

**SRI DURGA MALLESWARA SIDDHARTHA MAHILA KALASALA, VIJAYAWADA - 10.**  
(An Autonomous college in the jurisdiction of Krishna University, Machilipatnam, A.P)

**MICROBIOLOGY**

**MICT11B**

**2020-2021**

**B.Sc. (FMC) (FMB)**

**SEMESTER – I**

**TOTAL HOURS: 60**

**No. of Credits-4**

**PAPER: I**

**MICT11B: INTRODUCTION TO MICROBIOLOGY AND MICROBIAL DIVERSITY**

**UNIT-I**

**No. of hours: 12**

History and milestones in microbiology. Contributions of Anton von Leeuwenhoek, Edward Jenner, Louis Pasteur, Robert Koch, Ivanowsky, Importance and applications of microbiology, Classification of microorganisms, Whittaker's five kingdom concept, Bergey's Manual of Systematic Bacteriology.

General characteristics and outline classification of Bacteria, Archaea Bacteria, Mycoplasma, Cyanobacteria, Algae, Fungi, Protozoa

1.12 viruses

**UNIT-II:**

**No. of hours: 12**

Methods of sterilization: Physical methods – Dry heat, moist heat, radiation methods, filtration methods. Chemical methods and their application. Microbial cultures: Concept of pure culture, Methods of pure culture isolation.

Enrichment culturing techniques single cell isolation. Preservation of microbial cultures: sub culturing, overlaying cultures with mineral oils, lyophilisation, and cultures, storage at low temperature.

**UNIT-III:**

**No. of hours: 12**

Staining Techniques - Simple and Differential staining techniques. Principles of microscopy - Bright field, Dark field, Phase contrast and Electron microscopy (SEM and TEM)

Nutritional types of bacteria. Microbiological media-Natural and synthetic basal, defined, complex, enrichment, selective, differential, maintenance and transport media.

**UNIT-IV:**

**No. of hours: 12**

Microbial growth: Principles of growth, Kinetics of growth. Methods of measuring growth: Direct methods: viable plate counts, membrane filtration. Indirect methods: Metabolic activity – measurements of DNA, Protein, Microscopic counts, electronic counters, most probable number

Batch and continuous growth, Synchronous culture, Diauxic growth, and stock cultures. Cultivation of aerobes and anaerobes.

Reproduction in bacteria and spore formation.

**UNIT-V:**

**No. of hours: 12**

Ultra structure of Prokaryotic cell- Variant components and invariant components. Cell wall of bacteria and fungi- Gram positive cell wall, Gram negative cell wall. Cell wall of fungi and yeasts.

Morphology, Ultrastructure and chemical composition of bacteria, Actinomycetes, Spirochetes. Rickettsia, Mycoplasma, Chlamydia.

Economic importance of algae and fungi. SCP.

**Co-circular Activities**

1. Student seminars
2. Assignment
3. Online Quiz
4. Group discussion
5. Preparation of Charts and Models

**Assessment Methods**

1. Continuous Internal Evaluation
2. Assignment
3. Semester end Examination

**TEXT BOOKS:**

- General Microbiology - C.B. Powar & H.F. Dagniwala (Vol I & II)  
Microbiology - Michael J. Peleczar T.M.H Edition.

**REFERENCE BOOKS:**

- Microbiology - P.D. Sharma  
General Microbiology - Schlegel - Cambridge University Press.  
Microbiology - Tauro, and Kapoor  
Microbiology - Lansing M.Prescott, John P.Harley Donald, A.Klein  
Microbiology Concepts And Applications - Michel J. Peleczar.  
Biology of Microorganisms - Brock. J

**SRI DURGA MALLESWARA SIDDHARTHA MAHILA KALASALA, VIJAYAWADA - 10.**

(An Autonomous college in the jurisdiction of Krishna University, Machilipatnam, A.P)

**An autonomous college in the jurisdiction of Krishna University**

**MICROBIOLOGY**

**MICP11B**

**2020-2021**

**B.Sc. (FMB) ( FMC)**

**TOTAL**

**HOURS: 30**

**CREDITS: 2**

**MICP11B- INTRODUCTION TO MICROBIOLOGY AND MICROBIAL DIVERSITY**

**PRACTICAL SYLLABUS:**

- Microbiology Good Laboratory Practices and Biosafety.
- Preparation of culture media for cultivation of bacteria
- Preparation of culture media for cultivation of fungi
- Sterilization of medium using Autoclave
- Sterilization of glassware using Hot Air Oven
- Light compound microscope and its handling
- Microscopic observation of bacteria (Gram +ve bacilli and cocci, Gram -ve bacilli), Cyanobacteria, Algae and Fungi.
- Simple staining
- Gram's staining
- Hanging-drop method.
- Isolation of pure cultures of bacteria by streaking method.
- Preservation of bacterial cultures by various techniques.

**SRI DURGA MALLESWARA SIDDHARTHA MAHILA KALASALA**

**An autonomous college in the jurisdiction of Krishna University**

**MICROBIOLOGY**

**MICT21B**

**2020-2021**

**B.Sc. (FMC) (FMB)**

**SEMESTER – II**

**TOTAL HOURS: 60**

**No. of Credits-4**

**PAPER: II**

**MICROBIAL PHYSIOLOGY AND BIOCHEMISTRY**

**UNIT-I:**

**No. of hours: 8**

Carbohydrates – Classification, chemistry, properties, and function– mono, di, oligo and polysaccharides. Lipids – classification, chemistry, properties and function – free fatty acids, triglycerides, phospholipids, glycolipids & waxes

**UNIT-II:**

**No. of hours: 10**

Amino acids – classification, structure and function. Essential amino Acids & amphoteric nature of amino acids and reactions and functions of carboxyl and amino groups and side chains.

Proteins– isolation and characterization of proteins. Structural levels of proteins– primary, secondary, tertiary and quaternary, denaturation of proteins. Hydrolysis of proteins. Outlines of Protein sequencing using various methods.

**SRI DURGA MALLESWARA SIDDHARTHA MAHILA KALASALA, VIJAYAWADA - 10.**  
(An Autonomous college in the jurisdiction of Krishna University, Machilipatnam, A.P)

**UNIT – III:**

**No. of hours: 10**

Nucleic acids—structure, function and their properties. Structural polymorphism of DNA, RNA. Chemical structure and base composition of nucleic acids, Chargaff's rules, Watson Crick Model (B-DNA), deviations from Watson-Crick model, other forms of DNA (A- and Z-DNA), forces stabilizing nucleic acid structures, (hydrogen bonds and hydrophobic associations, base stacking). Structural characteristics of RNA. Types of RNA.

**UNIT – IV:**

**No. of hours: 10**

Aerobic respiration - Glycolysis, HMP path way, ED path way, TCA cycle, Electron transport, oxidative and substrate level phosphorylation. Kreb's cycle, glyoxylate cycle, hexose monophosphate (HMP) shunt, gluconeogenesis.

Anaerobic respiration Fermentation, Biochemical mechanisms of lactic acid, ethanol, butanol and citric acid fermentations. Nitrate and sulphate respiration. Outlines of oxygenic and anoxygenic photosynthesis in bacteria.

**UNIT- V**

**No. of hours: 10**

Properties and classification of Enzymes. Biocatalysis- induced fit and lock and key models.

Coenzymes and Cofactors. Factors affecting catalytic activity.

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

Enzyme kinetics: Michaelis-Menten equation, effect of substrate concentration, effect of enzyme concentration, effect of pH and temperature, temperature.

**SRI DURGA MALLESWARA SIDDHARTHA MAHILA KALASALA, VIJAYAWADA - 10.**  
(An Autonomous college in the jurisdiction of Krishna University, Machilipatnam, A.P)

**SRI DURGA MALLESWARA SIDDHARTHA MAHILA KALASALA**  
An autonomous college in the jurisdiction of Krishna University

|                     |                |                  |                          |
|---------------------|----------------|------------------|--------------------------|
| <b>MICROBIOLOGY</b> | <b>MICP21B</b> | <b>2020-2021</b> | <b>B.Sc. (FMC) (FMB)</b> |
|---------------------|----------------|------------------|--------------------------|

**MICROBIAL PHYSIOLOGY AND BIOCHEMISTRY**

**TOTAL HOURS: 30**

**CREDITS: 2**

1. Qualitative Analysis of Carbohydrates.
2. Qualitative Analysis of Aminoacids.
3. Colorimetric estimation DNA by diphenylamine method.
4. Estimation of RNA by Orcinol method.
5. Colorimetric estimation of proteins by Biuret / Lowry method.
6. Estimation of reducing sugar-Anthrone method.
7. Estimation of sugar by titration method–Benedict’s method.
8. Determination of pKa and pI values of amino acids.
9. Assay of amylase activity
10. Effect of temperature / pH on enzyme activity
11. demonstration of immobilization of enzyme activity.

**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

**SRI DURGA MALLESWARA SIDDHARTHA MAHILA KALASALA**  
An autonomous college in the jurisdiction of Krishna University

|                     |                |                  |                          |
|---------------------|----------------|------------------|--------------------------|
| <b>MICROBIOLOGY</b> | <b>MICT31A</b> | <b>2021-2022</b> | <b>B.Sc. (FMC) (FMB)</b> |
|---------------------|----------------|------------------|--------------------------|

**SEMESTER – III      TOTAL HOURS: 60      No. of Credits-4      PAPER: III**

**MEDICAL MICROBIOLOGY AND IMMUNOLOGY**

**UNIT- I:      No. of hours: 8**

Normal flora of human body. Host pathogen interactions: infection, invasion, pathogen, pathogenicity, virulence and opportunistic infection. General account on nosocomial infection.

General principles of diagnostic microbiology- collection, transport and processing of clinical samples. General

**SRI DURGA MALLESWARA SIDDHARTHA MAHILA KALASALA, VIJAYAWADA - 10.**

(An Autonomous college in the jurisdiction of Krishna University, Machilipatnam, A.P)

methods of laboratory diagnosis - cultural, biochemical, serological and molecular methods.

**UNIT- II:**

**No. of hours: 10**

General account on microbial diseases - causal organism, pathogenesis, epidemiology, diagnosis, prevention and control.

Bacterial diseases - Tuberculosis and Typhoid

Fungal diseases – Candidiasis, Aspergillosis, Yeast

Protozoal diseases – Malaria, Filariasis & Diseases spread by House Fly.

Viral Diseases - Hepatitis- A & C and AIDS.

**UNIT- III:**

**No. of hours: 10**

Description and pathology of diseases caused by *Aspergillus*, *Penicillium*. Description and pathology of diseases caused by hemoflagellates; *Leishmania donovani*, *L. tropica*, *Trypanosoma gambiense*.

Principles of chemotherapy, Antibacterial drugs – Penicillin, Antifungal drugs – Nystatin, Antiviral agents – Ribavirin, Drug resistance in bacteria.

Interferon – Nomenclature, types & classification, Induction of interferon, types of Inducers.

**UNIT- IV:**

**No. of hours: 10**

Types of immunity - innate and acquired; active and passive; humoral and cell-mediated

immunity. Primary and secondary organs of immune system - Thymus, Bursa fabricus, bone marrow, spleen and lymph nodes. Cells of immune system.- Identification and function of B and T lymphocytes, null cells, monocytes, macrophages, neutrophils, basophils and eosinophils.

**UNIT – V:**

**No. of hours: 10**

Antigens - types, chemical nature, antigenic determinants, haptens. Factors affecting antigenicity. Antibodies - basic structure, types, properties and functions of immunoglobulins.

Types of antigen-antibody reactions - Agglutinations, Precipitation, Neutralization, complement fixation, blood groups. Labeled antibody based techniques - ELISA, RIA and Immuno fluorescence.

Polyclonal and monoclonal antibodies - production and applications.

Concept of Hypersensitivity and Autoimmunity. Hybridoma technology.

**SRI DURGA MALLESWARA SIDDHARTHA MAHILA KALASALA, VIJAYAWADA - 10.**  
(An Autonomous college in the jurisdiction of Krishna University, Machilipatnam, A.P)

**SRI DURGA MALLESWARA SIDDHARTHA MAHILA KALASALA**  
An autonomous college in the jurisdiction of Krishna University

**MICROBIOLOGY**

**MICP31A**

**2021-2022**

**B.Sc. (FMC) (FMB)**

**MEDICAL MICROBIOLOGY AND IMMUNOLOGY LAB**

**TOTAL HOURS: 30**

**CREDITS: 2**

1. Identification of human blood groups.
2. Separate serum from the blood sample (demonstration).
3. Estimation of blood haemoglobin.
4. Total Leukocyte Count of the given blood sample.
5. Differential Leukocyte Count of the given blood sample.
6. Immunodiffusion by Ouchterlony method.
7. Identify bacteria - *E. coli*, *Pseudomonas*, *Staphylococcus*, *Bacillus*, using laboratory strains on the basis of cultural, morphological and biochemical characteristics: IMViC, urease production and catalase tests
8. Isolation of bacterial flora of skin by swab method.
9. Antibacterial sensitivity by Kirby-Bauer method
10. Study symptoms of the diseases with the help of photographs: Anthrax, Polio, Herpes, chicken pox, HPV warts, Dermatomyces (ring worms)
11. 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.
- Kuby's Immunology. 6th edition W.H. Freeman and Company, New York.

**SRI DURGA MALLESWARA SIDDHARTHA MAHILA KALASALA, VIJAYAWADA - 10.**

(An Autonomous college in the jurisdiction of Krishna University, Machilipatnam, A.P)

- Jawetz, Melnick and Adelberg's Medical Microbiology. 26th edition. McGraw Hill  
Microbiology. 4th edition. Elsevier Publication.
- Willey JM, Sherwood LM, and Woolverton CJ. (2013) Prescott, Harley and Klein's  
Microbiology. 9th edition. McGraw Hill Higher Education.

**SRI DURGA MALLESWARA SIDDHARTHA MAHILA KALASALA**  
**An autonomous college in the jurisdiction of Krishna University**

|                     |               |                  |                          |
|---------------------|---------------|------------------|--------------------------|
| <b>MICROBIOLOGY</b> | <b>MICT01</b> | <b>2021-2022</b> | <b>B.Sc. (FMC) (FMB)</b> |
|---------------------|---------------|------------------|--------------------------|

**SEMESTER – III      TOTAL HOURS: 60      No. of Credits: 4      PAPER: IV**

**MICT01: INDUSTRIAL MICROBIOLOGY**

**UNIT – I**

**No. of hours: 7**

Microorganisms of industrial importance – yeasts (*Saccharomyces cerevisiae*), moulds (*Aspergillus niger*) bacteria (*E. coli*), actinomycetes (*Streptomyces griseus*). Industrially important Primary and secondary microbial metabolites. Screening techniques. Techniques involved in selection of industrially important metabolites from microbes.

**UNIT – II**

**No. of hours: 10**

Fermentation and fermenter: concept and discovery of fermentation. Fermenter: its parts and function. Types of fermenter – batch, continuous and fed batch.

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

Basic concepts of Design of fermenter.

Ingredients of Fermentation media.

**SRI DURGA MALLESWARA SIDDHARTHA MAHILA KALASALA, VIJAYAWADA - 10.**

(An Autonomous college in the jurisdiction of Krishna University, Machilipatnam, A.P)

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

**UNIT – III**

**No.of hours: 8**

Microorganisms involved in Pharma and therapeutic enzymes. Enzymes used in detergents, textiles and leather industries. Production of amylases and Proteases. Production of therapeutic enzymes. Role of microorganisms in bioleaching and textile industry.

**UNIT – IV**

**No.of hours: 7**

Industrial microorganisms: cell growth, microbial growth kinetics, factors affecting growth, basic nutrition, principles of production media, components of media, chemical composition of media. Microbial production of Industrial products: Citric acid, Ethanol, Penicillin, Glutamic acid, and vitamin B12.

**UNIT – V**

**No.of hours:7**

Bioreactors: basic structure of bioreactor, types of bioreactors, kinetics and methodology of batch and continuous bioreactors. Sterilization of bioreactors: fibrous filter sterilization. Aeration and agitation: agitation in shake flask and tube rollers.

**SRI DURGA MALLESWARA SIDDHARTHA MAHILA KALASALA**  
**An autonomous college in the jurisdiction of Krishna University**

**MICROBIOLOGY**

**MICP01**

**2021-2022**

**B.Sc. (FMC) (FMB)**

**MICP01:**

**INDUSTRIAL MICROBIOLOGY**



**SRI DURGA MALLESWARA SIDDHARTHA MAHILA KALASALA, VIJAYAWADA - 10.**  
(An Autonomous college in the jurisdiction of Krishna University, Machilipatnam, A.P)

**Total hours: 36**

**Credits: 2**

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

**SRI DURGA MALLESWARA SIDDHARTHA MAHILA KALASALA**  
An autonomous college in the jurisdiction of Krishna University

|                     |               |                  |                          |
|---------------------|---------------|------------------|--------------------------|
| <b>MICROBIOLOGY</b> | <b>MICT42</b> | <b>2021-2022</b> | <b>B.Sc. (FMC) (FMB)</b> |
|---------------------|---------------|------------------|--------------------------|

**SEMESTER – IV**      **TOTAL HOURS: 60**      **No. of Credits-4**      **PAPER: V**

**MOLECULAR BIOLOGY AND MICROBIAL GENETICS**

**UNIT- I**

**No. of hours: 8**

DNA and RNA as genetic material. Structure and organization of prokaryotic DNA. Watson and Crick model of DNA. Extra chromosomal genetic elements - Plasmids and transposons.

Replication of DNA - Semi conservative mechanism, Enzymes involved in replication.

**UNIT- II**

**No. of hours: 10**

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

Mutagens - Physical and Chemical mutagens.

Outlines of DNA damage and repair mechanisms.

Genetic recombination in bacteria - Conjugation, Transformation and Transduction.

**UNIT- III**

**No. of hours: 10**

**SRI DURGA MALLESWARA SIDDHARTHA MAHILA KALASALA, VIJAYAWADA - 10.**  
(An Autonomous college in the jurisdiction of Krishna University, Machilipatnam, A.P)

Concept of gene Mutation, Recombination and Cistron. One gene one enzyme and one gene one polypeptide hypotheses.

Types of RNA and their functions. Genetic code. Structure of ribosomes.

Bacterial recombination – Bacterial transformation, Bacterial conjugation, Transduction–Generalized and specialized transductions.

**UNIT- IV**

**No. of hours: 8**

Types of genes - structural, constitutive, regulatory, clustered genes and the control of gene expression. Regulation of gene expression in bacteria - operon concepts - Negative and positive control of the Lac Operon, trp operon. Poly and Mono cistronic m-RNA.

**UNIT- V**

**No. of hours: 10**

**Transcription:** Enzymatic Synthesis of RNA - Basic features of RNA synthesis, *E.coli* RNA polymerase, Classes of RNA molecules, processing of tRNA and rRNA in *E.coli*, Transcription in Eukaryotes, Eukaryotic rRNA genes, formation of eukaryotic tRNA molecules, RNA Polymerases of eukaryotes.

**Translation:** Outline of Translation, The Genetic Code, The Decoding System, Codon Anticodon interaction. Protein Synthesis, Complex Translation units, Inhibitors and Modifiers of protein synthesis, Protein Synthesis in Eukaryotes.

**SRI DURGA MALLESWARA SIDDHARTHA MAHILA KALASALA**  
An autonomous college in the jurisdiction of Krishna University

**MICROBIOLOGY**

**MICP42**

**2021-2022**

**B.Sc. (FMC) (FMB)**

**MOLECULAR BIOLOGY AND MICROBIAL GENETICS**

**TOTAL HOURS: 48**

**CREDITS: 2**

**SRI DURGA MALLESWARA SIDDHARTHA MAHILA KALASALA, VIJAYAWADA - 10.**

(An Autonomous college in the jurisdiction of Krishna University, Machilipatnam, A.P)

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., Venkateswarlu, 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.

1. mounts.

**SRI DURGA MALLESWARA SIDDHARTHA MAHILA KALASALA, VIJAYAWADA - 10.**  
(An Autonomous college in the jurisdiction of Krishna University, Machilipatnam, A.P)

|                     |               |                |                           |
|---------------------|---------------|----------------|---------------------------|
| <b>MICROBIOLOGY</b> | <b>MICT51</b> | <b>2017-18</b> | <b>B.Sc. (FMB) ( FMC)</b> |
|                     |               | <b>2018-19</b> |                           |

**THIRD YEAR – SEMESTER- V, PAPER-V**

**CREDITS: 3**

**ENVIRONMENTAL & AGRICULTURAL MICROBIOLOGY**

**UNIT – I Microorganisms and their habitats**

**9Hrs**

Terrestrial Environment: Soil profile and soil microflora

Aquatic Environment: Microflora of fresh water and marine habitats

Atmosphere: Aeromicroflora and dispersal of microbes

Microbial interactions – mutualism, commensalism, antagonism, competition, Parasitism, predation.

**UNIT – II Water potability**

**9Hrs**

Treatment and safety of drinking (potable) water,

methods to detect potability of water samples: (a) standard qualitative procedure: presumptive test/MPN test, confirmed and completed tests for faecal coliforms (b) Membrane filter technique Defined substrate test.

**UNIT – III Waste management**

**9Hrs**

Outlines of Solid Waste management: Sources and types of solid waste,

Methods of solid waste disposal (composting and sanitary landfill).

Liquid waste management: Composition and strength of sewage (BOD and COD), Primary, secondary (Oxidation ponds, trickling filter, activated sludge process and septic tank) and tertiary sewage treatment.

**UNIT – IV Soil Microbiology**

**9Hrs**

Plant Growth Promoting Microorganisms - Mycorrhizae, Rhizobia, Azospirillum, Azotobacter, Frankia, phosphate-solubilizers and Cyanobacteria.

Outlines of biological nitrogen fixation (symbiotic, non-symbiotic). Biofertilizers - Rhizobium

Role of microorganisms in nutrient cycling (Carbon, nitrogen, phosphorus).

**UNIT – V Plant disease management**

**9Hrs**

Concept of disease in plants

Symptoms of plant diseases caused by fungi, bacteria, and viruses.

Plant diseases - groundnut rust, Citrus canker and tomato leaf curl.

Principles of plant disease control.

**TEXT AND REFERENCE BOOKS:**

1. Introduction to Soil Microbiology : Martin Alexander.
2. Introduction to Environmental Microbiology. : R. Mitchell
3. Soil Microbiology and Biochemistry : Paul & Clark..
4. Aquatic Microbiology. : G. Rhenheiner.
5. Agricultural Microbiology : Rangaswami, G. and Bhagyaraj
6. Microbial Ecology - : Atlas, R.M. and Bartha, R.

**SRI DURGA MALLESWARA SIDDHARTHA MAHILA KALASALA, VIJAYAWADA - 10.**

(An Autonomous college in the jurisdiction of Krishna University, Machilipatnam, A.P)

|                     |               |                |                           |
|---------------------|---------------|----------------|---------------------------|
| <b>MICROBIOLOGY</b> | <b>MICP51</b> | <b>2017-18</b> | <b>B.Sc. (FMB) ( FMC)</b> |
|                     |               | <b>2018-19</b> |                           |

**CREDITS: 3**

**ENVIRONMENTAL & AGRICULTURAL MICROBIOLOGY 45Hrs**

1. Analysis of soil – pH, Moisture content and water holding capacity.
2. Isolation of microbes (bacteria and fungi) from soil.
3. Study of air flora by petriplate exposure method.
4. Analysis of potable water: SPC  
Presumptive, confirmed and completed test, determination of coliform count in water by MPN.
5. Determination of Biological Oxygen Demand (BOD) of waste water samples.
6. Isolation of Rhizobium from root nodules.
7. Staining and observation of Vesicular Arbuscular Mycorrhizal (VAM) fungi.
8. Observation of plant diseases of local importance - Citrus canker, Tikka disease of Groundnut, Bhendi yellow vein mosaic, Rusts, Smuts, Powdery mildews, Tomato leaf curl.

**SRI DURGA MALLESWARA SIDDHARTHA MAHILA KALASALA, VIJAYAWADA - 10.**  
(An Autonomous college in the jurisdiction of krishnaUniversity, Machilipatnam,A.P)

|                     |               |                |                           |
|---------------------|---------------|----------------|---------------------------|
| <b>MICROBIOLOGY</b> | <b>MICT52</b> | <b>2017-18</b> | <b>B.Sc. (FMB) ( FMC)</b> |
|                     |               | <b>2018-19</b> |                           |

**THIRD YEAR – SEMESTER-V, PAPER –VIA CREDITS: 3**  
**MICROBIAL DIAGNOSIS IN HEALTH CLINICS**

**UNIT- I –PATHOGENCITY & DIAGNOSIS**

**9Hrs**

Bacterial-vibriocholera(Intestinal tract),Treponema pallidum (Genital tract)  
Viral-polio (nervous system), Influenza(Respiratory tract)  
Fungal- Dermatophytic infections (skin) and  
Protozoan Diseases – Amoebiasis  
Disease associated clinical samples for diagnosis.

**UNIT- II COLLECTION OF CLINICAL SAMPLES**

**9Hrs**

Collection of clinical samples (oral cavity, throat, skin, blood, CSF, urine and faeces) &  
Precautions required.  
Method of transport of clinical samples to laboratory and storage.

**UNIT- III DIRECT MICROSCOPIC EXAMINATION & CULTURE METHODS**

**9Hrs**

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- IV SEROLOGICAL & MOLECULAR METHODS**

**9Hrs**

Serological Methods - Agglutination, ELISA, immunofluorescence,  
Nucleic acid based methods - PCR, Nucleic acid probes.  
Typhoid, Dengue and HIV(Kits).

**UNIT- V TESTING FOR ANTIBIOTIC SENSITIVITY IN BACTERIA**

**9Hrs**

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

**TEXT/ REFERENCE BOOKS :**

1. Text book of Microbiology : R. Ananta Narayan
2. Text Book of Microbiology : P. Chakrabarthy.
3. Medical Microbiology : Sateesh Guptae.
4. Medical Microbiology : Roitt.
5. Diagnostic Microbiology : Fine old SM& W.J. Martion

**SRI DURGA MALLESWARA SIDDHARTHA MAHILA KALASALA, VIJAYAWADA - 10.**

(An Autonomous college in the jurisdiction of Krishna University, Machilipatnam, A.P)

|                     |               |                |                           |
|---------------------|---------------|----------------|---------------------------|
| <b>MICROBIOLOGY</b> | <b>MICP52</b> | <b>2017-18</b> | <b>B.Sc. (FMB) ( FMC)</b> |
|                     |               | <b>2018-19</b> |                           |

**MICROBIAL DIAGNOSIS IN HEALTH CLINICS CREDITS: 345Hrs**

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

Receipts, Labeling, recording and dispatching clinical specimens by visiting a diagnostic centre

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

3. Identification of bacteria (salmonella typhi, streptococcus) by studying their morphology, cultural character, Biochemical tests

4. Widal test

5. RPR test

6. Malarial parasite test (Kit method)

7. Maintenance and preservation of stock culture.

**SRI DURGA MALLESWARA SIDDHARTHA MAHILA KALASALA, VIJAYAWADA - 10.**  
(An Autonomous college in the jurisdiction of Krishna University, Machilipatnam, A.P)

|                     |                 |                |                           |
|---------------------|-----------------|----------------|---------------------------|
| <b>MICROBIOLOGY</b> | <b>MICTEL61</b> | <b>2017-18</b> | <b>B.Sc. (FMB) ( FMC)</b> |
|                     |                 | <b>2018-19</b> |                           |

**THIRD YEAR – SEMESTER-VI ,PAPER-VII      CREDITS: 3**

**FOOD AND INDUSTRIAL MICROBIOLOGY UNIT- I- FOOD**

**SPOILAGE & FOOD BORN DISEASES      9Hrs**

Intrinsic and extrinsic parameters that affect microbial growth in food  
Microbial spoilage of food - fruits, vegetables, milk, meat, egg, bread and canned foods  
Food intoxication (botulism).  
Food-borne diseases (salmonellosis) and their detection.

**UNIT – II - FOOD PRESERVATION & MICROBES AS FOOD      9Hrs**

Principles of food preservation - Physical and chemical methods.  
Fermented Dairy foods – cheese and yogurt.  
Microorganisms as food – SCP, edible mushrooms (white button, oyster and paddy straw).  
Probiotics and their benefits.

**UNIT – III- INDUSTRIAL MICROBIOLOGY-I      9Hrs**

Microorganisms of industrial importance – yeasts, moulds, bacteria, actinomycetes.  
Isolation and Screening of industrially-important microorganisms.  
Outlines of strain improvement.

**UNIT – IV - INDUSTRIAL MICROBIOLOGY-II      9Hrs**

Types of fermentation processes – solid state, liquid state, batch, fed-batch, continuous.  
Design of fermenter.  
Ingredients of Fermentation media  
Downstream processing - filtration, centrifugation, cell disruption, solvent extraction.

**UNIT – V - INDUSTRIAL MICROBIOLOGY-III      9Hrs**

Microbial production of Industrial products - Citric acid, Ethanol, amylases, penicillin, glutamic acid and vitamin B12.

**TEXT BOOKS :**

1. Food Microbiology : W.C. Frazier & O.C. West Hoff
2. Modern Food Microbiology : James M. Jay.
3. Industrial Microbiology : Prescott & Donns
4. Industrial Microbiology : L.E. Casida.
5. A Text Book of Industrial Biotechnology : Cruger & Cruger
6. Industrial Microbiology : Patel, A.



**SRI DURGA MALLESWARA SIDDHARTHA MAHILA KALASALA, VIJAYAWADA - 10.**

(An Autonomous college in the jurisdiction of Krishna University, Machilipatnam, A.P)

|                     |                 |                |                           |
|---------------------|-----------------|----------------|---------------------------|
| <b>MICROBIOLOGY</b> | <b>MICPEL61</b> | <b>2017-18</b> | <b>B.Sc. (FMB) ( FMC)</b> |
|                     |                 | <b>2018-19</b> |                           |

**FOOD AND INDUSTRIAL MICROBIOLOGY**

**Credits: 3**

**45Hrs**

1. Isolation of bacteria from spoiled bread/fruits/vegetables
2. Isolation of fungi from spoiled bread/fruits/vegetables
3. Preparation of Yogurt/Dahi
4. Determination of the microbiological quality of milk sample by MBRT
5. Isolation of antagonistic microorganisms by crowded plate technique
6. Design of Fermenter
7. Microbial fermentation for the production and estimation of citric acid.

|                     |                 |                |                           |
|---------------------|-----------------|----------------|---------------------------|
| <b>MICROBIOLOGY</b> | <b>MICTCL61</b> | <b>2017-18</b> | <b>B.Sc. (FMB) ( FMC)</b> |
|                     |                 | <b>2018-19</b> |                           |

**THIRD YEAR – SEMESTER -VI, PAPER- VIIIA Credits: 3**

**MICROBIAL QUALITY CONTROL IN FOOD AND PHARMACEUTICAL INDUSTRIES**

**UNIT – I -BIOSAFETY IN MICROBIOLOGY**

**9Hrs**

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 – MICROBIAL ANALYSIS IN FOOD/PHARMACEUTICAL INDUSTRIES -I**

**9Hrs**

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 – MICROBIAL ANALYSIS IN FOOD/PHARMACEUTICAL INDUSTRIES -II**

**9Hrs**

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, Resazurin assay).

**UNIT – IV – MOLECULAR METHODS**

**9Hrs**

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

**UNIT – V – HACCP FOR FOOD SAFETY & MICROBIAL STANDARDS**

**9Hrs**

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.

**TEXT BOOKS :**

1. Food Microbiology : W.C. Frazier & O.C. West Hoff 2. Modern Food

Microbiology : James M. Jay.

3. Aquatic Microbiology. : G. Rhenheiner.

4. Handbook of Microbiological Quality control in: Baird RM, Hodges NA and Denyer  
SP Pharmaceutical and Medical Devices,

|                     |                 |                |                           |
|---------------------|-----------------|----------------|---------------------------|
| <b>MICROBIOLOGY</b> | <b>MICPCL61</b> | <b>2017-18</b> | <b>B.Sc. (FMB) ( FMC)</b> |
|                     |                 | <b>2018-19</b> |                           |

**MICROBIAL QUALITY CONTROL IN FOOD AND PHARMACEUTICAL INDUSTRIES**

**CREDITS: 3**

**45Hrs**

1. Microbiological laboratory safety- General rules & Regulations.
2. Sterility tests for Instruments – Autoclave & Hot Air Oven
3. Disinfection of selected instruments & Equipments
4. Sterility of Air and its relationship to Laboratory & Hospital sepsis.
5. Sterility testing of Microbiological media
6. Sterility testing of Pharmaceutical products –Antibiotics, fluids (saline)
7. Standard qualitative analysis of water.
8. Quantitative analysis of water – Membrane filter method





**SRI DURGA MALLESWARA SIDDHARTHA MAHILA KALASALA : VIJAYAWADA-10**  
**An autonomous college in the jurisdiction of Krishna University**

|                     |                  |                |                           |
|---------------------|------------------|----------------|---------------------------|
| <b>MICROBIOLOGY</b> | <b>MICTELS62</b> | <b>2017-18</b> | <b>B.Sc. (FMB) ( FMC)</b> |
|                     |                  | <b>2018-19</b> |                           |

**THIRD YEAR – SEMESTER-V, PAPER- VIB**  
**MICROBIAL BIOTECHNOLOGY**

**TOTAL HOURS: 45 +15 Tutorials**

**CREDITS: 3**

**UNIT- I - INTRODUCTION TO MICROBIAL BIOTECHNOLOGY & ITS APPLICATIONS**

**No. of Hours: 9**

Microbial biotechnology: Scope and its applications in human therapeutics, agriculture , environmental, and food technology.

Genetically engineered microbes for industrial application: Bacteria and yeast

**UNIT- II - THERAPEUTIC & INDUSTRIAL BIOTECHNOLOGY**

**No. of Hours: 9**

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 - APPLICATIONS OF MICROBES IN BIOTRANSFORMATIONS**

**No. of Hours: 9**

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 - MICROBES FOR BIOENERGY & ENVIRONMENT**

**No. of Hours: 9**

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 – INTELLECTUAL PROPERTY RIGHTS**

**No. of Hours: 9**

Outlines of Intellectual Property Rights: Patents, Copyrights, Trademarks

**TEXT/ REFERENCE BOOKS :**

Prescott, Harley and Klein's Microbiology: Willey JM, Sherwood LM, Woolverton CJ (2014)

Elements of Biotechnology 2nd edition: Gupta PK

Principles of Fermentation Technology 2nd edition: Stanbury PF, Whitaker A, Hall SJ

Biotechnology: A text Book of Industrial Microbiology 2nd edition: Crueger W, Crueger A

|              |           |         |                    |
|--------------|-----------|---------|--------------------|
| MICROBIOLOGY | MICPELS62 | 2017-18 | B.Sc. (FMB) ( FMC) |
|              |           | 2018-19 |                    |

**MICROBIAL BIOTECHNOLOGY**

**TOTAL HOURS: 36**

**CREDITS: 2**

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

|                     |                  |                |                             |
|---------------------|------------------|----------------|-----------------------------|
| <b>MICROBIOLOGY</b> | <b>MICTCLS62</b> | <b>2017-18</b> | <b>B.Sc.<br/>(FMB)(FMC)</b> |
|                     |                  | <b>2018-19</b> |                             |

### **Molecular Virology**

**TOTAL HOURS: 20**

**CREDITS: 2**

#### **UNIT – I**

**No of Hours: 4**

History of Virology and Biosafety: History and principles of virology.  
Structures of animal and plant viruses and their morphology.  
Principles of biosafety and requirements of virology laboratory.

#### **UNIT – II**

**No of Hours: 4**

Virus Replication: Structure and replication strategies of bacteriophages – T7,  $\lambda$ , and plant viruses – ss RNA virus (TMV) and ds DNA virus (CaMV).  
Structure and replication strategies of animal viruses – Influenza virus, Adeno virus and Retro virus.

#### **UNIT – III**

**No of Hours: 4**

Interferon and Antiviral Agents: Viral Interference and Interferons.  
Nature and source of interferons, Classification of interferons.  
Induction of interferon.  
Antiviral agents (chemical and biological) and their mode of actions.

#### **UNIT – IV**

**No of Hours: 4**

Cultivation of Viruses and Viral Vaccines : Cultivation of viruses in embryonated egg. Conventional vaccines – Killed and attenuated. Modern vaccines – Recombinant proteins, subunits, DNA vaccines, peptides, immunomodulators (cytokines). Vaccine delivery and adjuvants, large-scale manufacturing.

#### **UNIT – V**

**No of Hours: 4**

Virological Methods: Methods for purification of viruses with special emphasis on ultracentrifugation methods.  
Quantitative diagnostic methods – Haemagglutination, complement fixation, neutralization, Western blot.  
Nucleic acid based diagnosis – PCR, microarray and nucleotide sequencing.

#### **TEXT AND REFERENCE BOOKS:**

1. Text Book of Microbiology - Ananthanarayanan and Jayaram Paniker
2. Virology - Wilson and Topley
3. Text book of Virology - Rhodes and Van Royen
4. Virology and Immunology - Jokli



SRI DURGA MALLESWARA SIDDHARTHA MAHILA KALASALA: VIJAYAWADA-10  
An autonomous college in the jurisdiction of Krishna University

|                     |                  |                |                             |
|---------------------|------------------|----------------|-----------------------------|
| <b>MICROBIOLOGY</b> | <b>MICPCLS63</b> | <b>2017-18</b> | <b>B.Sc.<br/>(FMB)(FMC)</b> |
|                     |                  | <b>2018-19</b> |                             |

**TOTAL HOURS: 36**

**Practicals:**

1. Bacteriophage isolation, titration, plaque assay, single bust experiment.
2. Cultivation of viruses – Egg
3. Tissue culture techniques Animal inoculation techniques
4. Isolation and propagation of TMV Examination of blood smear by Leishman stain.
5. Rota viral RNA (ds RNA) analysis
6. Immunodiagnosis - ELISA tests.