 12

Concept of Innate and Adaptive immunity

Primary and secondary organs of immune system – thymus, bursa fabricus, bone marrow, spleen, lymph nodes and lymphoid tissues

Cells of immune system- Identification and function of B and T lymphocytes, null cells, monocytes, macrophages, neutrophils, basophils and eosinophils

Complement system (in brief)

UNIT-II : Immune response No. of hours: 12

Characteristics of antigen (Foreignness, Molecular size, Heterogeneity and solubility) haptens.

Antibodies – basic structure and types.

Generation of Immune Response - Primary and Secondary Immune Response

MHC- Functions of MHC I & II molecules

Generation of Humoral Immune Response (Plasma and Memory cells), Immune complex

formation and elimination - Agglutination, Precipitation, Neutralisation, Complement fixation, Phagocytosis

Generation of Cell Mediated Immune Response

Hypersensitivity- definition and types (in brief)

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UNIT- III: Microbes in Health and Disease

No. of hours: 12

Normal flora of human body.

Definitions - Infection, Invasion, Pathogen, Pathogenicity, Virulence, Toxigenicity, Opportunistic infections, Nosocomial infections.

General account on microbial diseases – causal organism, pathogenesis, epidemiology, diagnosis, prevention and control of the following

Bacterial diseases – Tuberculosis, Typhoid, Botulism

Fungal diseases – Candidiasis.

Protozoal diseases – Malaria.

Viral Diseases - Hepatitis- A and AIDS

UNIT- IV:Principles of Diagnosis

No. of hours: 12

General principles of diagnostic microbiology- Collection, transport of clinical samples

Identification by culturing

Identification by biochemical/physiological properties

Identification by molecular assays (PCR, DNA probes)

Identification by serological tests (ELISA, Immunofluorescence, Agglutination based tests, Complement fixation)

UNIT- V:Prevention and Treatment

No. of hours: 12

Vaccines -Active (Natural and recombinant) and passive

Monoclonal antibodies- Production and application

Antimicrobial agents- General modes of action of antibacterial (Penicillin, Streptomycin), antifungal (Amphotericin and Griseofulvin), antiviral (Amantadine, Acyclovir)agents

Interferons Tests for antimicrobial susceptibility (Disc diffusion)

Antibiotic resistance in bacteria

MBP IV: MEDICAL MICROBIOLOGY AND IMMUNOLOGY

Course Outcomes: By the completion of the course the learner should be able to–

CO1 Perform some of the ag-ab reactions

CO2 Carry out the biochemical tests useful for identification of bacteria

CO3 Perform antibiotic sensitivity test

CO4 Identify some common symptoms and relate them to etiology

CO5 Prepare some differential media routinely used for identification of bacteria

Syllabus

TOTAL HOURS: 30

CREDITS: 2

1. Identification of human blood groups.
2. Separate serum from the blood sample (demonstration).
3. Immunodiffusion by Ouchterlony method.
4. Identification of any of the bacteria (*E. coli*, *Pseudomonas*, *Staphylococcus*, *Bacillus*) using laboratory strains on the basis of cultural, morphological and biochemical characteristics: IMViC, urease production and catalase tests
5. Study of composition and use of important differential media for identification of bacteria: EMB Agar, McConkey agar, Mannitol salt agar, Deoxycholate citrate agar, TCBS Isolation of bacterial flora of skin by swab method.
6. Antibacterial sensitivity by Kirby-Bauer method
7. Determination of minimal inhibitory concentration of an antibiotic
8. Study symptoms of the diseases with the help of photographs: Anthrax, Polio, Herpes, chicken pox, HPV warts, Dermatophytes (ring worms)
9. Study of various stages of malarial parasite in RBCs using permanent mounts.

SUGGESTED READING:

- Ananthanarayan R. and Paniker C.K.J. (2009) Textbook of Microbiology. 8th edition, University Press Publication.
- Brooks G.F., Carroll K.C., Butel J.S., Morse S.A. and Mietzner, T.A. (2013) Jawetz, Melnick and Adelberg's Medical Microbiology. 26th edition. McGraw Hill Publication.
- Delves P, Martin S, Burton D, Roitt IM. (2006). Roitt's Essential Immunology. 11th edition Wiley-Blackwell Scientific Publication, Oxford.
- Goldsby RA, Kindt TJ, Osborne BA. (2007). Kuby's Immunology. 6th edition W.H. Freeman and Company, New York.
- Kubys Immunology. 6th edition W.H. Freeman and Company, New York.
- Jawetz, Melnick and Adelbergs Medical Microbiology. 26th edition. McGraw Hill Microbiology. 4th edition. Elsevier Publication.
- Willey JM, Sherwood LM, and Woolverton CJ. (2013) Prescott, Harley and Kleins Microbiology. 9th edition. McGraw Hill Higher Education.

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MBT V: MICROBIAL ECOLOGY AND INDUSTRIAL MICROBIOLOGY

Course Outcomes: By the completion of the course the learner should be able to–

CO1 Recognize the role of microbes in cycling of elements; Name and define different types of microbial interactions with examples.

CO2 Understand the role of microbes in waste management and degradation of xenobiotics

CO3

Explain the factors affecting association of microorganisms with food. Explain the microbiology of water potability

CO4 Discuss the basic concepts in industrial microbiology, industrially important microbes and metabolites

CO5 Explain the components of up stream and downstream bioprocessing

Syllabus

TOTAL HOURS: 60

CREDITS: 3

UNIT I: Microorganisms in environment

No. of hours: 12

Role of microorganisms in Biogeochemical cycles (Carbon, nitrogen, phosphorus)

Microbe-microbe interactions Synergism, mutualism, commensalism, antagonism, competition, parasitism, predation,

Plant- Microbe interactions Plant growth promoting Microorganisms, Plant pathogens

Extremophilic microorganisms

UNIT II: Microorganisms in Food and Water

No. of hours: 12

Microbes in waste management- solid and liquid waste (aerobic and anaerobic)

Microbes in degradation of Xenobiotics

Microbes in drinking water- detection of potability by (a) standard qualitative procedure: presumptive test/MPN test, confirmed and completed tests for faecal coliforms (b) Membrane filter technique, Microbes in food –intrinsic and extrinsic parameters that affect microbial growth in food

UNIT III: Industrial Microbiology**No. of hours: 12**

Microorganisms of industrial importance yeasts (*Saccharomyces cerevisiae*), moulds (*Aspergillus niger*) bacteria (*E.coli*), actinomycetes (*Streptomyces griseus*).

Screening techniques.

Industrially important Primary and secondary microbial metabolites- Techniques involved in selection of industrially important metabolites from microbes.

UNIT IV: Fermentation processes**No.of hours: 12**

Design of fermenter (for control of pH, temperature, dissolved oxygen, foaming and aeration)

Types of fermenter batch, continuous and fed batch.

Types of fermentation processes – solid state, liquid state, batch, fed-batch, continuous.

Fermentation media (Crude and synthetic media; molasses, corn- steep liquor, sulphite waste liquor, whey, yeast extract and protein hydrolysates)

Downstream processing - filtration, centrifugation, cell disruption, solvent extraction.

UNIT V: Microbial Productions**No. of hours: 12**

Microbial production of Industrial products: Citric acid, Ethanol, Penicillin, Glutamic acid, vitamin B12, Amylase, Yogurt

Microbial cells as food- SCP

MBP V: MICROBIAL ECOLOGY AND INDUSTRIAL MICROBIOLOGY

Course Outcomes: By the completion of the course the learner should be able to–

CO1 Comprehend the significance of and demonstrate microbial diversity by isolating microorganisms from natural environments.

CO2 Microscopically demonstrate the microorganisms found in fermented food; prepare some of the fermented products (wine) in the laboratory to observe the associated physical and chemical changes.

CO3 Carry out microbial productions in small scale (citric acid) and estimate the product

Syllabus

Total hours: 30

Credits: 1

1. Microbial fermentation for the production and estimation of ethanol
2. Isolation of amylase producing microorganisms from soil
3. Production of amylase from bacteria and fungi
4. Assay of amylase
5. Demonstration of fermenter
6. Production of wine from grapes
7. Growth curve and kinetics of any two industrially important microorganisms.
8. Microbial fermentation for the production and estimation of citric acid

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THIRD YEAR – SEMESTER- V

MBT- 6A : MICROBIAL QUALITY CONTROL IN FOOD AND PHARMACEUTICAL INDUSTRIES

TOTAL HOURS: 60

CREDITS: 3

Course Outcomes: By the completion of the course the learner should be able to–

- CO1** Explain the principles of biosafety cabinets and biological waste management
- CO2** Explain the methods of detection of microorganisms in pharmaceuticals.
- CO3** Explain the molecular methods of detection of pathogens for quality control
- CO4** Design/select specific media for identification of microbes in food and pharmaceutical products
- CO5** Understand various food preservation and safety principles

Syllabus

UNIT – I: Introduction to biosafety

No. of Hours: 12

Good laboratory practices - Good microbiological practices.

Biosafety cabinets – Working of biosafety cabinets, using protective clothing, specification for BSL-1, BSL-2, BSL-3.

Discarding biohazardous waste – Methodology of Disinfection, Autoclaving & Incineration

UNIT – II: Quality control in pharmaceuticals

No. of Hours: 12

Culture and microscopic methods - Standard plate count, Most probable numbers, Direct microscopic counts, Biochemical and immunological methods: Limulus lysate test for endotoxin, gel diffusion, sterility testing for pharmaceutical products

UNIT – III: Molecular methods for quality control

No. of Hours: 12

Molecular methods - Nucleic acid probes, PCR based detection, biosensors.

Molecular methods of detection of Salmonella Sp and Botulism toxin in food stuffs

UNIT – IV: Quality control tests in industries

No. of Hours: 12

Enrichment culture technique, Detection of specific microorganisms - on XLD agar, *Salmonella Shigella* Agar, Manitol salt agar, EMB agar, McConkey Agar, Saboraud Agar; Ascertaining microbial quality of milk by MBRT, Rapid detection methods of microbiological quality of milk at milk collection centres (COB, 10 min Resazurin assay).

UNIT – V : Food safety systems

No. of Hours: 12

Food preservation methods- Modern industrial techniques- Pasteurisation, vacuum packing, freeze drying, food additives, irradiation, modified atmosphere

Hazard analysis of critical control point (HACCP) - Principles, flow diagrams, limitations

Microbial Standards for Different Foods and Water – BIS standards for common foods and drinking water

MBP 6A : MICROBIAL QUALITY CONTROL IN FOOD AND PHARMACEUTICAL INDUSTRIES

TOTAL HOURS: 30

CREDITS: 2

Course Outcomes: By the completion of the course the learner should be able to–

- CO1** Perform sterility tests for equipment.
- CO2** To employ disinfection methods of selected instruments
- CO3** To perform sterility test of air in the lab
- CO4** To test the sterility of microbiological media
- CO5** To test the sterility of pharmaceutical products
- CO6** To analyse the microbial quality of water
- CO7** To analyse the food samples for mycotoxins

Syllabus

1. Sterility tests for Instruments – Autoclave & Hot Air Oven
2. Disinfection of selected instruments & Equipments
3. Sterility test of Air in Laboratory.
4. Sterility testing of Microbiological media
5. Sterility testing of Pharmaceutical products –Antibiotics, Vaccines & fluids
6. Standard qualitative analysis of water.
7. Analysis of food samples for Mycotoxins

SUGGESTED READING

- 1.Harrigan WF (1998) Laboratory Methods in Food Microbiology, 3rd ed. Academic Press
- 2.Garg N, Garg KL and Mukerji KG (2010) Laboratory Manual of Food Microbiology I K International Publishing House Pvt. Ltd.
- 3.Jay JM, Loessner MJ, Golden DA (2005) Modern Food Microbiology, 7th edition. Springer
- 4.Baird RM, Hodges NA and Denyer SP (2005) Handbook of Microbiological Quality control in Pharmaceutical and Medical Devices, Taylor and Francis Inc.
5. Microbiology - A laboratory manual, Cappuccino & Sherman , 6 th Ed, Pearson Education
6. Manual of diagnostic microbiology, Dr.B.J.Wadher & Dr.G.L.Bhoosreddy, First .Ed ., Himalaya publishing house, Nagpur.
7. Pharmaceutical Microbiology – W.B. Hugo
8. Pharmaceutical Microbiology – Purohit
9. Laboratory Exercises in Microbiology, George.A.Wistreich & Max.D.Lechtman, 3 rd Ed, Glencoe press, London.

B.Sc MICROBIOLOGY (CBCS) REVISED SYLLABUS - 2020

THIRD YEAR – SEMESTER- V

MBT- 7A: MICROBIAL BIOTECHNOLOGY

TOTAL HOURS: 60

CREDITS:3

Course Outcomes: By the completion of the course the learner should be able to–

CO1 Understand the scope and applications of microbial biotechnology in different sectors

CO2 Explain the microbial production processes for human welfare

CO 3 Discuss the biocatalytic processes and their industrial applications

CO 4 Describe the biofuel technology, bioremediation, mineral recovery processes.

CO 5 Know the IPR regulations

Syllabus:

UNIT- I : Scope and applications of Microbia Biotechnology

No. of Hours: 12

Microbial biotechnology: Scope and its applications in human therapeutics, agriculture (Biofertilizers, PGPR, Mycorrhizae), environmental, and food technology.

Genetically engineered microbes for industrial application: Bacteria and yeast

UNIT- II: Microbial production processes

No. of Hours: 12

Recombinant microbial production processes in pharmaceutical industries - Streptokinase, recombinant vaccines (Hepatitis B vaccine).

Microbial polysaccharides, polyesters and bioplastics. Microbial production of bio-pesticides

Microbial biosensors

UNIT- III: Biocatalytic processes

No. of Hours: 12

Microbial based transformation of steroids and sterols.

Bio-catalytic processes and their industrial applications: Production of high fructose syrup and production of cocoa butter substitute.

Immobilization methods and their application: Whole cell immobilization

UNIT- IV: Biofuel technology

No. of Hours: 12

Bio-ethanol and bio-diesel production: commercial production from lignocellulosic waste and algal biomass.

Biogas production: Methane and hydrogen production using microbial culture. Microorganisms in bioremediation: Degradation of xenobiotics.

Mineral recovery, removal of heavy metals from aqueous effluents.

UNIT- V: IPR

No. of Hours: 12

Outlines of Intellectual Property Rights:

Patents and secret processes –History of patenting, composition, subject matter and characteristics of a patent, Inventor, Infringement, cost of patent

Copyrights, Trademark

MBP 7A- MICROBIAL BIOTECHNOLOGY

TOTAL HOURS: 30

CREDITS: 2

Course Outcomes: By the completion of the course the learner should be able to—

CO 1 Demonstrate yeast cell and enzyme immobilization methods

CO2 Demonstrate the pigment production from fungi

CO3 Demonstrate enzyme isolation from bacterial culture

CO4 Know the process of SCP production

Syllabus:

1. Yeast cell immobilization in calcium alginate gels
2. Enzyme immobilization by sodium alginate method
3. Pigment production from fungi (*Trichoderma / Aspergillus / Penicillium*)
4. Isolation of xylanase or lipase producing bacteria
5. Study of algal Single Cell Proteins

SUGGESTED READING:

1. Ratledge, C and Kristiansen, B. (2001). Basic Biotechnology, 2nd Edition, Cambridge University Press.
2. Demain, A. L and Davies, J. E. (1999). Manual of Industrial Microbiology and Biotechnology, 2nd Edition, ASM Press.
3. Swartz, J. R. (2001). Advances in Escherichia coli production of therapeutic proteins. Current Opinion in Biotechnology, 12, 195–201.
4. Prescott, Harley and Klein's Microbiology by Willey JM, Sherwood LM, Woolverton CJ (2014), 9th edition, Mc Graw Hill Publishers.
5. Gupta PK (2009) Elements of Biotechnology 2nd edition, Rastogi Publications,

6. Glazer AN and Nikaido H (2007) *Microbial Biotechnology*, 2nd edition, Cambridge University Press
7. Glick BR, Pasternak JJ, and Patten CL (2010) *Molecular Biotechnology* 4th edition, ASM Press,
8. Stanbury PF, Whitaker A, Hall SJ (1995) *Principles of Fermentation Technology* 2nd edition., Elsevier Science
9. Crueger W, Crueger A (1990) *Biotechnology: A text Book of Industrial Microbiology* 2nd edition Sinauer associates, Inc.

B.Sc MICROBIOLOGY (CBCS) REVISED SYLLABUS - 2020

MBT 6B – HUMAN MICROBIAL DISEASES

TOTAL HOURS: 60

CREDITS: 3

Course Outcomes: By the completion of the course the learner should be able to–

CO1 Outline the concept of health and infectious diseases.

CO2 To explain bacterial disease transmission and control.

CO3 To explain viral disease transmission and control.

CO4 To explain protozoan and fungal diseases;
disease transmission and control.

CO5 Summarize on cancers and pandemic diseases.

Syllabus:

Unit I: Concept of Health and infectious diseases

No of Hours: 12

Definition and concept of health, disease, Infection, Pathogen, Pathogenicity, Virulence, Toxigenicity, Carriers and their types;

Host microbe interactions, Germ theory of disease, Koch's postulates-modern interpretation

Unit II: Bacterial diseases

No of Hours: 12

Pathogenesis, Symptoms, mode of transmission, prophylaxis and control of

Respiratory Diseases: Streptococcus pyogenes, Haemophilus influenzae,

Mycobacterium tuberculosis

Gastrointestinal Diseases: Escherichia coli, Salmonella typhi, Vibrio cholerae,

Helicobacter pylori Others: Staphylococcus aureus, Bacillus anthracis, Clostridium

tetani, Treponema pallidum, Clostridium difficile

Unit III: Viral diseases

No of Hours: 12

Pathogenesis, Symptoms, mode of transmission, prophylaxis and control of

Polio, Hepatitis, Dengue, AIDS, Influenza, Chikungunya, Japanese Encephalitis.

Unit IV: Protozoan and fungal diseases

No of Hours: 12

Pathogenesis, Symptoms, mode of transmission, prophylaxis and control of

Malaria, Kala-azar

Cutaneous mycoses: Tinea pedis (Athlete's foot);

Systemic mycoses: Histoplasmosis; Opportunistic mycoses: Candidiasis

Unit V: Cancers and Pandemics

No of Hours: 12

Microbial mediated cancers

Recent outbreaks of human microbial diseases (Covid-19/ Swine flu/Ebola) – causes, spread and control.

B.Sc MICROBIOLOGY (CBCS) REVISED SYLLABUS - 2020

MBP 6B – HUMAN MICROBIAL DISEASES

TOTAL HOURS: 30

CREDITS: 2

Course Outcomes: By the completion of the course the learner should be able to–

CO1 Identify various pathogens by microscopic observation

CO2 Identifying diseases based on symptoms and case studies

Syllabus

1. Observation of permanent slides of pathogenic organisms covering various bacterial, protozoan and fungal pathogens
2. Symptomatic identification of any four diseases using photographs or case study

SUGGESTED READING

- Ananthanarayan R and Paniker CKJ (2009) Textbook of Microbiology, 8th edition, Universities Press Private Ltd.
- Brooks G.F., Carroll K.C., Butel J.S., Morse S.A. and Mietzner, T.A. (2013) Jawetz, Melnick and Adelberg's Medical Microbiology. 26th edition. McGraw Hill Publication.
- Collee JG, Fraser, AG, Marmion, BP, Simmons A (2007) Mackie and McCartney Practical Medical Microbiology, 14th edition, Elsevier.
- Randhawa, VS, Mehta G and Sharma KB (2009) Practicals and Viva in Medical Microbiology 2nd edition, Elsevier India Pvt Ltd.
- Tille P (2013) Bailey's and Scott's Diagnostic Microbiology, 13th edition, Mosby.

B.Sc MICROBIOLOGY (CBCS) REVISED SYLLABUS - 2020
MBP- 7B: DIAGNOSIS AND MANAGEMENT OF HUMAN MICROBIAL
DISEASES

TOTAL HOURS: 60 CREDITS: 3

Course Outcomes: By the completion of the course the learner should be able to

CO1 To differentiate and explain various methods of staining and media preparation.

CO2 Explain the principle and application of serological and molecular methods of Safeguard oneself and community from antibiotic misuse.

CO4 Analyse the incidence, distribution and determinants of diseases.

CO5 To execute the methods of prevention of various infectious diseases

Syllabus

UNIT- I: Microscopic and culture methods of Diagnosis

No. of

hours: 12

Examination of sample by staining - Gram stain, Ziehl-Neelson staining for tuberculosis, Giemsa-stained thin blood film for malaria

Preparation and use of culture media - Blood agar, Chocolate agar, Lowenstein-Jensen medium, MacConkey agar, Distinct colony properties of various bacterial pathogens.

UNIT- II: Serological and molecular methods of Diagnosis

No. of

hours: 12

Serological Methods - Agglutination, ELISA, immunofluorescence,

Nucleic acid based methods - PCR, Nucleic acid probes.

Kit methods for rapid detection- Typhoid, Dengue and HIV

UNIT- III: Antibiotic resistance**No. of hours: 12**

Judicious use of antibiotics, importance of completing antibiotic regimen, Concept of DOTS, emergence of antibiotic resistance, current issues of MDR/XDR microbial strains.

Importance of antibiotic sensitivity tests, Determination of resistance/sensitivity of bacteria using disc diffusion method, Determination of minimal inhibitory concentration (MIC) of an antibiotic by serial double dilution method

Role of Ayurveda, Yoga and naturopathy, Unani, Siddha, and Homeopathy in community health

Unit IV: Epidemeology**No of****Hours: 12**

History of epidemeology- cholera case study; Define epidemic endemic pandemic and sporadic

Components of epidemiology: disease frequency (Prevalence, Incidence, calculation of person-time at risk), distribution of disease and determinants of disease.

Epidemiological approach, measurements of health indicators (morbidity, mortality)

Unit V: Preventive measures**No of Hours: 12**

General preventive measures, Importance of personal hygiene, environmental sanitation and methods to prevent the spread of infectious agents transmitted by direct contact, food, water and insect vectors.

Prevention of Nosocomial infections; Oppurtunistic infections

Vaccines: Importance, types, vaccines available against microbial diseases, vaccination schedule (compulsory and preventive) in the Indian context

B.Sc MICROBIOLOGY (CBCS) REVISED SYLLABUS - 2020
MBP- 7B: DIAGNOSIS AND MANAGEMENT OF HUMAN MICROBIAL
DISEASES

TOTAL HOURS: 30

CREDITS: 2

Course Outcomes: By the completion of the course the learner should be able to–

CO1 Collect, label and transport clinical specimens

CO2 Isolate pure culture of bacteria

CO3 To identify common bacteria

CO4 To maintain and preserve stock culture

Syllabus

1. Collection transport and processing of clinical specimens (Blood, Urine, Stool and Sputum).

Receipts, Labeling, recording and dispatching clinical specimens.

2. Isolation of bacteria in pure culture and Antibiotic sensitivity.

3. Identification of common bacteria by studying their morphology, cultural characters, Biochemical reactions, slide agglutination and other tests.

4. Maintenance and preservation of stock culture.

SUGGESTED READING

1. Ananthanarayan R and Paniker CKJ (2009) Textbook of Microbiology, 8th edition, Universities Press Private Ltd.

2. Brooks G.F., Carroll K.C., Butel J.S., Morse S.A. and Mietzner, T.A. (2013) Jawetz, Melnick and Adelberg's Medical Microbiology. 26th edition. McGraw Hill Publication.

3. Randhawa, VS, Mehta G and Sharma KB (2009) Practicals and Viva in Medical Microbiology 2nd edition, Elsevier India Pvt Ltd.

4. Tille P (2013) Bailey's and Scott's Diagnostic Microbiology, 13th edition, Mosby. 5. Collee JG, Fraser, AG, Marmion, BP, Simmons A (2007) Mackie and McCartney Practical Medical Microbiology, 14th edition, Elsevier.

B.Sc MICROBIOLOGY (CBCS) REVISED SYLLABUS – 2020

MBT 6C–MICROBIOLOGY FOR SELF-SUSTENANCE

TOTAL HOURS: 60 CREDITS: 3

Course Outcomes: By the completion of the course the learner should be able to–

CO1 Identify the areas of entrepreneurship, and assess the scope for establishment.

CO2 Explain production of fermentation products and economics

CO3 Explain the production method of biofertilisers and mushrooms.

CO4 Explain the process of baking and brewing

CO5 prepare DPR and understand patenting

Syllabus

Unit–I: Entrepreneurial skill No of Hours: 12

Entrepreneurial skills–Institutes involved, Government support to entrepreneurs, Incubation centers, risk assessment. Scope for small, medium and Large scale industries in Microbiology

Unit–II: Fermentation Products No of Hours: 12

Microbial cells as fermentation products- Bakers yeast, food and feed yeasts, SCP, Bacterial Insecticides, Legume Inoculants, Algae. Enzymes as fermentation products– Bacterial and Fungal Amylases, Proteolytic Enzymes, Pectinases, Invertases, and other enzymes. Fermentation Economics

Unit–III: Biofertilisers and Mushrooms No of Hours: 12

Mushroom cultivation–Cultivation of *Agaricus campestris*, *Calocyba indica*, *Agaricus bisporus*, and *Volvariella volvaciae*; Preparation of compost, filling tray beds, spawning, maintaining optimal temperature, casing, watering, harvesting, storage.

Biofertilizers –Chemical fertilizers versus biofertilizers, organic farming. Production of biofertilisers–*Rhizobium* sp, *Azospirillum* sp, *Azotobacter* sp.

Microbial consortia for composting and as biofertilisers

Unit–IV: Baking and Brewing processesNo of Hours: 12

Brewing–Media components, preparation of medium, Microorganisms involved, maturation, carbonation, packaging, keeping quality, contamination, by products.

Bread making- Yeast activation,

Unit–V:DPR and Patents No of Hours: 12

Preparation of DPR (Detailed Project Report)

Patents and secret processes –History of patenting, composition, subject matter and characteristics of a patent, Inventor, Infringement, cost of patent

B.Sc MICROBIOLOGY (CBCS) REVISED SYLLABUS – 2020

MBP 6C– MICROBIOLOGY FOR SELF-SUSTENANCE

TOTAL HOURS: 30

CREDITS: 2

Course Outcomes: By the completion of the course the learner should be able to–

- CO1** Prepare Microbial consortia for composting
- CO2** Prepare a report on the working of production unit of mushrooms/biofertiliser
- CO3** Prepare sample DPR

Syllabus

1. Preparation of Microbial consortia for composting
2. Field visit and report preparation of Mushroom cultivation unit/ Biofertiliser production centre/or any other
3. Preparation of sample DPR

SUGGESTED READING

1. Entrepreneurial Development in India-By Arora.
2. Sathyanarayana.U, Biotechnology.(2005)1stEd. Books and Allied(P)Ltd.
3. Stanbury P.T and Whitaker,(1984). Principles of Fermentation Technology, Pergamon Press.NY
4. Casida, L.E.J.R,(2019). Industrial Microbiology. New Age International Publishers
5. K.R. Aneja, Experiments in Microbiology, Plant pathology, Tissue culture and Mushroom production technology, 6thEd. S Chand Publication.
6. Nduka Okafor. Modern Industrial Microbiology and Biotechnology. 2007. CRC Press
7. Michael J. Waites, Neil L. Morgan, John S. Rockey, Gary Higton. Industrial Microbiology: An Introduction. 2013. Wiley Blackwell Publishers.
8. A.H. Patel. Industrial Microbiology. 2016. 2ndEd. Laxmi Publications, New Delhi.
9. Dubey R.C. A Textbook of Biotechnology. (2014). S Chand Publishers.
10. Robert D. Hisrich, Michael P. Peters, "Entrepreneurship Development", Tata McGraw Hill

B.Sc MICROBIOLOGY (CBCS) REVISED SYLLABUS – 2020
MBT –7C: PLANT MICROBIAL DISEASES AND MANAGEMENT
TOTAL HOURS: 60

CREDITS: 3

Course Outcomes: By the completion of the course the learner should be able to–

- CO1** Explain the concept of plant pathology
- CO2** Explain the stages in development of plant diseases
- CO3** Explain the knowledge of host pathogen interactions.
- CO4** Explain the practices of plant disease control
- CO5** Elucidate the epidemiology of local plant diseases

Syllabus

Unit 1: Introduction and history of plant pathology

No. of Hours: 12

Concept of plant disease-

Definition of disease, disease cycle & pathogenicity, symptoms associated with microbial plant diseases, types of plant pathogens, economic losses and social impact of plant diseases.

Significant landmarks in the field of plant pathology- [Contributions of Anton DeBary, Millardet,

Burrill, E. Smith, Adolph Mayer, Ivanowski, Diener, Stakman, H.H. Flor, Van Der Plank (in brief)]

Molecular Koch's postulates. Contributions of eminent Indian plant pathologists.

Unit 2: Stages in development of a disease

No. of Hours: 12

Infection, invasion, colonization, dissemination of pathogens and perennation.

Concepts of monocyclic, polycyclic and polyetic diseases, disease triangle & disease pyramid

Forecasting of plant diseases and its relevance in Indian context.

Unit 3: Host Pathogen Interaction

No. of Hours: 12

Microbial Pathogenicity- Virulence factors of pathogens: enzymes, toxins (host specific and non specific) growth regulators, virulence factors in viruses (replicase, coat protein, silencing suppressors) in disease development.

Effects of pathogens on host physiological processes (photosynthesis, respiration, cell membrane permeability, translocation of water and nutrients, plant growth and reproduction).

Defense Mechanisms in Plants- Concepts of constitutive defense mechanisms in plants, inducible structural defenses (histological-cork layer, abscission layer, tyloses, gums), inducible biochemical defenses [hypersensitive response (HR), systemic acquired resistance (SAR), phytoalexins, pathogenesis related (PR) proteins, plantibodies, phenolics, quinones, oxidative bursts].

Unit4: Control of Plant Diseases

No. of Hours: 12

Principles & practices involved in the management of plant diseases by different methods, viz. regulatory - quarantine, crop certification, avoidance of pathogen, use of pathogen free propagative material

Cultural - host eradication, crop rotation, sanitation, polyethylene traps and mulches
chemical - protectants and systemic fungicides, antibiotics, resistance of pathogens to chemicals. Biological-suppressive soils, antagonistic microbes-bacteria and fungi, trap plants

Unit5: Specific Plant diseases

No. of Hours:12

Study of some important plant diseases giving emphasis on its etiological agent, symptoms, epidemiology and control

Important diseases caused by fungi- White rust of crucifers, Downy mildew of onion, Late blight of potato, Powdery mildew of wheat, Ergot of rye, Black stem rust of wheat, Loose smut of wheat,

Wilt of tomato, Red rot of sugarcane, Early blight of potato

Important diseases caused by phytopathogenic bacteria- Angular leaf spot of cotton, bacterial leaf blight of rice, crown galls, bacterial cankers of citrus

Important diseases caused by phytoplasmas: Aster yellow

Important diseases caused by viruses: Papaya ring spot, tomato yellow leaf curl, banana bunchy top

Important diseases caused by viroids: Potato spindle tuber, coconut cadang cadang

B.Sc MICROBIOLOGY (CBCS) REVISED SYLLABUS – 2020
MBP –7C: PLANT MICROBIAL DISEASES AND MANAGEMENT

TOTAL HOURS: 30

CREDITS: 2

Course Outcomes: By the completion of the course the learner should be able to–

CO1 Demonstrate the infection mechanism in plants

CO2 Identify the plant diseases based on section cuttings

1. Demonstration of Koch's postulates in fungal, bacterial and viral plant pathogens.
2. Study of important diseases of crop plants by cutting sections of infected plant material-

Albugo, Puccinia, Ustilago, Fusarium, Colletotrichum.

SUGGESTED READINGS

1. Agrios GN. (2006). Plant Pathology. 5th edition. Academic Press, San Diego.
2. Lucas JA. (1998). Plant Pathology and Plant Pathogens. 3rd edition. Blackwell Science, Oxford.
3. Mehrotra RS. (1994). Plant Pathology. Tata McGraw-Hill Limited.
4. Rangaswami G. (2005). Diseases of Crop Plants in India. 4th edition. Prentice Hall of India Pvt. Ltd., New Delhi.
5. Singh RS. (1998). Plant Diseases Management. 7th edition. Oxford & IBH, New Delhi.

HOD

Dear Sir/Madam,

Greetings..!!

I hereby introduce myself **Dr. M. Naveen**, finished my Doctoral degree **PhD in Life Sciences (Dept. of Botany)** during 2011 from Sri Krishnadevaraya University, Anantapur, A.P. I had completed MSc Biochemistry during the year 2005 in Sri Venkateswara University, Tirupati, A.P. Formerly I had honored as **BOS Chairman of Microbiology** from S K University UG stream, and **currently working as HOD & Associate Professor of Life Sciences** in SLN Degree College for Women (SKU Affiliated), Anantapur, A.P., from 2017 to present. I had been awarded and worked prestigious **PDF-Postdoctoral Research Scientist (BK 21), College of Agriculture, Life & Environmental Sciences, Chungbuk National University, Cheongju, South Korea**. I had also serving as **Scientific Adviser** for NGO & Private sectors. And I had 4.6 years of Research experience as SRF and JRF of UGC, New Delhi, 13.6 years of R&D, Industrial & Teaching experiences (**Total experience 18 years**). I certainly had my credit of **5 Books** and **7 Research paper publications** in reputed International and National journals. I had successfully **organized** and participated in many **Workshops, Seminars, Symposias, Conferences, FDPs and Projects** of **International and National level**. I had also given many **Invited talks & Guest lectures**. Though I am from Life science background I strongly believe my experience in working with different fields of Applied/Basic Sciences and research groups would certainly help me success in the current position in this Institution. I have excellent presentation, written, computational skills and superior at communication with people. **I have been a registered member of APNRT & other Scientific associations**. I thank you for your time and cooperation. Thanking you.

PERSONAL PROFILE (For NAAC)

Dr. M. NAVEEN, MSc., PhD., PDF.

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Near RTO office, Anantapur, A.P.

Mobile: 9494609930

Academic details:

- **Ph.D., Life Sciences (Dept. of Botany), 2011, Sri Krishnadevaraya University, Anantapur, A.P., India.**
- **M.Sc., Biochemistry, (62%), 2005, Sri Venkateswara University, Tirupati, A.P., India.**
- **PGDCA, (A Grade), 2006, ITEA-ZONE Software Training & Development Centre (Regd. No. 255), Anantapur, A.P., India.**
- **B.Sc., Microbiology, Biochemistry and Chemistry (64%), 2003, Sri Krishnadevaraya University, Anantapur, A.P., India.**



Awards/Honors/Fellowships availed:

1. **Brain Korea (BK 21) Postdoctoral Fellowship (PDF), South Korea (March 2014 – March 2015).**
2. **UGC- Meritorious Students Senior Research Fellowship in Sciences (SRF), Govt. of India (September 2010 – June 2011).**
3. **UGC- Meritorious Students Junior Research Fellowship in Sciences (JRF), Govt. of India (September 2008 – September 2010).**
4. **Best Teacher Award 2022 received from SR Edu. Society (NYK, Anantapur, A.P. & MYAS, Govt. of India) during September 2022.**
5. **BOS Chairman of Microbiology from Sri Krishnadevaraya University (UG stream) Anantapur, A.P., India, from 2018 – 2020.**

Research experience and Projects handled:

Postdoctoral Research: Lab of Biomass Chemistry, College of Agriculture, Life & Environmental Sciences, Chungbuk National University, Cheongju, **South Korea.**

March

2014 – March 2015. **Research Supervisor: Prof. S. J. Shin**

Outline of the project: Production of Biofuels, conversion into Bioenergy and Bioanalysis from biomass materials with microbial cultures. (Microbial Biotechnology)

Doctoral Research: Biotechnology Division, Dept. of Botany, Sri Krishnadevaraya University,

Anantapur, A.P., **India.** April 2007 – September 2011.

Title of the PhD thesis: *In vitro* propagation studies of *Boucerosia indica* Wt. & Arn., Determination of Nutritive value, Mineral elements and Protein analysis of a few species of *Boucerosia* and *Caralluma*. **Research Supervisor: Prof. T. Pullaiah**

UGC-SRF: Biotechnology Division, Dept. of Botany, Sri Krishnadevaraya University, Anantapur, A.P., **India.** (September 2010 – June 2011)

Title of the project: *In vitro* propagation studies of *Boucerosia indica* Wt. & Arn., Determination of Nutritive value and Mineral elements analysis of a few species of *Boucerosia* and *Caralluma*.

UGC-JRF: Biotechnology Division, Dept. of Botany, Sri Krishnadevaraya University, Anantapur, A.P., **India.** (September 2008 – September 2010)

Title of the project: Studies of glycoside production via *in vitro* and callus cultures of *Caralluma adscendens* var. *fimbriata* (Asclepiadaceae).

Professional work experience:

- **June 2017 to Till date: Currently Working** as a **Associate Professor in Microbiology & HOD** of Biosciences at **SLN Degree College for Women, Anantapur, A.P.** (Nature of employment: **Part time**)

- Worked as **PG Lecturer** of Biochemistry in **Sri Vani Degree & PG College (NAAC B⁺⁺)**, **Anantapur, A.P.**, from July 2015 to January 2018. (Nature of employment: **Part time**)
- Worked as **Postdoc Research Scientist**, **College of Agriculture, Life & Environmental Sciences**, Chungbuk National University, Cheongju, **South Korea**, from March 2014 to March 2015. (Nature of employment: **Full time**)
- Worked as **Assistant Professor (as a UNO member)**, **College of Health Sciences**, Mizan Tepi University, Mizan Teferi, **Ethiopia**, from August 2012 to March 2014. (Nature of employment: **Full time**)
- **April 2005 to April 2007**: Worked as Teaching Faculty: Theory and practical classes of Biochemistry and Microbiology have been engaged for **B.Sc.**, Nursing students at **Adarsha College of Nursing, Anantapur, A.P.** (Nature of employment: **Full time**)

Academic achievements:

1. **Chief Examiner** in Spot evaluation BSc **Microbiology** answer scripts for all semesters of S K University, **Anantapur, A.P.**, from 2018 – 2020.
2. **Assistant Examiner** in Spot evaluation BSc **Microbiology** answer scripts for all semesters of S K University, **Anantapur, A.P.**, from 2017 – Till date.
3. **External Practical Examiner** for BSc **Microbiology** students in various affiliated colleges of S K University, **Anantapur, A.P.**, from 2017 – Till date.
4. Act as **Main Guide** to **PG Diploma Students** of **IGNOU, New Delhi**, during 2019.
5. **Question paper Setter** of BSc **Biotechnology** IVth Semester Codes: 433-21 & 434-21 for **SSBN Degree College (Autonomous) Anantapur, A.P.**, during August 2022.
6. **Evaluator & External Examiner** of BSc **Biotechnology & Microbiology** answer

scripts of all semesters for **Govt. Degree College (Autonomous) & SSBN**

Degree

College (Autonomous) Anantapur, A.P., from 2017 – Till date.

7. Delivered Guest Lecture to BSc Biotechnology students for Govt. Degree College

(Autonomous) Anantapur, A.P., during March 2019.

8. **Delivered Guest Lecture to BSc Microbiology students for KSN Govt. Degree College for Women, Anantapur, A.P.**, during March 2022.

9. **Delivered Guest Lecture to BSc Microbiology students for KTS Govt. Degree College, Rayadurg, Anantapur (Dist), A.P.**, during July 2022.

10. **Delivered Guest Lecture to BSc Microbiology students for KSN Govt. Degree College for Women, Anantapur, A.P.**, during September 2022.

11. **Delivered Guest Lecture to BSc Microbiology students for SV Degree & PG College, Anantapur, A.P.**, during August 2021.

12. **Reviewer for few Research Journals & Adviser for few Scientific bodies.**

13. **Mentor to BSc BMC students for Community Service Project of SLN Degree College for Women, Anantapur, A.P.**, during 2022.

14. Mentor to BSc BMC & BZC students for Short term Internship Program of SLN

Degree College for Women, Anantapur, A.P., during 2022.

Research/Teaching interests:

- Microbiology and Veterinary sciences.
- Agriculture and Horticulture developments.
- Plant and Applied Biotechnology areas.
- Nutritional and Food analysis programmes.
- Applied and Plant Biochemistry methods.
- Biomedical and Bioinformatics studies.

Technical/Scientific skills:

- Qualitative and Quantitative Biochemical methods.
- Microbiological and Biotechnological tools.
- Ecological and Environmental developments.
- Agricultural and Horticultural programmes.
- Bioinformatics and Biostats softwares.

- Nutrients and Mineral elements studies.

Book publications:

1. **Dr. M. Naveen & Dr. K. Praveen, A Text Book of Applied Biochemistry** by **Nightingale Publishers, Hyderabad, Telangana.** Updated 5th edition 2023.
2. **Dr. M. Naveen & Dr. K. Praveen, A Text Book of Biochemistry** by **Florence Publishers, Hyderabad, Telangana.** Revised 4th edition 2022.
3. **Dr. M. Naveen & Dr. K. Praveen, A Text Book of Biochemistry** by **Florence Publishers, Hyderabad, Telangana.** Revised 3rd edition 2018.
4. **Dr. M. Naveen & Dr. K. Praveen, Fundamentals of Biochemistry** by **Florence Publishers, Hyderabad, Telangana.** Updated 2nd edition 2014.
5. **M. Naveen & K. Praveen, A Text Book of Biochemistry** by **Florence Publishers, Hyderabad, Telangana.** First edition 2010.

Research paper publications: International = 5, National = 2

1. **M. Naveen, M. Chandraasekhar, and T. Pullaiah. 2016.** Nutritional evaluation and mineral elements analysis of threatened medicinal plants *Boucerosia indica* (Wight & Arn.) Plowes and *Caralluma adscendens* (Roxb.) R.Br. var. *fimbriata* Gravely & Mayur. **Current Trends in Biotechnology and Pharmacy.** 10(4): 324-333
2. **M. Naveen and T. Pullaiah. 2013.** *In vitro* propagation studies of a threatened medicinal plant *Boucerosia indica* Wt. & Arn. **Journal of Indian Botanical Society (1920).** 92(1&2): 89-96
3. **K. Praveen, K.Y. Usha, B. Shanthi, G. Ramanjaneyulu, M. Naveen and B. Rajasekhar Reddy. 2012.** Production of cellulolytic enzymes by a mushroom- *Stereum ostrea*. **International Journal of Research in Biochemistry and Biophysics.** 2(1): 1-4
4. **K. Praveen, K.Y. Usha, M. Naveen and B. Rajasekhar Reddy. 2012.** Antibacterial activity of a mushroom- *Stereum ostrea*. **Journal of Biology, Agriculture and Healthcare.** 2(1): 1-5
5. **K. Praveen, B. Viswanath, K.Y. Usha, H. Pallavi, G. V. S. Reddy, M. Naveen and B.R. Reddy. 2011.** Lignolytic enzymes of a mushroom- *Stereum ostrea* isolated from wood logs. **Journal of Enzyme Research (Pubmed).** Article ID 749518, 1-6

6. V. Raja Sreelatha, S. Sandhya Rani, P.V. Krishna Reddy, **M. Naveen**, A. Ugraiah and T. Pullaiah. **2008**. *In vitro* propagation of *Caralluma sarkariae* Lavranos & Frandsen- an endemic and endangered medicinal plant. **Indian Journal of Biotechnology**. 8: 236-239
7. **M. Naveen**, M. Sivakumar, A. Nareshkumar and T. Pullaiah. **2023**. Protein analysis of threatened medicinal plants of few species of *Boucerosia* and *Caralluma*. **Applied Biochemistry and Biotechnology**. (Communication)

Training courses, FDPs and Workshops completed: Total = 10. Best of

1. Completed **National Workshop on Environmental Degradation and Management**, during 27 – 28 March 2011, at Sri Krishnadevaraya University, **Anantapur, A.P.**
2. Completed **Faculty Knowledge Sharing Program**, on 26 August 2022, at **Anantapur, A.P.**, organized by ICFAI Business School, Hyderabad, Telangana.
3. Completed **National Level Training Workshop on Biosafety Regulatory Framework: Assessment, Decision, Implication and Public - Private Interface**, during 26 – 28 September 2007, at Madurai Kamaraj University, **Madurai**, Tamilnadu.
4. Successfully completed one week **Faculty Development Programme on Research Methodology and Data Analysis** (sponsored by TEQIP-III) during 23-28 September 2019, at JNTU **Anantapur, A.P.**
5. Successfully completed **Training Course on Modern Instrumental Methods for Pharmaceutical Analysis**, during 18 – 31 May 2005, at Jawaharlal Nehru Technological University, **Hyderabad**, Telangana.
6. Completed **Workshop on Systat Statistical Package**, during 19 December 2007, organized jointly by Sri Krishnadevaraya University, **Anantapur, A.P.**, and Crane Software International Ltd., **Bangalore**, Karnataka.

Papers presented in Seminars/Symposias/Conferences: Total = 20. Top most

1. Presented paper in **33rd Conference of Indian Botanical Society and International**

- Symposium on the new horizons of Biology**, during 10 – 12 November 2010, at Shivaji University, **Kolhapur**, Maharashtra.
2. Presented paper in **International Seminar on Medicinal plants & Herbal products**, during 7 – 9 March 2008, at Sri Venkateswara University, **Tirupati**, A.P.
 3. Presented paper in **Annual Convention of Andhra Pradesh Akademi of Sciences and National Symposium on Science 21st Century**, during 5 – 6 February 2008, at Sri Krishnadevaraya University, **Anantapur**, A.P.
 4. Presented paper in **32nd All India Botanical Conference and International Symposium on Diversity of Plants and Microbes: Present Scenario**, during 28 – 30 December 2009, at Kuvempu University, **Shivamoga**, Karnataka.
 5. Presented paper in **31st Annual Conference of Indian Botanical Society and International Symposium on Plant Biology and Environment: Changing Scenario**, during 17 – 19 December 2008, at University of Allahabad, **Allahabad**, Uttar Pradesh.
 6. Presented paper in **International Conference on Trends in Seri Biotechnology**, during 27 – 29 March 2008, at Sri Krishnadevaraya University, **Anantapur**, A.P.
 7. Participated in **National Seminar on Emerging trends in Plant Tissue culture and Secondary metabolite production**, during 22 – 23 May 2009, at Padmasree Institute of Management and Sciences, **Bangalore**, Karnataka.
 8. Presented paper in **National Seminar on Trends in Plant Sciences**, during 25 – 26 March 2011, at Sri Krishnadevaraya University, **Anantapur**, A.P.
 9. Presented paper in **International Conference on Plant Biotechnology and Molecular Biology**, during 15 – 17 August 2008, at Kakatiya University, **Warangal**, Telangana.
 10. Presented paper in **National Seminar on Application of Microbes in management of Agriculture and Environment**, during 4 – 6 March 2011, at Sri Krishnadevaraya University, **Anantapur**, A.P.

Participated in Virtual Seminars/Webinars and E Quiz: Total = 50. Few are

1. Participated in **National Virtual Seminar on Corona Virus and Chemistry: Its Research and Response**, during 04.07.2021, at Janata Shikshan Mandal's Devchand College, **Arjunnagar, Kolhapur (Dist), Maharashtra.**
2. Participated in **National E Quiz on Covid 19-Therapeutics and Vaccines**, during 17.07.2021, at Yogi Vemana University, **Kadapa, A.P.**
3. Participated in **National Webinar on Immune Boosters and Covid-19**, during 17.07.2020, at YMCA Madras, Kilpauk Branch, **Chennai, Tamilnadu.**
4. Participated in **International Webinar on Data Science and its uses in Life Science**, during 18.07.2020, at Dr.M.G.R. Educational and Research Institute, **Chennai, Tamilnadu.**
5. Participated in **National Online Quiz on Covid-19 Awareness (Related with Current and Future perspectives of various Sectors)**, during 17.05.2020, at SVMVV Society's **S.R. Kanthi College of Education, Ilkal, Bagalkot (Dist), Karnataka.**
6. Participated in **National 3 day FDP on Plants for Food and Healthcare**, during 12 – 14 August 2020, at Yogi Vemana University, **Kadapa, A.P.**
7. Participated in **International Webinar on Covid-19: The Pandemic Research Implications and Prospective Vaccines**, during 06 & 07 June 2020, at Sri Padmavati Mahila Viswavidyalayam (Womens University), **Tirupati, A.P.**
8. Participated in **National Webinar on Nano Engineered Materials-Synthesis, Characterisation & Applications**, during 10.07.2021, at Vignan's Institute of Engineering For Women, **Visakhapatnam, A.P.**
9. Participated in **National Webinar on Artificial Intelligence for Smart Healthcare Systems in Post Covid era**, during 06.06.2020, at R.M.D. Engineering College, **Kavaraipettai, Thiruvallur (Dist), Tamilnadu.**
10. Participated in **National Awareness Quiz on Covid-19**, during 24.05.2020, at P.T. Lee **Chengalvaraya Naicker College of Engineering & Technology, Kanchipuram, Tamilnadu.**

Extra & Co curricular activities:

- **Got appreciation in National Science day celebrations at BEST Innovation University (in association with NYK, Anantapur & MYAS, Govt. of India) Anantapur, A.P., during February 2021.**
- **Got appreciation in Online Quiz Competition on HIV/AIDS & Adolescent Health by Govt. of A.P., DAPCU-Dist. AIDS Prevention & Control Unit & RIDS-Rural Integrated Development Society, during December 2020.**
- **Got appreciation in Taekwondo-Annual Summer Coaching Camp by Dist. Sports Authority, Anantapur, A.P., from 1.5.2010 – 31.5.2010.**
- **Got appreciation in Debate on National Voters Day Celebrations by Govt. of India & Govt. of A.P., during January 2012.**
- **Got appreciation in Voluntary Blood Donation Camp by A.P State AIDS Control Society, SBTC-State Blood Transfusion Council, Blood Bank, Govt. General Hospital, Anantapur, A.P., during December 2017.**
- **Got appreciation in Janmabhumi-Preparation of Micro plan by Govt. of A.P., during January 2000.**
- **Overall Championship in Sports & Games for 2010, 2009 & 2008 from Sri Krishnadevaraya University, Anantapur, A.P.**
- **NCC ‘A’ Certificate (Team leader) holder of Andhra Pradesh.**
- **Special Invitee Member in JVV- “Jana Vignana Vedika” a Science oriented NGO of Andhra Pradesh.**
- **Won many Merit Certificates and Medals in District level of Andhra Pradesh, for various Competitions and Events.**

Personal details:

Name: Dr. Naveen Medapuram

Gender: Male

Marital Status: Married

Visited Countries: South Korea, Hong Kong, Ethiopia & Kenya

Languages Known: English, Korean, Amharic, Hindi, Kannada, Tamil & Telugu

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