# CAUVERY COLLEGE FOR WOMEN (AUTONOMOUS)

**Nationally Accredited with 'A$^{+}$' Grade by NAAC**

# TIRUCHIRAPPALLI

## PG AND RESEARCH DEPARTMENT OF MICROBIOLOGY

## M.Sc., MICROBIOLOGY

## SYLLABUS

## 2026 -2027 and Onwards

# CAUVERY COLLEGE FOR WOMEN (AUTONOMOUS)

## PG AND RESEARCH DEPARTMENT OF MICROBIOLOGY

## VISION

Our vision is to encourage eminent research work through the conception of an attractive and vibrant environment to achieve goals of our department.

## MISSION

- To impart relevant, ultimate, principle-oriented education and practical expertise in the field of Microbiology.
- To strive to provide quality education conjugated with innovative technology so as to be able to gain technical and educational expertise locally, nationally, internationally.
- Our prime focus is to enrich the ambitions of our students, staff and steer with constructive collaboration towards excellence.

## PROGRAMME EDUCATIONAL OBJECTIVES(PEOs)

| PEOs | Statements |
|---|---|
| **PEO1** | **LEARNING ENVIRONMENT**<br>To facilitate value-based holistic and comprehensive learning by integrating innovative learning practices to match the highest quality standards and train the students to be effective leaders in their chosen fields. |
| **PEO2** | **ACADEMIC EXCELLENCE**<br>To provide a conducive environment to unleash their hidden talents and to nurture the spirit of critical thinking and encourage them to achieve their goal. |
| **PEO3** | **EMPLOYABILITY**<br>To equip students with the required skills in order to adapt to the changing global scenario and gain access to versatile career opportunities in multidisciplinary domains. |
| **PEO4** | **PROFESSIONAL ETHICS AND SOCIAL RESPONSIBILITY**<br>To develop a sense of social responsibility by formulating ethics and equity to transform students into committed professionals with a strong attitude towards the development of the nation. |
| **PEO5** | **GREEN SUSTAINABILITY**<br>To understand the impact of professional solutions in societal and environmental contexts and demonstrate the knowledge for an overall sustainable development. |

**PROGRAMME OUTCOMES FOR M.Sc.,Microbiology PROGRAMME**

| PO NO | On completion of M.Sc., Microbiology, the students will be able to |
|---|---|
| PO1 | **Scientific Management and Career Opportunities:** Master the scientific and applied aspects of the subject for employment opportunities. |
| PO2 | **Explore Creativity and Intelligence:** Employ novel ideas with conceptual thinking to secure self-discipline and independence to foster scientific attitude by exploration of Science. |
| PO3 | **Team Building and Scientific Temperament:** Inculcate training, internships and team spirit with leadership skills through academic projects and transmit complex scientific and technical information and contribute to the scientific community. |
| PO4 | **Innovative Learning and Technological Advancement:** Perceive research in the specialized areas and to engage in life-long learning to keep pace with emerging trends in academics, research and technology. |
| PO5 | **Personality Development with Social Responsibility:** Achieve ethical, social and holistic values with social responsibility to develop a healthy life. |

**PROGRAMME SPECIFIC OUTCOMES FOR M.Sc., MICROBIOLOGY**

| PSO NO. | Students of M.Sc., Microbiology will be able to | POs Addressed |
|---|---|---|
| PSO 1 | Understand the applied sciences to engage them life long learning to foster their successful carrier and educational goals. | PO1 PO5 |
| PSO 2 | Focus perceptive in the subject of Microbiology to apply its principles and its applications by adding broad range of scientific knowledge. | PO2 PO3 |
| PSO 3 | Acquire contextual knowledge on basis and modern concepts in current areas with contemporary technologies and multidisciplinary domains | PO3 PO4 |
| PSO 4 | Instill to work independently identify appropriate resources; enable individual, institutional and national values to understand the impact of innovation and applications. | PO4 PO1 |
| PSO 5 | Ability to imbibe moral and ethical values to formulate effective research grants and experimental designs | PO5 PO2 |

# CAUVERY COLLEGE FOR WOMEN (AUTONOMOUS)

## PG DEPARTMENT OF MICROBIOLOGY

## M.Sc MICROBIOLOGY

### CHOICE-BASED CREDMB SYSTEM-LEARNING OUTCOME BASED CURRICULUM FRAMEWORK (CBCS – LOCF)

(For the Candidates admitted from the Academic year 2026-2027 onwards)

| Semester | Course | Course Title | Course Code | Inst. Hrs. / week | Credits | Exam | | | Total |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Hrs. | Marks | | |
| | | | | | | | Int. | Ext. | |
| I | Core Course– I (CC-I) | Essentials of Microbiology | 26PMB1CC1 | 6 | 5 | 3 | 30 | 70 | 100 |
| | Core Course – II (CC-II) | Biological Macromolecules | 26PMB1CC2 | 6 | 5 | 3 | 30 | 70 | 100 |
| | Core Practical –I (CP-I) | Essentials of Microbiology and Biological Macromolecules (P) | 26PMB1CP1 | 6 | 5 | 3 | 40 | 60 | 100 |
| | Discipline Centric Elective Course-I (DCEC-I) | A. Virology | 26PMB1DCE1A | 5 | 3 | 3 | 30 | 70 | 100 |
| | | B. Public Health Microbiology | 26PMB1DCE1B | | | | | | |
| | | C. Biological Instrumentation | 26PMB1DCE1C | | | | | | |
| | Generic Elective Course -I (GEC-I) | A. Virology (P) | 26PMB1GEP1A | 4 | 2 | 3 | 40 | 60 | 100 |
| | | B. Clinical Lab Technology (P) | 26PMB1GEP1B | | | | | | |
| | Non-Major Elective Course -I (NMEC-I) | Food Quality Testing (P) (Choose from other Department) | 26PMB1NMEP1 | 3 | 2 | 3 | 40 | 60 | 100 |
| | Total | | | **30** | **22** | | | | **600** |
| II | Core Course –III (CC-III) | Microbial Metabolism | 26PMB2CC3 | 6 | 5 | 3 | 30 | 70 | 100 |
| | Core Course - IV (CC-IV) | Immunology | 26PMB2CC4 | 6 | 5 | 3 | 30 | 70 | 100 |
| | Core Practical –II (CP-II) | Microbial Metabolism and Immunology (P) | 26PMB2CP2 | 6 | 5 | 3 | 40 | 60 | 100 |
| | Discipline Centric Elective Course-II (DCEC-II) | A. Environmental Microbiology | 26PMB2DCE2A | 5 | 3 | 3 | 30 | 70 | 100 |
| | | B. Food Adulteration | 26PMB2DCE2B | | | | | | |
| | | C. Microbial Diversity | 26PMB2DCE2C | | | | | | |
| | Generic Elective Course -II (GEC-II) | A. Environmental Microbiology (P) | 26PMB2GEP2A | 4 | 2 | 3 | 40 | 60 | 100 |
| | | B. Food Adulteration (P) | 26PMB2GEP2B | | | | | | |
| | Non-Major Elective Course -II (NMEC-II) | Mushroom Technology(P) | 26PMB2NMEP2 | 3 | 2 | 3 | 40 | 60 | 100 |
| | Extra Credit Course | SWAYAM | As per UGC Recommendation | | | | | | |
| | Total | | | **30** | **22** | | | | **600** |
| **30 Days INTERNSHIP during Semester Holidays** | | | | | | | | | |
| III | Core Course- V (CC-V) | Molecular Biology and Microbial Genetics | 26PMB3CC5 | 6 | 5 | 3 | 30 | 70 | 100 |
| | Core Course-VI (CC-VI) | Food and Dairy Microbiology | 26PMB3CC6 | 6 | 5 | 3 | 30 | 70 | 100 |
| | Core Practical -III (CP-III) | Molecular Biology and Microbial Genetics and Food and Dairy Microbiology (P) | 26PMB3CP3 | 6 | 5 | 3 | 40 | 60 | 100 |
| | Discipline Centric Elective Course-III (DCEC-III) | A. Clinical Microbiology | 26PMB3DCE3A | 5 | 3 | 3 | 30 | 70 | 100 |
| | | B. Pharmacognosy | 26PMB3DCE3B | | | | | | |
| | | C. Microbial Cytology | 26PMB3DCE3C | | | | | | |
| | Generic Elective Course -III (GEC-III) | A. Clinical Microbiology (P) | 26PMB3GEP3A | 3 | 2 | 3 | 40 | 60 | 100 |
| | | B. Pharmacognosy (P) | 26PMB3GEP3B | | | | | | |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Skill Enhancement Course -I(SEC-I) | Professional Competitive Exam I- Microbiology for Competitive Examinations | 26PMB3SE1 | 4 | 2 | 2 | - | - | 100 |
| | Internship | Internship | 26PMB3INT | - | 2 | - | 20 | 80 | 100 |
| | Extra Credit Course | SWAYAM | As per UGC Recommendation | | | | | | |
| | | | | **30** | **24** | | | | 700 |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| IV | Core Course-VII (CC-VII) | Industrial Microbiology | 26PMB4CC7 | 6 | 5 | 3 | 30 | 70 | 100 |
| | Core Practical-VII (CP-IV) | Industrial Microbiology (P) | 26PMB4CP4 | 6 | 5 | 3 | 30 | 70 | 100 |
| | Discipline Centric Elective Course-IV (DCEC-IV) | A. Microbial Biotechnology | 26PMB4DCE4A | 5 | 3 | 3 | 30 | 70 | 100 |
| | | B. Research Methodology | 26PMB4DCE4B | | | | | | |
| | | C. Microbial Nanotechnology | 26PMB4DCE4C | | | | | | |
| | Generic Elective Course - IV (GEC-IV) | A. Bioinformatics | 26PMB4GE4A | 3 | 2 | 3 | 30 | 70 | 100 |
| | | B. Soil Microbiology | 26PMB4GE4B | | | | | | |
| | Skill Enhancement Course -II (SEC-II) | Computational Biology (P) | 26PMB4SEP2 | 3 | 2 | 3 | 40 | 60 | 100 |
| | Entrepreneurship/ Industry Based Course | Entrepreneurship Microbiology | 26PMB4ENT/ 26PMB4IBC | 3 | 2 | 3 | 30 | 70 | 100 |
| | Project | Project Work | 26PMB4PW | 4 | 4 | - | - | 100 | 100 |
| | Total | | | **30** | **23** | | | | **700** |
| | Grand Total | | | **120** | **91** | | | | **2800** |

## Courses & Credit for PG Science Programmes

| Sl. No | Courses | No of Courses | Hours Allocated | No of CredMBs | Marks |
|---|---|---|---|---|---|
| 1. | Core Course – (CC) | 7 | 6 | 7*5=35 | 700 |
| 2. | Core Practical – (CP) | 4 | 6 | 4*5=20 | 400 |
| 3. | Discipline Specific Elective- (DSE) | 4 | 5 | 4*3=12 | 400 |
| 4. | Generic Elective Course - (GEC) | 4 | 3/4 | 4*2=8 | 400 |
| 5. | Non-Major Elective Course | 2 | 3 | 2*2=4 | 200 |
| 5. | Skill Enhancement Course- (SEC) | 2 | 3 | 2*2=4 | 200 |
| 6. | Project | 1 | 4 | 4 | 100 |
| 7. | Internship | 1 | - | 2 | 100 |
| 8. | Entrepreneurship/Industry Based Course | 1 | 3 | 2 | 100 |
| | Total | 26 | | 91 | 2600 |

| Semester: I | Internal Marks: 30 | | External Marks: 70 | |
|---|---|---|---|---|
| **COURSE CODE** | **COURSE TITLE** | **CATEGORY** | **Hrs./Week** | **CREDITS** |
| **26PMB1CC1** | **ESSENTIALS OF MICROBIOLOGY** | **CORE COURSE - I** | **6** | **5** |

**Course Objectives**

- Explain the scope and importance of Microbiology in various fields.
- Differentiate the various types of microscopy based on their principles and applications.
- Identify the structural features of eukaryotic cells using microscopic observations.
- Describe the structure and components of prokaryotic cells.
- Demonstrate the methods used for cultivation of microorganisms in laboratory conditions.

| S. No. | Course Features | Relevance Status |
|---|---|---|
| 1. | Course emphasis on Employability/Entrepreneurship/Skill Development | Employability, Skill Development |
| 2. | Course integrates cross-cutting issues relevant to Professional Ethics/Gender sensitization/Environment and Sustainability/Human Values/Indian Knowledge Systems | Environment and Sustainability |
| 3. | Course relevant to Local/Regional/National/Global needs | Global Needs |
| 4. | Course focus on Sustainable Developmental Goals | SDG 3, 4, 12 |

**Course Outcomes**

**Course Outcome and Cognitive Level Mapping**

| CO Number | CO Statement<br>On the successful completion of the course, students will be able to | Cognitive Level |
|---|---|---|
| CO1 | Determine the scope of Microbiology | K1, K2, K3 |
| CO2 | Differentiate the types of Microscopy | K3, K4 |
| CO3 | Assess the morphological features of Eukaryotic Cell | K4, K5 |
| CO4 | Generalize view of Prokaryotic Cell Structure | K5, K6 |
| CO5 | Develop the cultivation methods of microbes | K5, K6 |

**Mapping of CO with PO and PSO**

| COs | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 | PO1 | PO2 | PO3 | PO4 | PO5 |
|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| **CO2** | 2 | 3 | 2 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| **CO3** | 3 | 2 | 3 | 3 | 2 | 3 | 3 | 3 | 3 | 2 |
| **CO4** | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 2 | 2 |
| **CO5** | 3 | 3 | 3 | 2 | 2 | 2 | 2 | 2 | 1 | 1 |

"1"– Slight (Low) correlation "2"– Moderate (Medium) correlation
"3"– Substantial (High) correlation "-"– Indicates there is no correlation

**Syllabus**

| UNIT | CONTENT | HOURS | COS | COGNITIVE LEVEL |
|---|---|---|---|---|
| I | **History and Scope of Microbiology** Generation theory– Contribution of Leuwenhoek, Louis Pasteur, Robert Koch, Edward Jenner, Joseph Lister, Winogradsky, Waksman and John Tyndall. Classification of microorganisms - Haeckel's three kingdom concept, Whittaker's five kingdom concept, Carl Woes three domain system, Bacterial classification (outline) according to Bergey's manual of systemic Bacteriology. Applications of Microbiology in Daily Life, Applied Areas of Microbiology, Role of Microbiology in Society, Modern Trends in Microbiology, Laboratory and Career Aspects. | 15 | CO1, CO2, CO3, CO4, CO5 | K1, K2, K3, K4, K5 |
| II | **Microscopy**<br>Light Microscopy – Bright field, Dark field, Phase contrast, Fluorescent and Polarization microscopes, Electron Microscopy – TEM & SEM, Atomic absorption Microscopy, Confocal Microscopy – Principles and applications. Cyro Electron Microscopy & Live cell Imaging. | 15 | CO1, CO2, CO3, CO4, CO5 | K1, K2, K3, K4, K5 |
| III | **Cell Structure of Prokaryotes** Morphological types, Cell wall of Gram negative, Gram positive bacteria and halophiles. Cell wall synthesis. Capsule composition and function. Cell membranes in Eubacteria, archaebacteria and cyanobacteria, Cell membrane functions. Periplasmicspace. Structure and function of flagella, cilia and pili, gas vesicles, chlorosomes, carboxysomes, magnetosomes and phycobilisomes. Reserve food materials – polyhydroxybutyrate, polyphosphates, cyanophycin and sulphur inclusions. General account on Mycolpasma. | 15 | CO1, CO2, CO3, CO4, CO5 | K1, K2, K3, K4, K5 |
| IV | **Cell Structure of Eukaryotes**<br>General characteristics, Classification, Structure and Reproduction of Algae: Chlorophyta (Green algae), Diatoms, Rhodophyta (Red algae), Fungi: Cell wall – chemical composition and functions, membranes and their functions, nutritional strategies of fungi. Structure and life cycle of fungi Ascomycetes (Aspergillus), Zygomycetes (Mucor), Basidiomycetes (Agaricus). Discovery, distinctive properties, morphology and ultra-structure of Virus, Classification, Cultivation and Purification assay of virus and Protozoa. | 15 | CO1, CO2, CO3, CO4, CO5 | K1, K2, K3, K4, K5, K6 |
| V | **Microbial Growth Measurements** Microbial growth - culture media - isolation of pure culture. Growth curve: Diauxy - continuous culture – chemostat – turbidostat - synchronized growth. Measurement of microbial growth – Total cell count method - viable cell count method and biomass determination - dry weight – wet weight – protein – Kjeldhal nitrogen – chlorophyll. Growth phases – kinetics – asynchronous – synchronous - batch – continuous culture. Factors affecting growth (pH, salinity, temperature, light, etc). Microbial growth control - Physical and chemical methods – sterilization and disinfection. Maintenance and preservation of microorganism. | 15 | CO1, CO2, CO3, CO4, CO5 | K1 K2, K3, K4, K5, K6 |
| VI | **Self-Study for Enrichment**<br>**(Not included for End Semester Examination)**<br>Giant bacteria, Cultivation of Anaerobic organisms, Microscope Handling and Procedures. Automated image analysis using AI | - | CO1, CO2, CO3, CO4, CO5 | K1 K2, K3, K4, K5, K6 |

**Text Books**


1. Cynthia Westfall (2022). Microbiology: A Systems Approach, 6th Edition, McGraw Hill.
2. Patrick R. Murray, Ken S. Rosenthal and Michael A. P.faller (2021). Medical Microbiology, 9th Edition, Elsevier.
3. Jeffrey C. Pommerville (2021). Fundamentals of Microbiology, 11th Edition, Jones & Bartlett Learning.
4. Stuart Hogg (2020). Essential Microbiology, 2nd Edition, Wiley-Blackwell.
5. Black, J. G. (2019). Microbiology: Principles and Explorations, 10th Edition, Wiley.


**Reference Books**


1. Joanne M. Willey, Linda M. Sherwood and Christopher J. Woolverton (2020). Prescott's Microbiology, 11th Edition, McGraw Hill.
2. Michael T. Madigan, Kelly S. Bender, Daniel H. Buckley and W. Matthew Sattley (2021). Brock Biology of Microorganisms, 16th Edition, Pearson.
3. Gerard J. Tortora, Berdell R. Funke and Christine L. Case (2022). Microbiology: An Introduction, 13th Edition, Pearson.
4. Kathleen Park Talaro and Barry Chess (2021). Foundations in Microbiology, 11th Edition, McGraw Hill.
5. Ananthanarayan and Paniker (2021). Textbook of Microbiology, 11th Edition, Universities Press.
6. Bergey, D.H. and John G. Holt (Editors) (2021).Bergey's Manual of Systematic Bacteriology, Springer.


**Web References**

1. https://microbenotes.com/eukaryotic-cells/?utm_source=chatgpt.com
2. https://imperfectpharmacy.in/wp-content/uploads/2025/02/UNIT-1- Microbiology-Imperfect-Pharmacy.pdf?utm_source=chatgpt.com
3. https://pharmacyindia.co.in/wp-content/uploads/2023/12/Microbiology- Unit-1-Part-2-One-Shot- Notes.pdf?utm_source=chatgpt.com
4. https://www.firsthope.co.in/b-pharmacy/semester-3/pharmaceutical-microbiology/microbiology-and- bacterial-cultivation- techniques/?utm_source=chatgpt.com
5. https://www.firsthope.co.in/b-pharmacy/semester-3/pharmaceutical-microbiology/microbiology-and- bacterial-cultivation- techniques/?utm_source=chatgpt.com

**Pedagogy**

Chalk and talk, Power Point Presentation, Quiz, Assignments, Group Discussions, Seminar, and Assignment.

**Course Designer**

**Dr. N.Sathammai Priya**

| Semester I | Internal Marks: 30 | External Marks: 70 | | |
|---|---|---|---|---|
| **COURSE CODE** | **COURSE TITLE** | **CATEGORY** | **Hrs./Week** | **CREDITS** |
| **26PMB1CC2** | **BIOLOGICAL MACROMOLECULES** | **CORE COURSE - II** | **6** | **5** |

**Course Objectives**

- To understand the structure and classification of biological macromolecules.
- To learn about carbohydrates, proteins, lipids, and nucleic acids.
- To study the biological functions of macromolecules in living systems.
- To gain knowledge about the role of macromolecules in metabolism and health.

| S. No. | Course Features | Relevance Status |
|---|---|---|
| 1. | Course emphasis on Employability/Entrepreneurship/Skill Development | Employability, Skill Development |
| 2. | Course integrates cross-cutting issues relevant to Professional Ethics/Gender sensitization/Environment and Sustainability/Human Values/Indian Knowledge Systems | Environment and Sustainability |
| 3. | Course relevant to Local/Regional/National/Global needs | Global Needs |
| 4. | Course focus on Sustainable Developmental Goals | SDG 3, 4, 12 |

**Course Outcomes**

**Course Outcome and Cognitive Level Mapping**

| CO Number | CO Statement<br>On the successful completion of the course, students will be able to | Cognitive Level |
|---|---|---|
| CO1 | Recall and explain the basic structure and classification of biological macromolecules. | K1 & K2 |
| CO2 | Explain the structure and functions of carbohydrates, proteins, lipids, and nucleic acids. | K3 |
| CO3 | Differentiate and categorize various biological macromolecules based on their properties and functions. | K4 |
| CO4 | Analyze the role of macromolecules in metabolism and disease conditions. | K5 |
| CO5 | Evaluate and illustrate the significance of biological macromolecules in health, biotechnology, and industry. | K6 |

**Mapping with Programme Outcomes**

| Cos | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 | PO1 | PO2 | PO3 | PO4 | PO5 |
|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 2 | 3 | 3 | 3 | 2 | 3 | 3 | 3 | 2 | 3 |
| **CO2** | 3 | 2 | 3 | 3 | 2 | 2 | 3 | 2 | 3 | 3 |
| **CO3** | 3 | 2 | 2 | 3 | 3 | 3 | 2 | 3 | 3 | 2 |
| **CO4** | 2 | 3 | 3 | 2 | 3 | 3 | 3 | 2 | 3 | 2 |
| **CO5** | 3 | 3 | 2 | 3 | 2 | 3 | 3 | 3 | 2 | 2 |

"1"– Slight (Low) Correlation "2" – Moderate (Medium) Correlation

"3"– Substantial (High) Correlation "-" – Indicates there is no Correlation

**Syllabus**

| UNIT | CONTENT | HOURS | COS | COGNITIVE LEVEL |
|---|---|---|---|---|
| I | **Carbohydrates:** Definition, sources, classification, structure of glucose, biological importance, digestion and assimilation. **Proteins:** Definition, sources, classification and structural organization of proteins (primary, secondary and tertiary levels). Amino acids – structure and classification; essential and non-essential amino acids; proteinogenic and non-protein amino acids. | 18 | CO1, CO2, CO4, CO5 | K1, K2, K3, K4, K5 |
| II | **Lipids:** Definition, sources, classification, structural features, properties and functions; fatty acids – saturated, unsaturated and essential fatty acids. **Nucleic Acids:** Definition, structure, different forms and functions of DNA. Types, structural characteristics and functions of RNA (mRNA, tRNA and rRNA). | 18 | CO1, CO2, CO3, CO4, CO5 | K1, K2, K3, K4, K5 |
| III | **Hormones:** Definition and classification of hormones. Human endocrine glands – Pituitary, Thyroid, Parathyroid, Pancreas, Adrenal, Testis and Ovary. **Phytohormones:** Structure and functions of Auxins, Gibberellins, Cytokinins and Abscisic acid. | 18 | CO1, CO2, CO3, CO4 | K2, K3, K4, K5 |
| IV | **Vitamins:** Definition, sources, deficiency disorders and functions of fat-soluble vitamins (A, D, E and K) and water-soluble vitamins (B-complex and C). **Minerals:** Zinc (Zn), Calcium (Ca), Iodine, Iron (Fe) and Magnesium(Mg). | 18 | CO1, CO2, CO3, CO4 | K2, K4, K5, K6 |
| V | **Blood and Microbial pigments:** Introduction, origin, composition, characteristics, functions and the process of blood coagulation. General overview of primary and secondary metabolites. Major and accessory microbial pigments – chlorophyll carotenoids, phycobilins and anthocyanins. | 18 | CO1, CO4, CO5 | K1, K2, K3, K4, K5 |
| VI | **Self-Study for Enrichment (Not included for End Semester Examinations**<br>Diseases associated with deficiency of endocrine hormones- hypo and hyper secretions. Life style diseases and metabolic diseases. Diet biochemical-health. Food as drug. | - | CO1, CO2, CO3, CO4 | K2, K3, K4, K5 |

**Text Books**


1. Ahluwalia, V. K. (2025). Biomolecules: Chemistry of Living Systems. CRC Press.
2. Singh, R. L., Singh, P., & Pathak, N. (Eds.). (2024). Clinical Applications of Biomolecules in Disease Diagnosis. Springer.
3. More, K. A. (Ed.). (2024). Introduction to the Study of Macromolecules. Delve Publishing.
4. Kaushik, S., & Singh, A. (2023). Biomolecules: From Genes to Proteins. De Gruyter.
5. Verma, C., & Verma, D. K. (2023). Handbook of Biomolecules: Fundamentals, Properties and Applications (1st ed.). Elsevier Publishers.


**Reference Books**


1. Elzagheid, M. (2024). Biomacromolecules: Carbohydrates, Lipids, Proteins and Nucleic Acids (2nd ed.). De Gruyter.
2. Salehi, H. (2024). Biochemistry of Macromolecules 1: The Principles, Proteins and Enzymes. (Kindle ed.). — (Student-oriented primer).
3. Okano, T. (2023). The Chemistry of Biomolecules. Cambridge Scholars Publishing.
4. Gupta, M. N. (Ed.). (2024). Some Key Topics in Chemistry and Biochemistry for Biotechnologists. CRC Press.
5. Basu, S., Achalkumar, A. S., & Pramanik, S. (Eds.). (2025). Current Progress in Biochemical, Biomedical, and Physical Sciences: Select Papers of RIC 2024, Volume 2. Springer Singapore.


**Web links:**

1. https://byjus.com/biology/biomolecules/
2. https://en.wikipedia.org/wiki/Biomolecule
3. https://www.sciencedirect.com/topics/engineering/biomolecule
4. https://ncert.nic.in/textbook/pdf/lech205.pdf
5. https://ncert.nic.in/textbook/pdf/kebo109.pdf

**Pedagogy**

Power point presentations, Group discussion, Seminar, Quiz, Assignment, Brain storming activity.

**Course Designer**

**Dr.P.F.Steffi**

| Semester: I | Internal Marks: 40 | | External Marks: 60 | |
|---|---|---|---|---|
| **COURSE CODE** | **COURSE TITLE** | **CATEGORY** | **Hrs./Week** | **CREDITS** |
| **26PMB1CP1** | **ESSENTIALS OF MICROBIOLOGY AND BIOLOGICAL MACROMOLECULES (P)** | **CORE PRACTICAL - I** | **6** | **5** |

**Course objective**

- To develop basic practical skills in general microbiology.
- To perform culturing and staining of microorganisms.
- To understand biological macromolecules through laboratory experiments.
- To correlate theoretical knowledge with practical applications.

| S. No. | Course Features | Relevance Status |
|---|---|---|
| 1. | Course emphasis on Employability/Entrepreneurship/Skill Development | Employability, Skill Development |
| 2. | Course integrates cross-cutting issues relevant to Professional Ethics/Gender sensitization/Environment and Sustainability/Human Values/Indian Knowledge System | Environment and Sustainability |
| 3. | Course relevant to Local/Regional/National/Global needs | Global Needs |
| 4. | Course focus on Sustainable Developmental Goals | SDG 3, 4, 15 |

**Course Outcome**

**Course Outcome and Cognitive Level Mapping**

| CO Number | CO Statement<br>On the successful completion of the course, students will be able to | Cognitive Level |
|---|---|---|
| CO1 | Understand fundamental techniques of microscopy, staining and sterilization. | K1, K2 |
| CO2 | Illustrate the preparation of bacterial growth media, plating and growth measurement techniques. | K2, K3 |
| CO3 | Analyze and quantify the biological macromolecules. | K2, K3, K4 |
| CO4 | Interpret DNA extraction and gene transfer mechanisms, analyze and identify by gel electrophoresis. | K3, K4, K5 |
| CO5 | Discuss isolation of mutants and separation of proteins. | K4, K5, K6 |

**Mapping of CO with PO and PSO**

| COs | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 | PO1 | PO2 | PO3 | PO4 | PO5 |
|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 3 | 3 | 3 | 3 | 2 | 3 | 3 | 3 | 3 | 3 |
| **CO2** | 3 | 3 | 2 | 3 | 3 | 3 | 3 | 2 | 3 | 3 |
| **CO3** | 3 | 3 | 3 | 3 | 2 | 3 | 2 | 3 | 3 | 2 |
| **CO4** | 3 | 2 | 3 | 2 | 3 | 3 | 3 | 3 | 2 | 3 |
| **CO5** | 3 | 3 | 3 | 3 | 2 | 3 | 3 | 2 | 2 | 3 |

"1"– Slight (Low) correlation "2"– Moderate (Medium) correlation

"3"– Substantial (High) correlation "-"– Indicates there is no correlation

**Syllabus**

**I. Essentials of Microbiology (45 Hours)**

1. Principles and methods of sterilization, decontamination and laboratory fumigation.
2. Preparation and use of glassware cleaning solutions.
3. Light microscopic techniques: Wet mount to show different types of microbes.
4. Staining techniques - Simple staining, Gram's staining and Capsule staining.
5. Preparation of Agar deeps, Slants and Plates and Biochemical test media.
6. Pure culture techniques: Spread Plate, Pour plate, and Streak plate.
7. Fungal slide culture technique.
8. Motility of bacteria - Hanging drop and soft agar inoculation.
9. Determination of Bacterial growth curve
10. Enumeration of microorganisms from soil: Bacteria (viable and total count), Fungi and Actinomycetes,
11. Isolation of cyanobacteria, actinomycetes and fungi.
12. Measurement of microbes by Micrometry.

**II. Biological Macromolecules (30 Hours)**

1. Determination of (H+) ion concentration.
2. Quantitative and qualitative analysis of Carbohydrate reducing sugars (Anthrone method & Benedicts method).
3. Quantitative and qualitative estimation of Aminoacids - Ninhydrin method.
4. Colorimetric assays of Protein–Lowry's method/Biuret method/ Bradford method.
5. Estimation of lipids.
6. Estimation of DNA (diphenyl amine method).
7. Estimation of RNA (Orcinol method).

**Reference Books**


1. Dubey R.C. and Maheshwari D. K. (2023). Practical Microbiology, 4th Edition. S. Chand Publisher.
2. James G. Cappuccimo and Chad T. Welsh. (2023). Microbiology: A Laboratory Manual, Global Edition, 11th Edition. Pearson Education, Publication.
3. Collee J. G., Fraser A.G., Marmion B. P. and Simmons A. (2023). Mackie & McCartney Practical Medical Microbiology. 14th Edition Reprint. Elsevier.
4. Das, S. & Saha, R. (2024). Microbiology Practical Manual, 3rd edition. CBS Publishers & Distributors Pvt. Ltd., New Delhi.
5. Rafi Mohammed. (2024). Manual of Practical Biochemistry, 5th Edition. Orient Blackswan Pvt. Ltd.


**Web References**

1. https://ttk.elte.hu/dstore/document/893/book.pdf
2. https://webstor.srmist.edu.in/web_assets/downloads/2021/18BTC103J-lab-manual.pdf
3. https://microbenotes.com/gene-cloning-requirements-principle-steps-applications/
4. https://www.slideshare.net/PatriciaCosta17/practical-handbook-of-microbiology
5. https://www.researchgate.net/publication/320508474_Molecular_Biology_Laboratory_manual

**Pedagogy**

Chalk and talk, Power Point Presentation, Demo Video and Group Discussions.

**Course Designer**

**Dr. N. Jeenathunisa**

| Semester: I | Internal Marks:30 | | External Marks:70 | |
|---|---|---|---|---|
| **COURSE CODE** | **COURSE TITLE** | **CATEGORY** | **Hrs./Week** | **CREDITS** |
| **26PMB1DCE1A** | **VIROLOGY** | **DISCIPLINE CENTRIC ELECTIVE COURSE - I** | **5** | **3** |

**Course Objective**

- The course is designed to develop the student with enough knowledge about general account of viruses, bacteriophages, plant, animal and human viral diseases.
- Basic Understanding of Etiology and Diagnostic Management of Viruses.
- To train up the student in gaining knowledge about instrumentation relevant to virology.

| S.No | Course Features | Relevance Status |
|---|---|---|
| 1. | Course emphasis on Employability/Entrepreneurship/Skill Development | Employability, Skill Development |
| 2. | Course integrates cross-cutting issues relevant to Professional Ethics/Gender sensitization/Environment and Sustainability/Human Values/Indian Knowledge System | Environment and Sustainability |
| 3. | Course relevant to Local/Regional/National/Global needs | Global Needs |
| 4. | Course focus on Sustainable Developmental Goals | SDG 3, 4 |

**Course Outcome and**
**Course Outcome and Cognitive Level Mapping**

| CO Number | CO Statement<br>On the successful completion of the course, students will be able to | Cognitive Level |
|---|---|---|
| CO1 | Describe General Characters and Classification of viruses | K1, K2, K3 |
| CO2 | Aware different Diagnostic methods adopted for viruses | K2, K3, K4 |
| CO3 | Understand the replicative cycles of Viruses | K2, K3, K4, K5 |
| CO4 | Analyze the pathogenesis and symptoms of Viruses | K3, K4, K5, K6 |
| CO5 | Examine and Categorize different types of preventive measures of Viruses | K3, K4, K5, K6 |

**Mapping of CO with PO and PSO**

| COs | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 | PO1 | PO2 | PO3 | PO4 | PO5 |
|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 3 | 3 | 3 | 2 | 3 | 3 | 3 | 3 | 3 | 1 |
| **CO2** | 3 | 3 | 3 | 3 | 3 | 1 | 3 | 3 | 3 | 1 |
| **CO3** | 3 | 3 | 2 | 3 | 3 | 3 | 2 | 3 | 3 | 1 |
| **CO4** | 2 | 3 | 1 | 3 | 3 | 3 | 1 | 3 | 3 | 1 |
| **CO5** | 3 | 3 | 3 | 1 | 3 | 3 | 3 | 3 | 1 | 1 |

"1"– Slight (Low) Correlation "2" – Moderate (Medium) correlation
"3"– Substantial (High) Correlation "-" – Indicates there is no correlation

**Syllabus**

| UNIT | CONTENTS | HOURS | COs | COGNITIVE LEVEL |
|---|---|---|---|---|
| **I** | General Virology: Brief outline on discovery of viruses, nomenclature and classification of viruses; Distinctive properties of viruses; morphology & ultrastructure. Capsids and their arrangements - types of envelopes and their composition-viral genome, Virus related agents (Viroids, Virusoids, Prions and Satellite viruses). | 15 | CO1, CO2, CO3 | K1, K2, K3 |
| **II** | General Methods of Diagnosis and Serology: Cultivation of viruses in embryonated eggs, experimental animals, and cell cultures. cell strains, cell lines and transgenic systems. Assay of viruses – physical and chemical methods (protein, nucleic acid, radioactivity tracers, electron microscopy). Infective assay (plaque method, end point method) | 15 | CO1, CO2, CO5 | K1, K2, K3, K4 |
| **III** | Bacterial Viruses: Bacteriophage - structural organization - one step growth curve - life cycle - Lytic and Lysogenic, Classification, Morphological groups - virulent dsDNA phage, ssDNA phage - phage lambda, Phage Mu, M13, T4, P1, Bacteriophage typing, Phage therapy. | 15 | CO1, CO2, CO3, CO4 | K1, K2, K3, K4, K5 |
| **IV** | Plant Viruses: Classification and nomenclature; effects of viruses on plants; Common virus diseases of plants - Tobamo virus group, Potex virus, Tomato spotted wilt, Cauliflower mosaic virus, Potato leaf roll virus, Rice tungro virus, Mosaic disease of sugarcane. Transmission of plant viruses with vectors - insects, nematodes, fungi - without vectors (contact, seed and pollens). control measures of plant viruses. | 15 | CO1, CO2, CO3, CO4, CO5 | K1, K2, K3, K4, K5 |
| **V** | Animal Viruses: Classification, nomenclature and Life cycle of animal Viruses – RNA Viruses- Rhabdo, Rota, HIV, SARS, Influenza, Oncogenic viruses. DNA viruses - Pox, Herpes, Adeno, Hepatitis viruses, DNA tumor Viruses. Viral vaccines, interferons, and antiviral drugs. | 15 | CO1, CO2, CO3, CO4, CO5 | K1, K2, K3, K4, K5, K6 |
| **VI** | **Self Study Enrichment (Not included for End Semester Examinations)** Cultural Characters of Viruses, Qualitative and Quantitative estimation of Viruses, Structure and life cycle of viruses, Etiology and Classification of viruses and Viral Prophylaxis. | - | CO1, CO2, CO3, CO4, CO5 | K1, K2, K3, K4, K5, K6 |

**Text Books**


1. S. Ram Reddy, S.M. Reddy (2024). Essentials of Virology (2nd Edition). Scientific Publishers, India.
2. Geo Brooks, Karen Carroll, Janet Butel and Stephen Morse (2020). Medical Microbiology (26th Edition). McGraw Hill Publication, India.
3. Ananthanarayan and Jayaram Paniker (2020). Text book of Microbiology (11th Edition). London: Oxford University press.
4. Baijayantimala Mishra (2021). Textbook of Medical Virology (2nd edition). CBS publishers and distributors pvt ltd, India.
5. Dorothy H. Crawford (2021). VIRUSES (2nd edition). Oxford University Press, London.
6. Jawetz, Melnick and Adelberg's (2019). Medical Microbiology (24th Edition), Hill Medical Publication division, India.


**Reference book**


1. Saravanan P (2024), Virology (1st Edition). MJP Publishers, India.
2. Van G. Wilson (2022). Viruses: Intimate Invaders (1st edition). Springer Nature Switzerland.
3. Reeti Khare (2019). Guide to clinical and diagnostic virology (1st edition). ASM Press, India.
4. Luke S. P. Moore and James C. Hatcher (2019). Infectious Diseases, Microbiology and Virology (1st edition). Cambridge University Press, UK.


**Web References**

1. https://samicrobiology.files.wordpress.com/2018/08/modern-viro1ogy.pdf
2. https://www.jfmed.uniba.sk/fileadmin/jlf/Pracoviska/ustav-mikrobiologie-aimunologie/ distancna_vyuka/ang_12_lect_viruses.pdf
3. https://eazhar.kau.edu.sa/Files/0030203/files/19623_Lec-1%20General% 20Virology_ Medical%20Virology.pdf
4. https://www.virology.ws/wp-content/uploads/2012/03/020_3310_17.pdf
5. https://content.kopykitab.com/ebooks/2017/04/10504/sample/sample_10504.pdf

**Pedagogy**

Chalk and talk, Quiz, Assignments, Group Discussion, Demo and Power Point Presentation

**Course Designer**

**Dr. S. Jeyabharathi**

| Semester: I | Internal Marks:30 | External Marks:70 | | |
|---|---|---|---|---|
| **COURSE CODE** | **COURSE TITLE** | **CATEGORY** | **Hrs./Week** | **CREDITS** |
| **26PMB1DCE1B** | **PUBLIC HEALTH MICROBIOLOGY** | **DISCIPLINE CENTRIC ELECTIVE COURSE - I** | **5** | **3** |

**Course Objectives**

- To study about the microbes related to public health.
- To gain knowledge about thematically important human microbial pathogens
- To focus on the diseases caused by microbes, pathogenesis, lab diagnosis, prophylaxis, Control measures.

| S. No. | Course Features | Relevance Status |
|---|---|---|
| 1. | Course emphasis on Employability/Entrepreneurship/Skill Development | Employability, Entrepreneurship, Skill Development |
| 2. | Course integrates cross cutting issues relevant to Professional Ethics/Gender sensitization/ Environment and Sustainability/ Human Values//Indian Knowledge Systems | Environment and Sustainability |
| 3. | Course relevant to Local/Regional/National/ Global needs | Global needs |
| 4. | Course focus on Sustainable Developmental Goals | SDG 2,12,14 |

**Course Outcome**

**Course Outcome and Cognitive Level Mapping**

| CO Number | CO Statement<br>On the successful completion of the course, students will be able to | Cognitive Level |
|---|---|---|
| CO1 | Define and examine the basic ideas about microbial association | K1, K4 |
| CO2 | Diagnose and analyze various air borne disease | K3, K4 |
| CO3 | Determine the water borne diseases and its control | K1, K4 |
| CO4 | Evaluate and discuss about the role of microorganisms in food | K3, K5 |
| CO5 | Extend the diagnosis hospital acquired Infections | K2, K6 |

**Mapping of CO with PO and PSO**

| COs | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 | PO1 | PO2 | PO3 | PO4 | PO5 |
|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 2 | 2 | 2 | 3 | 3 | 3 | 3 | 2 | 3 |
| CO2 | 2 | 3 | 2 | 3 | 3 | 3 | 2 | 3 | 3 | 3 |
| CO3 | 3 | 2 | 3 | 3 | 3 | 3 | 2 | 3 | 2 | 3 |
| CO4 | 3 | 2 | 2 | 2 | 2 | 3 | 2 | 2 | 2 | 3 |
| CO5 | 3 | 2 | 3 | 3 | 2 | 2 | 3 | 3 | 3 | 3 |

"1"– Slight (Low) correlation "2"– Moderate (Medium) correlation
"3"– Substantial (High) correlation "-"– Indicates there is no correlation

**Syllabus**

| UNIT | CONTENT | HOURS | COS | COGNITIVE LEVEL |
|---|---|---|---|---|
| I | **Introduction to public health**: Public health definition and approach. Public health Organizations and functions – (World health organization (WHO), Center for Disease control and Prevention (CDC), Occupational Safety and Health Administration (OSHA) and Public health organizations in India), Importance of public health Microbiology, Public health Diseases (Non communicable and communicable) | 15 | CO1, CO2, CO3, | K1, K2, K3, K4, |
| II | **Air borne infections**: Air and its composition, indoor air and outdoor air. Air borne diseases-bacterial, fungal and viral, Sources of infection. Methods of enumeration of microorganisms in air. | 15 | CO1, CO2, CO3, CO4, | K1, K2, K3, K4, K5, |
| III | **Water borne infections**: water borne diseases -viral, bacterial, protozoan, methods of enumeration of microorganisms in water, indicator organisms ,water treatment, control of water borne diseases. | 15 | CO1, CO2, CO3, CO4, | K1, K2, K3, K4, K5, |
| IV | **Food borne diseases**: Food Hygiene, Food spoilage, Food poisoning and food borne infection. Types of food borne diseases (Typhoid, Cholera, Diarrhea, Food poisoning), control of food borne diseases. | 15 | CO1, CO2, CO3, CO4, CO5, | K1, K2, K3, K4, K5, K6, |
| V | **Nosocomial Infection:** Causes, Control, Prevention and surveillance. Disposal of infective hospital and laboratory materials – monitoring of sanitation in community. Sexually transmitted Infections (STI): HIV/AIDS, Hepatitis B, Syphilis, Genital herpes–diagnosis of hospital acquired infection | 15 | CO1, CO2, CO3, CO4, CO5, | K1, K2, K3, K4, K5, K6, |
| VI | **Self Study for Enrichment (Not included for End Semester Examinations)** Classification of Medically important Microbes. | - | CO1, CO2, CO3, CO4, CO5, | K1, K2, K3, K4, K5, K6, |

**Text Books**


1. Patrick R. Murray, Ken S. Rosenthal, and. Michael A. Pfalle. (2019). Medical Microbiology. Elsevier Health Sciences.
2. Keith Struthers. J.(2019). Clinical Microbiology. Taylor &Francis Group.
3. Sastry Apurba .S.(2025). Essentials of Microbiology. Jaypee Brothers Medical Publishers.
4. Engelkirk P.G. and Duben-Engelkirk J. (2022) Burton's Microbiology for the Health Sciences, 10th Edn. Wolters Kluwer Health.UK.


**Reference Books**


1. Joanne Willey, Christopher J. Woolverton, Linda Sherwood (2011).Prescott's Microbiology. McGraw Hill Publishers.
2. Park.K.(2021). Parks Text Book of Preventive and Social Medicine, Bhanot Publishers.
3. Goering, Hazel Dockrell, Mark Zuckerman, PeterChiodini.(2018). Mim's Medical Microbiology and Immunlogy, Elsevier.
4. Jay J.M., Loessner, M.J. and Golden D.A. (2025) Modern Food Microbiology, 7th Edn. Springer.


**Web References**

1. https://www.webmd.com/lung/what-are-airborne-diseases
2. https://www.health.state.mn.us/diseases/waterborne/basics.html
3. https://www.who.int/health-topics/foodborne-diseases#tab=tab_1
4. https://www.osmosis.org/answers/nosocomial-infection

**Pedagogy**

Chalk and Talk, Assignment, Seminar and Group Discussion, Quiz.

**Course Designer**
**Dr.V.Aruna**

| Semester: I | Internal Marks: 30 | | External Marks: 70 | |
|---|---|---|---|---|
| **COURSE CODE** | **COURSE TITLE** | **CATEGORY** | **Hrs./ Week** | **CREDITS** |
| **26PMB1DCE1C** | **BIOLOGICAL INSTRUMENTATION** | **DISCIPLINE CENTRIC ELECTIVE COURSE -I** | **5** | **3** |

**Course Objectives**

- To educate the students with the basic principles of biological instruments
- To develop their research aptitude and career prospects.
- To equip students to understand, operate, design, and maintain instruments used
- To measure and control biological parameters
- To focus on principle and design of the instruments.

| S. No. | Course Features | Relevance Status |
|---|---|---|
| 1. | Course emphasis on Employability/Entrepreneurship/Skill Development | Employability, Skill Development |
| 2. | Course integrates cross-cutting issues relevant to Professional Ethics/Gender sensitization/Environment and Sustainability/Human Values/Indian Knowledge Systems | Environment and Sustainability |
| 3. | Course relevant to Local/Regional/National/Global needs | Global Needs |
| 4. | Course focus on Sustainable Developmental Goals | SDG 3,4,9 |

**Course Outcomes**

**Course Outcome and Cognitive Level Mapping**

| CO Number | CO Statement<br>On the successful completion of the course, students will be able to | Cognitive Level |
|---|---|---|
| CO1 | Explain the principles and working mechanisms of laboratory instruments. | K1, K2 |
| CO2 | Discuss chromatography techniques and molecular biology techniques. | K3, K4 |
| CO3 | Illustrate molecular techniques in biological applications. | K4, K5 |
| CO4 | Acquire knowledge on spectroscopic techniques | K5, K6 |
| CO5 | Demonstrate the use of radio isotopes in various techniques. | K5, K6 |

**Mapping of CO with PO and PSO**

| COs | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 | PO1 | PO2 | PO3 | PO4 | PO5 |
|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 3 | 3 | 3 | 2 | 2 | 3 | 2 | 2 | 3 | 1 |
| **CO2** | 3 | 3 | 3 | 2 | 2 | 3 | 2 | 3 | 2 | 3 |
| **CO3** | 3 | 3 | 2 | 2 | 3 | 3 | 2 | 3 | 2 | 2 |
| **CO4** | 3 | 2 | 3 | 2 | 2 | 3 | 2 | 3 | 2 | 1 |
| **CO5** | 3 | 3 | 3 | 3 | 2 | 3 | 2 | 3 | 3 | 3 |

"1" – Slight (Low) Correlation "2" – Moderate (Medium) Correlation
"3" – Substantial (High) Correlati "-" – indicates there is no correlation

**Syllabus**

| UNIT | CONTENT | HOURS | COS | COGNITIVE LEVEL |
|---|---|---|---|---|
| I | **Basic Instrumentation:** Aerobic and anaerobic incubator – Biosafety Cabinets - Fume Hood, pH meter, Lyophilizer, Flow cytometry. Centrifugation techniques: Basic principles of centrifugation: Principles, methodology and applications of differential, rate zonal and density gradient centrifugation | 15 | CO1, CO2, CO3, CO4 | K1, K2, K3, K4 |
| II | **Separation Methods:** Translational diffusion, Rotational diffusion. Sedimentation, Osmosis, Viscosity, Chromatographic methods: Thin layer chromatography, Column chromatography (LC, Adsorption chromatography, Size exclusion chromatography, Ion exchange chromatography and affinity chromatography), Gas chromatography. HPLC, Nano-LC, FPLC. Electrophoretic methods: Gel electrophoresis, 2-D electrophoresis. | 15 | CO1, CO2, CO3, CO4 | K1, K2, K3, K4, K6 |
| III | **X-ray Diffraction:** Diffraction of X-rays, Structure determination, Phase determination procedures, Structure refinement, Application in determination of structure and function of small molecules, globular molecules and fibrous macromolecules. | 15 | CO1, CO2, CO3, CO4, CO5 | K1, K2, K3, K4, K6, |
| IV | **Spectroscopic techniques:** Principle, methodology, and applications of UV-visible spectroscopy (UV), Infrared spectroscopy, Raman Spectroscopy, Atomic absorption chromatography, ESR spectroscopy, Mass spectroscopy and NMR. | 15 | CO1, CO2, CO3, CO4, CO5 | K1, K2, K3, K4, K5, K6, |
| V | **Radio isotopic techniques:** Principle and applications of tracer techniques in biology. Radioactive isotopes - radioactive decay; Detection and measurement of radioactivity using ionization chamber, proportional chamber, Geiger- Muller and Scintillation counters, auto radiography and its applications. | 15 | CO1, CO2, CO3, CO4, CO5 | K1, K2, K3, K4, K5, K6 |
| VI | **Self-Study for Enrichment (Not included for End Semester Examinations)**<br>DNA Finger printing, RFLP, RAPD and AFLP application.Advance techniques-IR,qPCR,NGS. | - | CO1, CO2, CO3, CO4, CO5 | K4, K5, K6 |

**Text Books**


1. Gurdeep R. Chatwal and Sham K. Anand. (2022). Instrumental Method of Chemical Analysis. Himalaya Publishing House.
2. Sudip Paul, Angana Saikia, Vinayak Majhi & Vinay Kumar Pandey. (2022). Introduction to Biomedical Instrumentation and Its Applications. healthcare and life-science research.
3. Shama A. Baig & Dr. Sanju Sinha — Bio Instrumentation: Tools and Techniques (2024). Accessible reference covering basic instruments, microscopy, spectroscopy, electrophoresis, biosensors.
4. Veerakumari.L, Bioinstrumentation (2024). An extensive textbook on bioinstrumentation principles and devices relevant to life-science research.
5. Jayaraman J. (2020). Laboratory Manual in Biochemistry. (2nd Edition). New Age International (P) Ltd., Publishers.


**Reference Books**


1. Kaur H (2021) Spectroscopy. Pragati Prakashan.
2. Douglas A. Skoog, James Holler, Stanley R. Crouch. (2020). Principles of InstrumentalAnalysis(7th edition). Cengage India Private Limited.
3. Raymond P.W. Scott. (2020) Techniques and Practice of Chromatography. CRC Press.
4. Reddy.S.M & Ramchander Merugu , Instrumentation in Biosciences (2025) — A recent reference book emphasizing instrumentation across biological sciences.
5. Ponmurugan P. and Gangathara P. B. (2021). Biotechniques. (1st Edition). MJP Publishers.


**Web References**

1. https://norcaloa.com/BMIA
2. https://sist.sathyabama.ac.in/sist_coursematerial/uploads/SMB2103.pdf
3. https://kamarajwomenscollege.ac.in/wp-content/uploads/Study-Materials-Bio-Instrumention.pdf
4. https://apacwomen.ac.in/learning-resources/botany/Bioinstrumentation.pdf
5. https://gacbe.ac.in/pdf/ematerial/18BPH45S-U2.pdf
6. https://kahedu.edu.in/naac/C-3/Additional%20documents/E-content/1459.pdf
7. http://www.biologydiscussion.com/biochemistry/centrifugation/centrifuge-introducti on- types-uses-and-other-details-with-diagram/12489
8. https://www.watelectrical.com/biosensors-types-its-working-and-applications.
9. http://www.wikiscales.com/articles/electronic-analytical-balance/
10. https://study.com/academy/lesson/what-is-chromatography-definition-types-uses.

**Pedagogy**

Power point presentations, Group Discussion, Seminar, Quiz, Assignment, Brain Storming Activity.

**Course Designer**

**Ms.S.Sathya**

| Semester : I | Internal Marks: 40 | | External Marks: 60 | |
|---|---|---|---|---|
| **COURSE CODE** | **COURSE TITLE** | **CATEGORY** | **Hrs./Week** | **CREDITS** |
| **26PMB1GEP1A** | **VIROLOGY (P)** | **GENERIC ELECTIVE COURSE -I** | **4** | **2** |

**Course Objectives**

- Understand and apply biosafety and biosecurity practices adopted for viral pathogens in the laboratory.
- Perform laboratory techniques including isolation and purification of bacteriophages.
- Demonstrate techniques involving embryonated egg inoculation used in virology.
- Determine the transmission of Plant viruses.
- To describe the structure and symptoms of plant and animal viral diseases.

| S.No | Course Features | Relevance Status |
|---|---|---|
| 1. | Course emphasis on Employability/Entrepreneurship/Skill Development | Entrepreneurship, Skill Development |
| 2. | Course integrates cross-cutting issues relevant to Professional Ethics/Gender sensitization/Environment and Sustainability/Human Values/Indian Knowledge Systems | Professional Ethics |
| 3. | Course relevant to Local/Regional/National/Global needs | Global Needs |
| 4. | Course focus on Sustainable Developmental Goals | SDG 3, 4,9,15 |

**Course Outcomes**

**Course Outcome and Cognitive Level Mapping**

| CO Number | CO Statement<br>On the successful completion of the course, students will be able to | Cognitive Level |
|---|---|---|
| CO1 | Recall the safety practices in virology laboratory and sample collection methods. | K1, K2 |
| CO2 | Illustrate the isolation and characterization of bacteriophage from sewage. | K2, K3, K4 |
| CO3 | Demonstrate the cultivation of Animal Viruses using Embryonated Egg. | K3, K4 |
| CO4 | Understand the impacts of mechanical transfer of Plant Viruses | K4,K5 |
| CO5 | Describe the structure of few Plant, Animal viruses and Bacteriophages | K5, K6 |

**Mapping of CO with PO and PSO**

| Cos | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 | PO1 | PO2 | PO3 | PO4 | PO5 |
|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 2 |
| CO2 | 3 | 3 | 3 | 3 | 2 | 1 | 3 | 3 | 3 | 1 |
| CO3 | 3 | 3 | 1 | 3 | 3 | 3 | 2 | 2 | 2 | 1 |
| CO4 | 3 | 3 | 2 | 3 | 3 | 3 | 3 | 1 | 3 | 2 |
| CO5 | 3 | 3 | 3 | 2 | 2 | 3 | 3 | 2 | 2 | 2 |

"1"–Slight (Low) Correlation "2" – Moderate (Medium) Correlation

"3"–Substantial (High) Correlation "-" – indicates there is no correlation

**Syllabus (30 Hours)**

1. Biosafety practices in virology laboratory

2. Laboratory detection of viral samples (Collection and transport of samples).

3. Isolation of Bacteriophage from sewage.

4. Cultivation of Animal Viruses – Embryonated Egg.
   Routes of inoculation:
   a) Allantoic cavity
   b) Amniotic cavity
   c) Chorioallantoic membrane (CAM)
   d) Yolk sac

5. Demonstration of Mechanical transfer of Plant Viruses

6. Study the Structure of Bacteriophages.
   a) T4 Bacteriophage
   b) Lambda Phage
   c) M13 Bacteriophage
   d) Mu Phage

7. Study the symptoms of Plant viral diseases.
   a) Tobacco Mosaic Virus (TMV)
   b) Banana Bunchy Top Virus (BBTV)
   c) Papaya Ring Spot Virus (PRSV)
   d) Tomato Spotted Wilt Virus (TSWV)
   e) Rice Tungro Virus (RTV)

8. Study on the symptoms of human viral disease
   a) Foot-and-Mouth Disease
   b) Blue tongue Diseases
   c) Rabies
   d) Influenza
   e) AIDS

9. Visit to Hospitals, Viral Research Institutes and Clinical laboratories.

**Reference Books**


1. Ananthanarayan and Paniker's Textbook of Microbiology. 2022. 12th E-edition, Universities Press. United States.
2. Martinez J. Hewlett, David Camerini, David C. Bloom. 2021. Basic Virology, Fourth Edition, Wiley Blackwel.
3. Baijayantimala Mishra.2022. Textbook of Medical Virology. 2 nd Edition, CBS Publishers & Distributors Pvt Ltd, India. Churchill Livingstone.

4. Geo. Brooks, Karen C. Carroll, Janet Butel, Stephen Morse.2019 . Jawetz Mel nick & Adelbergs Medical Microbiology. 28th Edition, McGraw-Hill Education.
5. Apurba S Sastry, Sandhya Bhat.2022. Essentials of Medical Microbiology 4th edition. Jaypee brothers med Pub Pvt Ltd, India.
6. Rajan S and Selvi Christy R. 2018. Experimental Procedures in Life Sciences, CBS Publishers.
7. Yi-Wei Tang, Charles W. Stratton. 2018. Advanced Techniquesin Diagnostic Microbiology. 3rd edition. Springer Publishers.

**Web References**

1. https://www.youtube.com/watch?v=xNYASNEdgg8
2. https://www.youtube.com/watch?v=NEtKQtCZUBQ
3. https://www.youtube.com/watch?v=Eq9JIq9HvMg
4. https://www.youtube.com/watch?v=_aQUm5J-E3o

**Pedagogy**

Chalk and talk, Power Point Presentation and Group Discussions

**Course Designer**

**Dr. S. Jeyabharathi**

| Semester I | Internal Marks: 40 | External Marks: 60 | | |
|---|---|---|---|---|
| **COURSE CODE** | **COURSE TITLE** | **CATEGORY** | **Hrs./Week** | **CREDITS** |
| **26PMB1GEP1B** | **CLINICAL LAB TECHNOLOGY (P)** | **GENERIC ELECTIVE COURSE - I** | **4** | **2** |

**Course Objectives**

- To provide fundamental knowledge in clinical laboratory sciences and diagnostic techniques.
- To gain understanding of the handling, maintenance, and calibration of laboratory equipment.
- To develop skills in routine and specialized laboratory investigations.

| S.No. | Course Features | Relevance Status |
|---|---|---|
| 1. | Course emphasis on Employability/Entrepreneurship/ Skill Development | Employability, Skill Development |
| 2. | Course integrates cross-cutting issues relevant to Professional Ethics/Gender sensitization/Environment and Sustainability/Human Values/Indian Knowledge System | Environment and Sustainability |
| 3. | Course relevant to Local/Regional/National/Global needs | Global Needs |
| 4. | Course focus on Sustainable Developmental Goals | SDG 3, 4, 6, 8, 9 |

**Course Outcome**

**Course Outcome and Cognitive Level Mapping**

| CO Number | CO Statement<br>On the successful completion of the course, students will be able to | Knowledge level |
|---|---|---|
| CO1 | Understand ethics and biosafety of laboratory | K1, K2 |
| CO2 | Apply media preparation, staining and handling of specimen | K2, K3 |
| CO3 | Analyze haematology tests | K2, K3, K4 |
| CO4 | Evaluate physical and chemical examinations of urine | K3, K4, K5 |
| CO5 | Perform diagnostic tests, blood grouping and serology tests | K4, K5, K6 |

**Mapping of CO with PO and PSO**

| COs | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 | PO1 | PO2 | PO3 | PO4 | PO5 |
|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| CO2 | 2 | 3 | 2 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| CO3 | 3 | 2 | 3 | 3 | 2 | 3 | 3 | 3 | 3 | 2 |
| CO4 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 2 | 3 |
| CO5 | 3 | 3 | 3 | 2 | 3 | 3 | 2 | 3 | 3 | 3 |

"1"– Slight (Low) Correlation "2" – Moderate (Medium) Correlation

"3"– Substantial (High) Correlation "-" – Indicates there is no Correlation

**Syllabus (30 Hours)**

1. Ethics of laboratory practice and general laboratory safety rules.
2. Preparation of culture media – solid, semi-solid and liquid.
3. Study on simple, differential and capsule staining.
4. Specimen collection: blood, urine and swab (nose and throat).
5. Separation of serum and plasma.
6. Determination of blood cell count: RBC, WBC and differential leucocyte count.
7. Haemoglobin estimation – Sahli's acid hematin method.
8. Erythrocyte sedimentation rate – Westergren method.
9. Physical examination and Chemical examination of urine: Albumin, Creatinine, Urea, Bile salt (Hay's Test), Bile pigments (Fouchet's Test) and urobilinogen test.
10. Urine sugar determination by Benedict's method.
11. Blood grouping and Rh typing.
12. Serology – Widal test (slide and tube method), VDRL (RPR method), CRP, and ASO.

**Reference Books**


1. Harsh M. (2024). Practical Pathology. Jaypee Brothers Medical Publishers Pvt. Ltd.
2. Kanai L. Mukherjee and Anuradha Chakravarthy. (2025). Medical Laboratory Technology, Procedure Manual for Routine Diagnostic Tests. 4th Edition. Mc Graw Hill India.
3. Marieb, E. N., & Hoehn, K. (2024). Human Anatomy & Physiology (12th ed.). Pearson Education.
4. Procop, G. W., & Koneman, E. W. (2023). Koneman's Color Atlas and Textbook of Diagnostic Microbiology. 7th Edition Jones and Bartlett Learning.
5. Vasudevan D.M., Sreekumari S. and Vidhyanathan K. (2025). Textbook of Biochemistry for Medical students. 11th Edition. Jaypee Brothers Medical Publishers Pvt. Ltd.


**Web References:**

1. https://www.pdfdrive.com/medical-laboratory-technician-hematology-serology-blood-banking-and- immunohematology-e21321666.html
2. https://www.pdfdrive.com/medical-laboratory-technician-microbiology-afsc-90470-e17289142.html
3. https://www.pdfdrive.com/introduction-to-medical-laboratory-technician-e184576491.html
4. http://downloadinfobook1.firebaseapp.com/Medical-Laboratory-Technology-Kanai-Mukherjee-PDF-c3f0077fe.pdf
5. https://www.cdc.gov/labtraining/index.html

**Pedagogy**

Chalk and talk, Demo Video and Group Discussions.

**Course Designer**

**Dr. N. Jeenathunisa**

| Semester: I | Internal Marks: 40 | | External Marks: 60 | |
|---|---|---|---|---|
| **COURSE CODE** | **COURSE TITLE** | **CATEGORY** | **Hrs./Week** | **CREDITS** |
| **26PMB1NMEP1** | **FOOD QUALITY TESTING (P)** | **NON-MAJOR ELECTIVE COURSE - I** | **3** | **2** |

**Course Objectives**

- Understand basic laboratory techniques and safety measures in food analysis.
- Perform proximate analysis of food components.
- Carry out microbiological analysis to assess food safety.
- Identification of microorganisms from foods.

| S. No. | Course Features | Relevance Status |
|---|---|---|
| 1. | Course emphasis on Employability/Entrepreneurship/Skill Development | Employability, Skill Development |
| 2. | Course integrates cross-cutting issues relevant to Professional Ethics/Gender sensitization/Environment and Sustainability/Human Values/Indian Knowledge Systems | Environment and Sustainability |
| 3. | Course relevant to Local/Regional/National/Global needs | Global Needs |
| 4. | Course focus on Sustainable Developmental Goals | SDG 3, 4, 12 |

**Course Outcome**

**Course Outcome and Cognitive Level Mapping**

| CO Number | CO Statement<br>On the successful completion of the course, students will be able to | Cognitive Level |
|---|---|---|
| CO1 | Explain the basics of food quality | K2, K3 |
| CO2 | Perform standard food quality tests independently | K3, K4 |
| CO3 | Summarize the adulteration and contamination | K4, K5 |
| CO4 | Analyze microbiological safety of foods | K5, K6 |
| CO5 | Discuss about the MBRT | K5, K6 |

**Mapping of CO with PO and PSO**

| COs | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 | PO1 | PO2 | PO3 | PO4 |
|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| CO2 | 2 | 3 | 2 | 3 | 3 | 3 | 3 | 3 | 3 |
| CO3 | 3 | 2 | 3 | 3 | 2 | 3 | 3 | 3 | 3 |
| CO4 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 2 |
| CO5 | 3 | 3 | 3 | 2 | 3 | 3 | 2 | 3 | 3 |
| CO1 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |

"1"– Slight (Low) correlation "2"– Moderate (Medium) correlation

"3"– Substantial (High) correlation "-"– Indicates there is no correlation

**Syllabus**

1. Laboratory safety rules
2. Preparation of culture media
3. Sterilization techniques
4. Determination of Moisture Content in food sample
5. Determination of pH of the given food sample
6. Enumeration of total viable count by standard plate count method in the given food sample.
7. Detection of clot on boiling of given milk sample
8. Detection of adulteration in the given food sample
9. Detection of Yeasts and molds (LCB method)
10. Isolation of organisms from food sample
11. Milk Quality Testing (MBRT)

**Reference Books**


1. C. K. Sunil, Ashish Rawson, D. V. Chidanand, S. Shanmugasundaram (2025). Emerging Non-destructive Technologies for Food Quality Analysis, Springer.
2. Mohammed Kuddus, Syed Amir Ashraf & Pattanathu Rahman (2024). Comprehensive modern approaches to food contaminants, quality control techniques, risk assessment, chromatographic and molecular testing, and HACCP principles. CRP Press.
3. FSSAI 2024. Manual on Methods of analysis- Microbiological examination of food and water - reg. Food Safety and Standards Authority of India, Ministry of Health and Family Welfare, Government of India, New Delhi.
4. Suzanne Nielsen, (2017). Food Analysis, Springer.
5. Vasconcellos J. Andres, (2003). Quality Assurance for the Food Industry: A Practical Approach, CRC Press.
6. Deshpande.S.S, (2001), Food Analysis: Principles and Techniques is a technical, Marcel Dekker (Food Science and Technology Series).


**Web References**

1. https://en.wikipedia.org/wiki/Quality_assurancehttps://www.omicsonline.org/scholarly/food-quality-assurance-journals-articles-pptslist.phphttp://www.fao.org/3/v5380e/V5380E05.htm
2. https://www.aaps.ca/principles-of-qaqc-in-the-food-industry.php
3. http://ecoursesonline.iasri.res.in/mod/page/view.php?id=1019
4. http://egyankosh.ac.in/bitstream/123456789/11486/5/Unit-1.pdf

**Pedagogy**

Chalk and talk, Demonstration,Group Discussions and hands on training

**Course Designer**

**Dr. E.Priya**