



**THANTHAI HANSROEVER COLLEGE  
(AUTONOMOUS)**



**PERAMBALUR-621220**

*(For the Students admitted from the Academic year 2025-2026 onwards)*

**M.Sc., MICROBIOLOGY**

**Course Structure and Syllabus**

**CHOICE BASED CREDIT SYSTEM- LEARNING OUTCOMES  
BASED CURRICULUM FRAME WORK (CBCS-LOCF)**



**PG & RESEARCH DEPARTMENT OF MICROBIOLOGY**

**(Nationally Re-Accredited by NAAC with A)**

**(Affiliated to Bharathidasan University, Tiruchirappalli)**

**ELAMBALUR, PERAMBALUR-621220.**

# **THANTHAI HANS ROEVER COLLEGE (AUTONOMOUS)**

*(Nationally Re-Accredited by NAAC with A)*

*(Affiliated to Bharathidasan University, Tiruchirappalli) EL*

**AMBALUR, PERAMBALUR-621220**

## **PG & RESEARCH DEPARTMENT OF MICROBIOLOGY**

### **Vision**

- ❖ To develop high quality human resource required for both academics and industries as well as to pursue research in the frontier areas of Microbiology of international standard and to rise as center of excellence and information/ knowledge in the all fields of microbiology.

### **Mission**

- ❖ To train students in the field of Microbiology, provide value based education, with commitment to academic excellence and innovative research.
- ❖ To undertake research activities relevant to present day needs such as emerging infections, drug developments, biofertilizers in agricultural fields, safety waste disposal/ management and water/ food quality control etc.
- ❖ To develop knowledgeable, motivated and skilled entrepreneurs who can establish/ accompanies modern microbiological industries that could cater the need of the hour.
- ❖ To create a biologically ethical, safe environment for the society.

### **Programme Outcomes (POs)**

Upon completion of the programme, the postgraduate will be able to

1. Gain advanced knowledge resulting in entrepreneurship; innovation and newer opportunities for being employable in public and private sectors, research and development organizations
2. Apply enhanced new techniques and adopt new technologies needed in the respective disciplines
3. Appreciate the diversity of behaviour in professional practice and act in accordance with the core values of chosen profession
4. Demonstrate the knowledge, values and skills to be critical consumer of research practice and possess investigative skills to evaluate the practice
5. Engage in lifelong learning process, have the ability to communicate the findings of Languages/ Commerce/ Management Studies/ Social Work/ Computing Sciences/ Physical Sciences/ Biological Sciences/ Life Sciences with the current knowledge

**Programme Specific Outcome (PSOs) :**

1. Knowledge and understanding of concepts of microbiology and its application in pharma, food, agriculture, beverages, nutraceutical industries
2. Applying the knowledge acquired to undertake studies and identify specific remedial measures for the challenges in health, agriculture, and food sectors.
3. Understanding and application of microbial principles in forensic and working knowledge about clinical microbiology
4. Demonstrate the ability to identify ethical issues related to recombinant DNA technology, GMOs, intellectual property rights, biosafety and biohazards.
5. Demonstrate the ability to identify key questions in microbiological research, optimize research methods, and analyze outcomes by adopting scientific methods, thereby improving the employability

**THANTHAI HANS ROEVER COLLEGE (AUTONOMOUS)**  
**ELAMBALUR, PERAMBALUR- 621220**

**M.Sc. MICROBIOLOGY**

**CHOICE BASED CREDITS SYSTEM – LEARNING OUTCOMES BASED  
CURRICULUM FRAME WORK (CBCS-LOCF)**

*(Applicable to the Students admitted from the academic year (2025-2026))*

Semester	Course Code	Title of the Course	Ins. Hours/Week	Credits	Exam Hrs	Max. Marks		
						CIA	ESE	Total
I	25PMB1CC1	General Microbiology and Microbial Diversity	6	5	3	25	75	100
	25PMB1CC2	Immunology and Microbial Genetics	6	5	3	25	75	100
	25PMB1CP1	General Microbiology and Microbial Diversity, Immunology and Microbial Genetics-Practical-I	6	4	6	40	60	100
	25PMB2EC11	Bioinformatics/	5	3	3	25	75	100
	25PMB2EC12	Nanobiotechnology						
	25PMB1EC21	Forensic Science	6	3	3	25	75	100
	25PMB1EC22	/Health Hygiene						
		Value Added Course-1*	-	2*	2	50	50	100*
	<b>Total</b>		<b>30</b>	<b>20</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>500</b>
II	25PMB2CC3	Medical Bacteriology and Mycology	6	5	3	25	75	100
	25PMB2CC4	Medical Virology and Parasitology	6	5	3	25	75	100
	25PMB2CP2	Medical Bacteriology and Mycology, Medical Virology and Parasitology Practical-II	6	4	6	40	60	100
	25PMB1EC31	Bioinstrumentation/	6	3	3	25	75	100
	25PMB1EC32	Essentials of Laboratory Management and Biosafety						
	25PMB2EC41	Clinical and Diagnostic Microbiology	5	3	3	25	75	100
	25PMB2EC42	Herbal Technology						
	25PMB2NME1	NME-1	2	2	3	25	75	100
25PMB2OC	SWAYAM/NPTEL Online Course		2*	*				
	<b>Total</b>		<b>30</b>	<b>22</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>600</b>

Semester	Course Code	Title of the Course	Ins. Hours/Week	Credits	Exam Hrs	CIA	ESE	Total
III	25PMB3CC6	Recombinant DNA Technology and Biotechnology	6	5	3	25	75	100
	25PMB3CP3	Practical III	6	4	6	40	60	100
	25PMB4CC7	Food & Dairy Microbiology	5	4	3	25	75	100
	25PMB3EC51	Biosafety, Bioethics and IPR	5	4	3	25	75	100
	25PMB3EC52	Water Conservation and Water Treatment						
	25PMB3NME2	NME2	2	2	3	25	75	100
		Internship/Industrial Activity***	-	2	-	-	-	100
		Value Added Course-2*	-	2*	2	50	50	100*
		<b>Total</b>	<b>30</b>	<b>26</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>700</b>
IV	25PMB4CC8	Research Methodology & Biostatistics	6	5	3	25	75	100
	25PMB4CP4	Practical IV	6	4	6	40	60	100
	25PMB4EC61	Marine Microbiology/	5	4	3	25	75	100
	25PMB4EC62	Life Science for Competitive Examinations						
	25PMB4PW	Project with Viva Voce	9	5	3	25	75	100
	25PMB4SE1	Microbial Quality Control and Testing	2	2	3	25	75	100
	25PMB4SE2	Soft Skill for Microbiology	2	2	3	25	75	100
		<b>Total</b>	<b>30</b>	<b>22</b>				<b>600</b>
		<b>Grand Total</b>	<b>120</b>	<b>90</b>				<b>2400</b>

\*\*\* Internship/Industrial Activity-Internship after 2<sup>nd</sup> semester during summer vacation -30 Hours and 2 credits will be included in the 3<sup>rd</sup> semester.

\*The value added course credit will not be included in the total CGPA. These courses are extra-credit courses. Instruction hours for these courses is 30 hours

\*\* SWAYAM/NPTEL Online Course -Extra Credit Course. Not considered for grand total & CGPA

### **Note:**

<b>Project</b>	:100
<b>Dissertation</b>	:80 [2 reviews-20 + 20 = 40 marks, Report valuation = 40 marks]
<b>Viva Voce</b>	:20
<b>Core papers</b>	:08
<b>Core practical</b>	:04
<b>Elective</b>	:06
<b>Project</b>	:01
<b>Skill Enhancement</b>	: 02

<b>Particulars</b>	<b>Internal</b>	<b>External</b>
1. Theory	25 Marks	75 Marks
2. Practical	40 Marks	60 Marks

### **3. Separate passing minimum is prescribed for internal and external**

- The passing minimum for CIA shall be 40% out of 25 marks (i.e. 10 marks)
- The passing minimum for University Examinations shall be 40% out of 75 marks (i.e. 30 marks)
- The passing minimum not less than 50% in the aggregate

### **Question paper pattern for Theory Course**

- 20 Questions compulsory - 20 x 01 = 20 Marks (4 from each unit)
- 5 Questions - 05 x 05 = 25 Marks (either or type, one from each unit)
- 3 Questions from 5 - 03 x 10 = 30 Marks (One question from each unit)
- Total = 75 Marks

### **Question paper pattern for Practical Course**

- 1 Question compulsory - 15 x 01 = 15 Marks (Major Experiment)
- 2 Questions compulsory - 10 x 02 = 20 Marks (Minor Experiment)
- 5 Spotters - 03 x 05 = 15 Marks (Related to that semester Theory & Practical courses)
- Record Note - 05 x 01 = 05 Marks (According to maintaining the record note)
- Viva-voce - 05 x 01 = 05 Marks (Oral questions)
- Total - 60 Marks

## CIA Components – Theory

### CIA Components

- ❖ Best 2 tests out of 3 - 15 Marks
- ❖ Group Discussion / Seminar - 05 Marks
- ❖ Assignment - 05 Marks
- ❖ Total - 25 Marks
- ❖ Total - 40 Marks

### Practical

- Continuous Performance -20Marks
- Model Practical - 10 Marks
- Record - 05Marks
- Viva - 05 Marks

### ❖ NME COURSES:

25PMB2NME1- SERICULTURE

25PMB3NME2- ORGANIC FARMING AND BIOFERTILIZER TECHNOLOGY

### ❖ VALUE ADDED COURSES:

25PMBVA1- BIOREMEDIATION

25PMBVA2- ADVANCES IN PLANT TISSUE CULTURE

25PMBVA3- HOSPITAL INFECTION CONTROL PRACTICES

<b>Course Code:</b> 25PMB1CC1	<b>SEMESTER-I</b>	<b>Instruction Hours:6</b>
<b>CORE COURSE I: GENERAL MICROBIOLOGY AND MICROBIAL DIVERSITY</b>		
<b>Credits:5</b>		<b>Exam hours:3</b>

#### Course Objectives:

- ❖ Acquire knowledge on the principles of different types of microscopes and their applications.
- ❖ Compare and contrast the structure of bacteria and fungi. Illustrate nutritional requirements and growth in bacteria.
- ❖ Exemplify, isolate and cultivate microalgae from diverse environmental sources.
- ❖ Explain various pure culture techniques and discuss sterilization methods.
- ❖ Discuss the importance and conservation of microbial diversity.

#### Course Outcome:

- ❖ **CO1:** Examine various microbes employing the microscopic techniques learnt. Measure and compare the size of microbes.
- ❖ **CO2:** Differentiate and appreciate the anatomy of various microbes. Plan the growth of microbes for different environmental conditions.
- ❖ **CO3:** Identify and cultivate the algae understanding their habitat. Analyze the morphology, classify and propagate depending on its economic importance.
- ❖ **CO4:** Create aseptic conditions by following good laboratory practices.
- ❖ **CO5:** Categorize and cultivate a variety of extremophiles following standard protocols for industrial applications.

#### UNIT I:

History and Scope of Microbiology. Microscopy – Principles and applications. Types of Microscopes – Brightfield, Dark-field, Phase-contrast, Fluorescence microscope, Transmission electron microscope (TEM) and Scanning electron microscope (SEM). Sample preparation for SEM & TEM. Atomic force, Confocal microscope. Micrometry – Stage, Ocular and its applications.

#### UNIT II

Bacterial Structure, properties and biosynthesis of cellular components – Cell wall. Actinomycetes and Fungi – Distribution, morphology, classification, reproduction and economic importance. Sporulation. Growth and nutrition - Nutritional requirements, Growth curve, Kinetics of growth, Batch culture, Synchronous growth, Measurement of growth and factors affecting growth.

#### UNIT III

Algae - Distribution, morphology, classification, reproduction and economic importance. Isolation of algae from soil and water. Media and methods used for culturing algae, Strain selection and large-scale cultivation. Life cycle - *Chlamydomonas*, *Volvox*, *Spirogyra* (Green algae), *Nostoc* (Cyanobacteria), *Sargassum* (Brown algae), *Batrachospermum* (Red algae).

## UNITIV

Microbial techniques Safety guidelines in Microbiology Laboratories. Sterilization, Disinfection and its validation. Staining methods –

Simple, Differential and Special staining. Automated Microbial identification systems - Pure culture techniques – Cultivation of Anaerobic organisms. Maintenance and preservation of pure cultures. Culture collection centres - National and International.

## UNITY

Biodiversity- Introduction to microbial biodiversity – Thermophiles- Classification, Thermophilic Archaeobacteria and its applications. Methanogens - Classification, Habitats, applications. Alkaliphiles and Acidophiles - Classification, discovery basin, its cell wall and membrane. Barophiles- Classification and its applications. Halophiles- Classification, discovery basin, cell walls and membranes – purple membrane, compatible solutes, Osmoadaptation/ halotolerance- Application of halophiles. Conservation of Biodiversity

### Text Books

1.	Kanunga R. (2017). Ananthanarayanan and Panicker's Textbook of Microbiology. (10 <sup>th</sup> Edition). Universities Press (India) Pvt. Ltd.
2.	Chan E. C. S., Pelczar M. J. Jr. and Krieg N. R. (2010). Microbiology. (5 <sup>th</sup> Edition). Mc. Graw Hill. Inc, New York.
3.	Prescott L. M., Harley J. P. and Klein D. A. (2004). Microbiology. (6 <sup>th</sup> Edition). McGraw-Hill company, New York.
4.	White D. Drummond J. and Fuqua C. (2011). The Physiology and Biochemistry of Prokaryotes, Oxford University Press, Oxford, New York.
5.	Dubey R. C. and Maheshwari D. K. (2009). Textbook of Microbiology. S. Chand, Limited.

### References:

Tortora G. J., Funke B. R. and Case C. L. (2015). Microbiology: An Introduction (12 <sup>th</sup> Edition). Pearson, London, United Kingdom
Webster J. and Weber R. W. S. (2007). Introduction to Fungi. (3 <sup>rd</sup> Edition). Cambridge University Press, Cambridge.
Schaechter M. and Leaderberg J. (2004). The Desk encyclopedia of Microbiology. Elsevier Academic Press, California.
Ingraham, J. L. and Ingraham, C. A. (2000) Introduction to Microbiology. (2 <sup>nd</sup> Edition). Books/ Cole Thomson Learning, UK.
Madigan M. T., Bender K. S., Buckley D. H. Sattley W. M. and Stahl (2018) Brock Biology of Microorganisms. (15 <sup>th</sup> Edition). Pearson.
<b>Web Resources:</b>
<a href="http://sciencenetlinks.com/tools/microbeworld">http://sciencenetlinks.com/tools/microbeworld</a>
<a href="https://www.microbes.info/">https://www.microbes.info/</a>
<a href="https://www.asmscience.org/VisualLibrary">https://www.asmscience.org/VisualLibrary</a>
<a href="https://open.umn.edu/opentextbooks/BookDetail.aspx?bookId=404">https://open.umn.edu/opentextbooks/BookDetail.aspx?bookId=404</a>
<a href="https://www.grsmu.by/files/file/university/cafedry//files/essential_microbiology.pdf">https://www.grsmu.by/files/file/university/cafedry//files/essential_microbiology.pdf</a>

**Relationship Matrix for COs, POs and PSOs**

Semester	Code	Title of the Course					Hours	Credits			
I	23PMB1CC1	General Microbiology and Microbial Diversity					6	4			
Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)					
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	
CO1	✓	✓	✓	✓	✓	✓		✓	✓		
CO2	✓	✓	✓	✓		✓		✓	✓		
CO3	✓	✓	✓		✓	✓	✓	✓	✓	✓	
CO4	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
CO5	✓	✓	✓	✓	✓	✓		✓	✓		
Number of Matches (✓) = 43 Relationship: High											

Mapping	1-29%	30-59%	60-69%	70-89%	90-100%
Matches	1-14	15-29	30-34	35-44	45-50
Relationship	Very Poor	Poor	Moderate	High	Very High

<b>Course Designed by</b>	<b>HOD</b>
	<b>Dr. R. ANBURAJ</b>

<b>CourseCode:</b> 25PMB1CC2	<b>SEMESTER-I</b>	<b>InstructionHours:6</b>
<b>CORECOURSE2–IMMUNOLOGY AND MICROBIAL GENETICS</b>		
<b>Credits:5</b>		<b>Examhours:3</b>

### Course Objectives

- ❖ Discussimmunity,organsandcellsinvolvedinimmunity.Comparethetypesofantigensandtheirproperties.
- ❖ Describeimmunoglobulinanditstypes.CategorizeMHCandunderstanditssignificance
- ❖ Elucidatethemechanismsofdifferenthypersensitivityreactions.ListouttheVaccinesanddiscusstheirdevelopment.
- ❖ Acquireknowledgethe structureDNA inprokaryotesand eukaryotes
- ❖ Explainoutgenetransferstudiesinmicrobes.

### CourseOutcomes

- ❖ **CO1:**Categorizetheimmuneresponsetoavarietyofantigens.Identifydifferentimmunecellsinvolvedinimmunity
- ❖ **CO2:**JustifythesignificanceofMHC moleculesinimmuneresponseandantibodyproduction.
- ❖ **CO3:**Designantibodiesandevaluateimmunologicalassaysinpatientsamples.
- ❖ **CO4:**AnalyzegenomicDNAofprokaryotesandeukaryotes.
- ❖ **CO5:**Summarizegenetransfermechanismsforexperimentalstudy.

### UNITI:

Introductiontobiology of the immunesystem–CellsandorgansofImmuneSystem.TandB lymphocytes – Origin, development, differentiation, lymphocyte subpopulation in humans.Innateimmunity- Complement,Toll-likereceptorsandothercomponents.Acquiredimmunity – Active and Passive immunity.Antigens - features associated with antigenicityand immunogenicity. Basis of antigen specificity. MHC genes and products, Structure ofMHC molecules, Genetics of HLA Systems – Antigens and HLA typing.Antigen processingandpresentationtoT-lymphocytes.

### UNITII:

Immunoglobulins.Theoriesofantibodyproduction.Classswitchingandgenerationofantibody diversity. Monoclonal and polyclonal antibodies. Complement system – mode ofactivation- Classical,AlternateandLectinpathways,biologicalfunctions.Antigenrecognition – TCR, Diversity of TCR, T cell surface alloantigens, lymphocyte activation,clonalproliferationanddifferentiation.

### UNITIII

Hypersensitivity–Typesandmechanisms,Autoimmunity,TumorImmunityandTransplantation immunology. Immunodeficiency-Primary immunodeficiency and Secondaryimmunodeficiencies.DiagnosticImmunology-Precipitationreaction,Immunodiffusionmethods - SRID, ODD. Immunoelectrophoresis - Rocket and Counter current electrophoresis.Agglutination- Hemagglutination-Hemagglutinationinhibition.LabeledAssay-Immunofluorescence assay, Radio immunoassay, FISH, ELISA. Flow cytometry. Role ofcytokines,lymphokines andchemokines.

## UNITIV

Structural of prokaryotic and eukaryotic genome. Introduction to prokaryotic genomic structure, Eukaryotic Genome - Structure of chromatin, chromosome, centromere, telomere, nucleosome. Modifications - methylation, acetylation, phosphorylation and its effect on structure and function of chromatin, DNA methylation and gene imprinting, organelle genome.

## UNITV

Gene Transfer Mechanisms - Conjugation and its uses. Transduction, Generalized and Specialized, Transformation - Natural Competence and Transformation. Transposition and Types of Transposition reactions. Insertion sequences, complex and compound transposons - T10, T5, and Retroposon. Mechanism - Transposon of *E. coli*, Bacteriophage and Yeast.

### Text Books

1.	Coico R., Sunshine G. and Benjamini E. (2003). Immunology - A Short Course. (5 <sup>th</sup> Edition). Wiley-Blackwell, New York.
2.	Owen J. A., Punt J., Stranford S. A. and Kuby J. (2013). Immunology, (7 <sup>th</sup> Edition). W. H. Freeman and Company, New York.
3.	Abbas A. K., Lichtman A. H. and Pillai S. (2021). Cellular and Molecular Immunology. (10 <sup>th</sup> Edition). Elsevier.
4.	Malacinski G. M. (2008). Freifelder's Essentials of Molecular Biology. (4 <sup>th</sup> Edition). Narosa Publishing House, New Delhi.
5.	Gardner E. J., Simmons M. J. and Snusted D. P. (2006). Principles of Genetics. (8 <sup>th</sup> Edition). Wiley India Pvt. Ltd.

### References Books

1.	Travers J. (1997). Immunobiology - The Immune System in Health and Disease. (3 <sup>rd</sup> Edition). Current Biology Ltd. New York.
2.	Delves P. J., Martin S., Burton D. R. and Roitt I. M. (2006). Roitt's Essential Immunology. (11 <sup>th</sup> Edition). Wiley-Blackwell.
3.	Hay F. C. and Westwood O. M. R. (2002). Practical Immunology (4 <sup>th</sup> Edition). Wiley-Blackwell.
4.	Glick B. R. and Patten C. L. (2018). Molecular Biotechnology - Principles and Application of Recombinant DNA. (5 <sup>th</sup> Edition). ASM Press.
5.	Russell P. J. (2010). Genetics - A Molecular Approach. (3 <sup>rd</sup> Edition). Pearson New International Edition.

### Web Resources

1.	<a href="https://www.ncbi.nlm.nih.gov/books/NBK279395/">https://www.ncbi.nlm.nih.gov/books/NBK279395/</a>
2.	<a href="https://med.stanford.edu/immunol/phd-program/ebook.html">https://med.stanford.edu/immunol/phd-program/ebook.html</a>
3.	<a href="https://ocw.mit.edu/courses/hst-176-cellular-and-molecular-immunology-fall-2005/pages/lecture-notes/">https://ocw.mit.edu/courses/hst-176-cellular-and-molecular-immunology-fall-2005/pages/lecture-notes/</a>

**Relationship Matrix for COs, POs and PSOs**

Semester	Code	Title of the Course	Hours	Credits						
I	23PMB1CC2	Immunology And Microbial Genetics	6	4						
Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)				
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	✓	✓	✓	✓	✓	✓		✓	✓	
CO2	✓	✓	✓	✓		✓		✓	✓	
CO3	✓	✓	✓		✓	✓	✓	✓	✓	✓
CO4	✓	✓	✓	✓		✓	✓	✓	✓	✓
CO5	✓	✓	✓	✓	✓	✓		✓	✓	
Number of Matches (✓) = 42      Relationship: High										

Mapping	1-29%	30-59%	60-69%	70-89%	90-100%
Matches	1-14	15-29	30-34	35-44	45-50
Relationship	Very Poor	Poor	Moderate	High	Very High

Course Designed by	HOD
	Dr. R. ANBURAJ

<b>CourseCode:</b> 25PMB1CP1	<b>SEMESTER-I</b>	<b>InstructionHours:6</b>
<b>CORE COURSE- GENERAL MICROBIOLOGY, IMMUNOLOGY AND MICROBIAL GENETICS-PRACTICAL-I</b>		
<b>Credits:4</b>		<b>Examhours:6</b>

### Course Objectives:

- ❖ Gain knowledge on the fundamentals, handling and applications of microscopy, sterilization methods. Identify microbes by different staining methods.
- ❖ Prepare media for bacterial growth. Discuss plating and growth measurement techniques.
- ❖ Acquire adequate skills to perform blood grouping and serological reactions.
- ❖ Provide fundamental skills in preparation, separation and purification of immunoglobulin.
- ❖ Apply the knowledge of molecular biology skills in clinical diagnosis.

### Course Outcomes:

- ❖ **CO1:** Apply microscopic techniques and staining methods in the identification and differentiation of microbes.
- ❖ **CO2:** Apply the knowledge on the sterilization of glasswares and media by different methods and measurement of cell growth.
- ❖ **CO3:** Perform and evaluate immunological reactions to aid diagnosis.
- ❖ **CO4:** Assess the level of lymphocytes in a blood sample and purify immunoglobulin employing appropriate techniques.
- ❖ **CO5:** Perform DNA extraction and gene transfer mechanisms, analyze and identify by gel electrophoresis.

1. Microscopic Techniques: Light microscopy: Hay infusion broth. Wet mount to show different types of microbes, hanging drop.
2. Washing and cleaning of glasswares: Sterilization methods: moist heat, dry heat and filtration.  
Quality control check for each method.
3. Staining techniques - Gram's staining, Acid fast staining, Metachromatic granule staining, Spore, Capsule, Flagella.
4. Media Preparation: Preparation of liquid, solid and semisolid media. Agar deeps, slants, plates. Preparation of basal, enriched, selective and enrichment media.
5. Preparation of Biochemical test media, media to demonstrate enzymatic activities.
- Microbial Physiology: Purification and maintenance of microbes. Streak plate, pour plate, and slide culture technique. Aseptic transfer.
6. Direct counts - Total cell count, Turbidometry.
7. Viable count - pour plate, spread plate.
8. Bacterial growth curve. Effect of physical and chemical factors on growth.  
Anaerobic culture methods.
9. Hematological reactions - Blood Grouping - forward and reverse, Rh

10. Typing Identification of various immune cells by morphology – Leishman staining, Giemsa staining.
11. Agglutination Reactions- Latex Agglutination reactions- RF, ASO, CRP. Detection of HBs Ag by ELISA.
12. Precipitation reactions – Ouchterlony double immunodiffusion (ODD)
13. Immuno-electrophoresis and staining of precipitin lines- Rocket immunoelectrophoresis and counter current immunoelectrophoresis
14. Preparation of lymphocytes from peripheral blood by density gradient centrifugation.
15. Purification of immunoglobulin – Ammonium
16. Sulphate Precipitation. Separation of IgG by chromatography using DEAE cellulose or Sephadex.
17. Western Blotting – Demonstration.
18. Isolation of genomic DNA from *E. coli* and analysis by agarose gel electrophoresis.
19. Estimation of DNA using colorimeter (Diphenylamine reagent)
20. Separation of proteins by polyacrylamide gel electrophoresis (SDS-PAGE) UV induced mutation and isolation of mutants by replica plating technique.
21. Plasmid DNA isolation from *E. coli*.
22. RNA isolation from yeast.
23. RNA estimation by Orcinol method.

### Text Books

1.	Dubey R.C. and Maheshwari D.K. (2010). Practical Microbiology. S. Chand.
2.	Cappuccino, J. and Sherman, N. (2002). Microbiology: A Laboratory Manual, (6 <sup>th</sup> Edition). Pearson Education, Publication, New Delhi.
3.	Cullimore D.R. (2010). Practical Atlas for Bacterial Identification. (2 <sup>nd</sup> Edition). - Taylor & Francis.
4.	Rich R.R., Fleisher T.A., Shearer W.T., Schroeder H., Frew A.J. and Weyand C.M. (2018). Clinical Immunology: Principles and Practice. (5 <sup>th</sup> Edition). Elsevier.
5.	Glick B.R. and Patten C.L. (2018). Molecular Biotechnology – Principles and Applications of Recombinant DNA. (5 <sup>th</sup> Edition). ASM Press.

### References Books

1.	Collee J.G., Fraser A.G. Marmion B.P. and Simmons A. (1996). Mackie & McCartney Practical Medical Microbiology. (14 <sup>th</sup> Edition). Elsevier, New Delhi.
2.	Gupta P.S. (2003). Clinical Immunology. Oxford University Press.
3.	Brown T.A. (2016). Gene Cloning and DNA Analysis. (7 <sup>th</sup> Edition). John Wiley and Sons, Ltd.
4.	Dale J.W., Schantz M.V. and Plant N. (2012). From Genes to Genomes – Concepts and Applications of DNA Technology. (3 <sup>rd</sup> Edition). John Wiley and Sons Ltd. 2012.
5.	Maloy S.R., Cronan J.E. Jr. and Freifelder D. (2011). Microbial Genetics. (2 <sup>nd</sup> Edition). Narosa Publishing Home Pvt Ltd.

### Web Resources

1.	<a href="http://textbookofbacteriology.net/">http://textbookofbacteriology.net/</a>
2.	<a href="https://www.ncbi.nlm.nih.gov/pmc/articles/PMC149666/">https://www.ncbi.nlm.nih.gov/pmc/articles/PMC149666/</a>

3.	<a href="https://ocw.mit.edu/courses/hst-176-cellular-and-molecular-immunology-fall-2005/pages/lecture-notes/">https://ocw.mit.edu/courses/hst-176-cellular-and-molecular-immunology-fall-2005/pages/lecture-notes/</a>
4.	[PDF] Lehninger Principles of Biochemistry (8 <sup>th</sup> Edition) By David L. Nelson and Michael M. Cox Book Free Download - Study Material z.in
5.	<a href="https://microbenotes.com/gene-cloning-requirements-principle-steps-applications/">https://microbenotes.com/gene-cloning-requirements-principle-steps-applications/</a>

**Relationship Matrix for COs, POs and PSOs**

Semester	Code	Title of the Course					Hours	Credits			
I	23PMB1CC3P	PRACTICAL-I					6	4			
Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)					
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	
CO1	✓	✓	✓	✓	✓	✓		✓	✓		
CO2	✓	✓	✓	✓		✓	✓	✓	✓	✓	
CO3	✓	✓	✓		✓	✓	✓	✓	✓	✓	
CO4	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
CO5	✓	✓	✓	✓	✓	✓		✓	✓		
Number of Matches (✓) = 45      Relationship: Very High											

Mapping	1-29%	30-59%	60-69%	70-89%	90-100%
Matches	1-14	15-29	30-34	35-44	45-50
Relationship	Very Poor	Poor	Moderate	High	Very High

<b>Course Designed by</b>	<b>HOD</b>
	<b>Dr. R. ANBURAJ</b>

<b>Course Code:</b> 25PMB2EC11	<b>SEMESTER-I</b>	<b>Instruction Hours:5</b>
<b>BIOINFORMATICS</b>		
<b>Credits:3</b>		<b>Exam hours:3</b>

### Course Objectives

- ❖ Discuss about various biological data mining concepts, tools.
- ❖ Elucidate the principles and applications of sequence alignment methods and tools.
- ❖ Demonstrate different phylogenetic tree construction methods and its uses in phylogenetic analysis.
- ❖ Acquaint with various approaches in predicting 3D and 2D structure of proteins.
- ❖ Describe various tools and techniques used in molecular docking, immunoinformatics and subtractive genomics.

### Course Outcomes

- ❖ **CO1:** Access to databases that provides information on nucleic acids and proteins
- ❖ **CO2:** Invent algorithms for sequence alignment.
- ❖ **CO3:** Construct phylogenetic tree
- ❖ **CO4:** Predict the structure of proteins.
- ❖ **CO5:** Design drugs by predicting drug ligand interactions and molecular docking.

### UNIT I

Biological Data Mining – Exploration of Data Mining Tools. Cluster Analysis Methods. Data Visualization. Biological Data Management. Biological Algorithms – Biological Primary and Derived Databases. Concept of Alignment, Pairwise Sequence Alignment (PSA), Multiple Sequence Alignment (MSA), BLAST, CLUSTALW, Scoring Matrices, Percent Accepted Mutation (PAM), Block of Amino Acid Substitution Matrix (BLOSUM).

### UNIT II

Phylogenetic Tree Construction - Concept of Dendrograms. Evolutionary Trees - Distance Based Tree Reconstruction - Ultrametric trees and Ultrametric distances – Reconstructing Trees from Additive Matrices- Evolutionary Trees and Hierarchical Clustering- Character Based Tree Reconstruction - Maximum Parsimony Method, Maximum likelihood method -Reliability of Trees– Substitution matrices–Evolutionary models.

### UNIT III

Computational Protein Structure prediction – Secondary structure – Homology modelling- Fold recognition and ab initio 3D structure prediction– Structure comparison and alignment – Prediction of function from structure. Geometrical parameters – Potential energy surfaces – Hardware and Software requirements- Molecular graphics– Molecular file formats- Molecular visualization tools.

### UNIT IV

Prediction of Properties of Ligand Compounds– 3D Autocorrelation -3D Morse Code-Conformation Dependent and Independent Chirality Codes–Comparative Molecular Field Analysis – 4 D QSAR – HYBOT Descriptors – Structure Descriptors – Applications –Linear Free Energy Relationships – Quantity Structure- Property Relationships –Prediction of the Toxicity of Compounds

### UNIT V

Molecular Docking-Flexible-Rigid docking-Target-Ligand preparation-Solvent accessibility-Surface volume calculation, Active site prediction-Docking algorithms-Genetic, Lamarckian - Docking analyses- Molecular interactions, bonded and nonbonded - Molecular Docking Software and Working Methods. Genome drug discovery– Subtractive Genomics Principles of Immunoinformatics and Vaccine Development

**TextBooks:**

1.	Lesk A.M.(2002).IntroductiontoBioinformatics.(4 <sup>th</sup> Edition).OxfordUniversityPress.
2.	LengauerT.(2008).Bioinformatics-fromGenomestoTherapies(Vol-1).Wiley- VCH.
3.	RastogiS.C.,MendirattaN.andRastogi P.(2014).Bioinformatics- MethodsandApplications(Genomics,ProteomicsandDrugDiscovery)(4 <sup>th</sup> Edition).Prentice- Hallof IndiaPvt.Ltd.
4.	Attwood,T.K.andParry- Smith,D.J.(1999).IntroductiontoBioinformatics.AddisionWesleyLongmanLimited,England .
5.	Mount D.W., (2013).Bioinformatics sequence and genome analysis, 2 <sup>nd</sup> edn.CBS Publishers,New Delhi.

**ReferenceBooks:**

1.	Baxevanis A. D. and Ouellette F. (2004). Bioinformatics: A Practical Guide to theAnalysisofGenesandProteins.(2 <sup>nd</sup> Edition). JohnWileyandSons.
2.	BosuO.andKaurS.(2007).Bioinformatics - Database,Tools,andAlgorithms.OxfordUniversityPress.
3.	David W.M.(2001).BioinformaticsSequenceandGenomeAnalysis(2 <sup>nd</sup> Edition). CBSPublishersandDistributors(Pvt.)Ltd.
4.	XiongJ,(2011).Essentialbioinformatics,FirstsouthIndianEdition,CambridgeUniversit yPress.
5.	Harshawardhan P.Bal, (2006). Bioinformatics Principles and Applications, TataMcGraw-HillPublishingCompanyLimited.

**WebResources:**

1.	<a href="https://www.hsls.pitt.edu/obrc/">https://www.hsls.pitt.edu/obrc/</a>
2.	<a href="https://www.hsls.pitt.edu/obrc/index.php?page=dna">https://www.hsls.pitt.edu/obrc/index.php?page=dna</a>
3.	<a href="https://www.ncbi.nlm.nih.gov/pmc/articles/PMC1669712/">https://www.ncbi.nlm.nih.gov/pmc/articles/PMC1669712/</a>
4.	<a href="https://www.ebi.ac.uk/">https://www.ebi.ac.uk/</a>
5.	<a href="https://www.kegg.jp/kegg/kegg2.html">https://www.kegg.jp/kegg/kegg2.html</a>

**Relationship Matrix for COs, POs and PSOs**

Semester	Code	Title of the Course					Hours	Credits			
II	23PMB2EC31	Bioinformatics					5	3			
Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)					
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	
CO1	✓	✓	✓	✓	✓	✓					
CO2	✓	✓	✓	✓	✓	✓	✓	✓	✓		
CO3	✓	✓	✓	✓		✓	✓	✓	✓	✓	
CO4	✓	✓	✓	✓	✓			✓	✓	✓	
CO5	✓	✓		✓	✓	✓	✓	✓	✓		
Number of Matches (✓) = 43      Relationship: High											

Mapping	1-29%	30-59%	60-69%	70-89%	90-100%
Matches	1-14	15-29	30-34	35-44	45-50
Relationship	Very Poor	Poor	Moderate	High	Very High

Course Designed by	HOD
	Dr. R. ANBURAJ

<b>CourseCode:</b> 25PMB2EC12	<b>SEMESTER-I</b>	<b>InstructionHours:5</b>
<b>NANOBIOTECHNOLOGY</b>		
<b>Credits:3</b>		<b>Examhours:3</b>

### Course Objectives

- ❖ Analyze nanomaterials based on the understanding of nanobiotechnology
- ❖ Discuss the methods of fabrication of nanomaterials
- ❖ Gain Knowledge on characterization of nanomaterials.
- ❖ Discover nanomaterials for targeted drug delivery.
- ❖ Explain nanomaterials in nanomedicine and environmental pollution.

### Course Outcomes

- ❖ **CO1:** Employ knowledge in the field of nanobiotechnology for development.
- ❖ **CO2:** Identify various applications of nanomaterials in the field of medicine and environment
- ❖ **CO3:** Examine the prospects and significance of nanobiotechnology.
- ❖ **CO4:** Identify recent advances in this area and create a career or pursue research in the field.
- ❖ **CO5:** Design non-toxic nanoparticles for targeted drug delivery.

### UNIT I

Nanotechnology – Emergence of nanotechnology – Nanomaterials – Classification of nanomaterials based on composition, number of dimensions in nanoscale and morphology – Characteristics of nanomaterials – Surface to volume ratio – Its effect on properties of nanomaterials – Nanoparticles – Nanoclusters – Nanocomposites – Nanohybrids – An overview on the applications of nanomaterials.

### UNIT II

Nanomaterials – Preparation – Top-down method – Ball milling – Photolithography – Electron beam lithography – Molecular beam epitaxy – Bottom-up technique – Soft-chemical method – Sol-gel synthesis – Electro chemical deposition – Atomic layer deposition – Molecular self assembly – Langmuir-Blodgett film (2D nanostructure) preparation.

### UNIT III

Structural characterization – Principle of X-ray powder diffraction – Determination of structural parameters – Optical studies – UV-Vis-NIR spectrometry – Band gap determination by Tauc's plot method – FTIR spectroscopy – Surface morphological analysis – Scanning electron microscopy (SEM) – Scanning tunnelling microscope (STM) – Transmission Electron Microscope (TEM) – Photoluminescence spectroscopy – X-ray photoelectron spectroscopy (XPS).

### UNIT IV

Nanomaterial based Drug delivery and therapeutics – surface modified nanoparticles, MEMS/NEMS based devices, peptide/DNA coupled nanoparticles, lipid and inorganic nanoparticles for drug delivery, Metal/metal oxide nanoparticles as antibacterial, antifungal and antiviral agents. Toxicity of nanoparticles and Toxicity Evaluation.

### UNIT V

Nanomaterials in diagnosis – Imaging, nanosensors in detection of pathogens. Treatment of surface water, ground water and waste water contaminated by toxic metal ions, organic and inorganic solutes and microorganisms.

**TextBooks:**

1.	Brydson R.M., Hammond, C. (2005). Generic Methodologies for Nanotechnology: Characterization. In Nanoscale Science and Technology. John Wiley & Sons, Ltd.
2.	Leggett G.J., Jones R. A. L. (2005). Bionanotechnology. In Nanoscale Science and Technology. John Wiley & Sons, Ltd.
3.	Mohan Kumar G. (2016). Nanotechnology: Nanomaterials and nanodevices. Narosa Publishing House.
4.	Goodsell D.S. (2004). Bionanotechnology. John Wiley & Sons, Inc.
5.	Pradeep T. (2007). Nano: The Essentials - Understanding nanoscience and nanotechnology. Tata McGraw-Hill.

**ReferenceBooks:**

1.	Nouailhat A. (2008). An Introduction to Nanoscience and Nanotechnology, Wiley.
2.	Sharon M. and Maheshwar (2012). Bio-Nanotechnology: Concepts and Applications. New Delhi. Anebooks Pvt Ltd.
3.	Niemeyer C.M. and Mirkin C.A. (2005). Nanobiotechnology. Wiley Interscience.
4.	Rehm, B. (2006). Microbial Bionanotechnology: Biological Self-Assembly Systems and Biopolymer-Based Nanostructures. Horizon Scientific Press.
5..	Reisner, D.E. (2009). Bionanotechnology: Global Prospects. CRC Press

**WebResources**

1.	<a href="https://www.gale.com/nanotechnology">https://www.gale.com/nanotechnology</a>
2.	<a href="https://www.understandingnano.com/resources.html">https://www.understandingnano.com/resources.html</a>
3.	<a href="http://dbtnanobiotech.com/index2.php">http://dbtnanobiotech.com/index2.php</a>
4.	<a href="http://www.istl.org/11-winter/internet1.html">http://www.istl.org/11-winter/internet1.html</a>
5.	<a href="https://www.cdc.gov/niosh/topics/nanotech/default.html">https://www.cdc.gov/niosh/topics/nanotech/default.html</a>

**Relationship Matrix for COs, POs and PSOs**

Semester	Code	Title of the Course					Hours	Credits			
II	23PMB2EC32	Nanobiotechnology					5	3			
Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)					
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	
CO1	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
CO2	✓	✓	✓	✓	✓	✓	✓	✓	✓		
CO3	✓	✓	✓	✓		✓	✓	✓	✓	✓	
CO4	✓	✓	✓	✓	✓			✓	✓	✓	
CO5	✓	✓		✓	✓	✓	✓	✓	✓		
Number of Matches (✓) = 44      Relationship: High											

Mapping	1-29%	30-59%	60-69%	70-89%	90-100%
Matches	1-14	15-29	30-34	35-44	45-50
Relationship	Very Poor	Poor	Moderate	High	Very High

<b>Course Designed by</b>	<b>HOD</b>
	<b>Dr. R. ANBURAJ</b>

<b>CourseCode:</b> 25PMB1EC21	<b>SEMESTER-I</b>	<b>InstructionHours:6</b>
<b>FORENSICS SCIENCE</b>		
<b>Credits:3</b>		<b>Examhours:3</b>

**Course Objectives:**

- ❖ Understand the Scope, need and learn the tools and techniques in forensic science.
- ❖ Comprehend organizational setup of a forensic science laboratory.
- ❖ Identify and Examine body fluids for identification
- ❖ Extract DNA from blood samples for investigation
- ❖ Recognize medico legal postmortem procedures and their importance

**Course Outcomes:**

- ❖ **CO1:** Identify the scope and need of forensic science in the present scenario.
- ❖ **CO2:** Plan for the organizational setup and functioning of forensic science laboratories.
- ❖ **CO3:** Analyze the biological samples found at the crime scene.
- ❖ **CO4:** Perform extraction and identification of DNA obtained from body fluids.
- ❖ **CO5:** Discuss the concept of forensic toxicology

**UNIT I:**

Forensic Science-Definition, history and development of forensic science. Scope and need of forensic science in present scenario. Branches of forensic science. Tools and techniques of forensic science. Duties of a forensic scientist.

**UNIT II:**

Forensic science laboratories - Organizational setup of a forensic science laboratory. Central and State level laboratories in India. Mobile forensic science laboratory and its functions. Forensic microbiology - Types and identification of microbial organisms of forensic significance.

**UNIT III:**

Forensic serology - Definition, identification and examination of body fluids - Blood, semen, saliva, sweat and urine. Forensic examination and identification of hair and fibre.

**UNIT IV:**

DNA profiling - Introduction, history of DNA typing. Extraction of DNA from blood samples - Organic and Inorganic extraction methods. DNA fingerprinting - RFLP, PCR, STR. DNA testing in disputed paternity.

**UNIT V:**

Forensic toxicology - Introduction and concept of forensic toxicology. Medico legal postmortem and their examination. Poisons - Types of poisons and their mode of action.

**TextBooks:**

1.	Nanda B.B. and Tewari R. K. (2001) Forensic Science in India: A Vision for the Twenty First Century. Select Publishers, New Delhi. ISBN-10: 8190113526/ ISBN-13: 9788190113526.
2.	James S. H. and Nordby, J. J. (2015) Forensic Science: An Introduction to Scientific and Investigative Techniques. (5 <sup>th</sup> Edition). CRC Press. ISBN-10: 9781439853832/ ISBN-13: 978-1439853832.
3.	Li R. (2015) Forensic Biology. (2 <sup>nd</sup> Edition). CRC Press, New York. ISBN-13: 978-1-4398-8972-5.
4.	Sharma B.R (2020) Forensic science in criminal investigation and trials. (6 <sup>th</sup> Edition) Universal Press.
5.	Richard Saferstein (2017). Criminalistics- An introduction to Forensic Science. (12 <sup>th</sup> Edition). Pearson Press.

**References:**

1.	Nordby J. J. (2000). Dead Reckoning. The Art of Forensic Detection- CRC Press, New York. ISBN: 0-8493-8122-3.
2.	Saferstein R. and Hall A. B. (2020). Forensic Science Handbook, Vol. I, (3 <sup>rd</sup> Edition). CRC Press, New York. ISBN-10: 1498720196.
3.	Lincoln, P. J. and Thomson, J. (1998). (2 <sup>nd</sup> Edition). Forensic DNA Profiling Protocols. Vol. 98. Humana Press. ISBN: 978-0-89603-443-3.
4.	Val McDermid (2014). Forensics. (2 <sup>nd</sup> Edition). ISBN 9780802125156.
5.	Vincent J. DiMaio., Dominick DiMaio. (2001). Forensic Pathology (2 <sup>nd</sup> Edition). CRC Press.

**Webresources**

1.	<a href="http://clsjournal.ascls.org/content/25/2/114">http://clsjournal.ascls.org/content/25/2/114</a>
2.	<a href="https://www.ncbi.nlm.nih.gov/books/NBK234877/">https://www.ncbi.nlm.nih.gov/books/NBK234877/</a>
3.	<a href="https://www.elsevier.com/books/microbial-forensics/budowle/978-0-12-382006-8">https://www.elsevier.com/books/microbial-forensics/budowle/978-0-12-382006-8</a>
4.	<a href="https://www.researchgate.net/publication/289542469_Methods_in_microbial_forensics">https://www.researchgate.net/publication/289542469_Methods_in_microbial_forensics</a>
5.	<a href="https://cisac.fsi.stanford.edu/events/microbialforensics">https://cisac.fsi.stanford.edu/events/microbialforensics</a>

**Relationship Matrix for COs, POs and PSOs**

Semester	Code	Title of the Course					Hours	Credits			
I	23PMB1EC21	Forensic Science					6	3			
Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)					
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	
CO1	✓	✓	✓	✓		✓		✓	✓		
CO2	✓	✓	✓	✓		✓		✓	✓		
CO3	✓	✓	✓		✓	✓	✓	✓	✓	✓	
CO4	✓	✓	✓	✓	✓	✓	✓	✓		✓	
CO5	✓	✓	✓	✓	✓	✓		✓	✓		
Number of Matches (✓) = 41      Relationship: High											

Mapping	1-29%	30-59%	60-69%	70-89%	90-100%
Matches	1-14	15-29	30-34	35-44	45-50
Relationship	Very Poor	Poor	Moderate	High	Very High

Course Designed by	HOD
	Dr. R. ANBURAJ

<b>CourseCode:</b> 25PMB1EC22	<b>SEMESTER-I</b>	<b>InstructionHours:6</b>
<b>HEALTHANDHYGIENE</b>		
<b>Credits:3</b>		<b>Examhours:3</b>

### CourseObjectives:

- ❖ Acquireknowledgeonhygieneand livehealthy.
- ❖ Provide insights on health laws for food safety and hygiene.
- ❖ Explainhealth,physicalexercisesandtheirimportance.
- ❖ Illustratementalhygieneand involvedinmentalhygiene.
- ❖ Describethevarioushealthandhealtheducationprogrammesbythegovernment.

### CourseOutcomes:

- ❖ **CO1:**Identifyfactorsaffectinghealthandhealthhabits.
- ❖ **CO2:**Executetheknowledgeofventilationandlighting.JustifyHealthlawsforfoodsafetyandhygiene.
- ❖ **CO3:**FollowpersonalhygienetoavoiddiseasesandPreventpeoplefromhealth-destroyinghabitsandaddictions.
- ❖ **CO4:**Explore Mental hygiene and maintain emotional stability
- ❖ **CO5:**Participate inhealtheducationprogrammes

### UNITI:

Introductiontohygiene-healthandhealthfulliving.Factors influencing health,healthhabitsandpractices. Recognizing positive & negative practices in the community. Scientific principlesrelatedtohealth.

### UNITII:

Nutrition and Health – Balanced diet, Food surveillance, food Fortification, adulteration andpreventivemeasures.Healthlawsforfoodsafety.Environmental andhousinghygiene.Ventilationandlighting.

### UNITIII:

Physicalhealth,physicalexercisesandtheirimportance– Walking,jogging,yogaandmeditation,stressrelief.Internationalcontrolofhealth,WHO.Personalhygiene,Sunbathing,ColonHygiene.Healthdestroyinghabitsandaddictions- Pan,supari,ganja,drinking,smoking,teaandcoffee.

### UNITIV:

Mental hygiene - factors responsible, developmental tasks, basic needs, emotional stability.Mental hygiene and health in infancy, early childhood, adolescence, adulthood and old age.Mentalhealthoccupationalhazards.

### UNITV:

Healthprogrammeandhealtheducation–Malariacontrol,Tuberculosiscontrol,AIDScontrol programmesandImmunizationProgrammes.Family planning,ReproductiveandChildhealthprogrammes (RCH).Covid vaccination programme

**TextBook:**

1.	Bamji M.S., Krishnaswamy K. and Brahmam G.N.V. (2019). Textbook of Human Nutrition. (4 <sup>th</sup> Edition). Oxford and IBH Publishing Co. Pvt. Ltd., New Delhi
2.	Swaminathan (1995) Food & Nutrition (Vol II) (2 <sup>nd</sup> Edition). The Bangalore Printing & Publishing Co Ltd., Bangalore.
3.	Paniker J.C. K. and Ananthanarayan R. (2017). Textbook of Microbiology. (10 <sup>th</sup> Edition). Universities Press (India) Pvt. Ltd
4.	Lindsay Dingwall. (2010). Personal Hygiene Care Print ISBN: 9781405163071   Online ISBN: 9781444318708   DOI: 10.1002/9781444318708
5.	Walter C.C. Pakes (1900). The Science of Hygiene: a Text-book of Laboratory Practice. (London: Methuen and Co.,).

**References:**

1.	Khader V. (2000) Food, Nutrition and Health, Kalyan Publishers, New Delhi.
2.	Srilakshmi, B. (2010) Food Science, (5 <sup>th</sup> Edition) New Age International Ltd., New Delhi.
3.	Dubey R.C. and Maheshwari D. K. (2010). Practical Microbiology. S. Chand.
4.	Park K. 2007, Park's textbook of Preventive and Social Medicine, Banarsidas Bhanot publishers, India.
5.	Srilakshmi, 2002, Dietetics, New Age Publications, India

**Web Resources:**

1.	Health and Hygiene - Personal Hygiene, Community Hygiene and Diseases (vedantu.com)
2.	Chapter-32.pdf (nios.ac.in)
3.	Menstrual Health and Hygiene Guide   Student Health and Counseling Services (ucdavis.edu)
4.	<a href="https://nap.nationalacademies.org/read/11756/chapter/13">https://nap.nationalacademies.org/read/11756/chapter/13</a>
5.	<a href="http://ecoursesonline.iasri.res.in/mod/page/view.php?id=112325">http://ecoursesonline.iasri.res.in/mod/page/view.php?id=112325</a>

**Relationship Matrix for COs, POs and PSOs**

Semester	Code	Title of the Course					Hours	Credits			
I	23PMB1EC22	Health and Hygiene					6	3			
Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)					
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	
CO1	✓	✓	✓	✓	✓	✓		✓	✓		
CO2	✓	✓	✓	✓		✓		✓	✓		
CO3	✓	✓			✓	✓	✓		✓	✓	
CO4	✓	✓		✓	✓	✓	✓	✓		✓	
CO5	✓	✓	✓	✓	✓	✓		✓	✓		
Number of Matches (✓) = 40      Relationship: High											

Mapping	1-29%	30-59%	60-69%	70-89%	90-100%
Matches	1-14	15-29	30-34	35-44	45-50
Relationship	Very Poor	Poor	Moderate	High	Very High

Course Designed by	HOD
	Dr. R. ANBURAJ

<b>CourseCode:</b> 25PMB2CC3	<b>SEMESTER-II</b>	<b>InstructionHours:6</b>
<b>MEDICALBACTERIOLOGYANDMYCOLOGY</b>		
<b>Credits:5</b>		<b>Examhours:3</b>

### CourseObjectives:

- ❖ Acquire Knowledge on collection, transportation and processing of various kinds of clinical specimens
- ❖ Explain morphology, characteristics and pathogenesis of bacteria.
- ❖ Discuss various factors leading to pathogenesis of bacteria.
- ❖ Acquire knowledge on antifungal agents and their importance.
- ❖ Describe various diagnostic methods available for fungal disease diagnosis.

### CourseOutcomes:

- ❖ CO1: Collect, transport and process of various kinds of clinical specimens.
- ❖ CO2: Analyze various bacteria based on morphology and pathogenesis.
- ❖ CO3: Discuss various treatment methods for bacterial disease.
- ❖ CO4: Employ various methods to detect fungi in clinical samples and apply knowledge on antifungal agents
- ..
- ❖ CO5: Apply various immunodiagnostic methods to detect fungal infections.

### UNIT I

Classification of medically important bacteria, Normal flora of human body, Collection, transport, storage and processing of clinical specimens - Blood, Urine, Sputum, CSF and other Body fluids.

Microbiological examination of clinical specimens, antimicrobial susceptibility testing. Handling and maintenance of laboratory animals - Rabbits, guinea pigs and mice

### UNIT II

Morphology, classification, characteristics, pathogenesis, laboratory diagnosis and treatment of diseases caused by species of *Staphylococci*, *Streptococci*, *Pneumococci*, *Neisseriae*, *Bacillus*, *Corynebacteria*, *Mycobacteria* and *Clostridium*.

### UNIT III

Morphology, classification, characteristics, pathogenesis, laboratory diagnosis and treatment of diseases caused by Enterobacteriaceae members, *Yersinia*, *Pseudomonas*, *Vibrio*, *Mycoplasma*, *Helicobacter*, *Rickettsiae*, *Chlamydiae*, *Bordetella*, *Francisella*, *Spirochaetes* - *Leptospira*, *Treponema* and *Borrelia*. Nosocomial, zoonotic and opportunistic infections - prevention and control.

### UNIT IV

Morphology, taxonomy and classification of fungi. Detection and recovery of fungi from clinical specimens. Dermatophytes and agents of superficial mycoses. *Trichophyton*, *Epidermophyton* & *Microsporum*. Yeasts of medical importance - *Candida*, *Cryptococcus*. Mycotoxins. Antifungal agents, testing methods and quality control.

### UNIT V

Dimorphic fungi causing systemic mycoses, *Histoplasma*, *Coccidioides*, *Sporothrix*, *Blastomyces*. Fungi causing Eumycotic Mycetoma, Opportunistic fungi - Fungi causing secondary infections in immunocompromised patients. Immunodiagnostic methods in mycology - Recent advancements in diagnosis. Antifungal agents.

**TextBooks:**

1.	Kanunga R. (2017). Ananthanarayanan and Panicker's Textbook of Microbiology. (2017). Orient Longman, Hyderabad.
2.	Greenwood, D., Slack, R. B. and Peutherer, J. F. (2012) Medical Microbiology, (18 <sup>th</sup> Edition). Churchill Livingstone, London.
3.	Finegold, S. M. (2000) Diagnostic Microbiology, (10 <sup>th</sup> Edition). C. V. Mosby Company, St. Louis.
4.	Alexopoulos C. J., Mims C. W. and Blackwell M. (2007). Introductory Mycology, (4 <sup>th</sup> Edition). Wiley Publishers.
5.	Chander J. (2018). Textbook of Medical Mycology. (4 <sup>th</sup> Edition). Jaypee Brothers Medical Publishers.

**References:**

1.	Salle A. J. (2007). Fundamental Principles of Bacteriology. (4 <sup>th</sup> Edition). Tata McGraw-Hill Publications.
2.	Collee J. C. Duguid J. P. Foraser, A. C, Marimon B. P, (1996). Mackie & McCartney Practical Medical Microbiology. 14 <sup>th</sup> edn, Churchill Livingstone.
3.	Cheesbrough M. (2006). District Laboratory Practice in Tropical Countries. - Part 2 2 <sup>nd</sup> edn. Cambridge University Press
4.	Topley and Wilson's. (1998). Principles of Bacteriology. 9 <sup>th</sup> edn. Edward Arnold, London.
5.	Murray P. R., Rosenthal K. S. and Michael A. (2013). Medical Microbiology. Pfaller. 7 <sup>th</sup> edn. Elsevier, Mosby Saunders.

**WebResources:**

1.	<a href="http://textbookofbacteriology.net/nd">http://textbookofbacteriology.net/nd</a>
2.	<a href="https://microbiologysociety.org/members-outreach-resources/links.html">https://microbiologysociety.org/members-outreach-resources/links.html</a>
3.	<a href="https://www.pathselective.com/micro-resources">https://www.pathselective.com/micro-resources</a>
4.	<a href="http://mycology.cornell.edu/fteach.html">http://mycology.cornell.edu/fteach.html</a>
5.	<a href="https://www.adelaide.edu.au/mycology/">https://www.adelaide.edu.au/mycology/</a>

Relationship Matrix for COs, POs and PSOs

Semester	Code	Title of the Course	Hours	Credits						
II	23PMB2CC4	Medical Bacteriology and Mycology	6	5						
Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)				
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	✓	✓	✓	✓	✓	✓		✓	✓	
CO2	✓	✓	✓	✓		✓		✓	✓	
CO3	✓	✓	✓		✓	✓	✓	✓	✓	✓
CO4	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
CO5	✓	✓	✓	✓	✓	✓		✓	✓	✓
Number of Matches (✓) = 43      Relationship: High										

<b>Mapping</b>	1-29%	30-59%	60-69%	70-89%	90-100%
<b>Matches</b>	1-14	15-29	30-34	35-44	45-50
<b>Relationship</b>	Very Poor	Poor	Moderate	High	Very High

<b>Course Designed by</b>	<b>HOD</b>
	<b>Dr. R. ANBURAJ</b>

<b>CourseCode</b> :25PMB2CC4	<b>SEMESTER-II</b>	<b>InstructionHours:6</b>
<b>MEDICAL VIROLOGY AND PARASITOLOGY</b>		
<b>Credits:5</b>		<b>Examhours:3</b>

### Course Objectives:

- ❖ Describe the replication strategy and cultivation methods of viruses.
- ❖ Acquire knowledge about oncogenic virus and human viral infections.
- ❖ Develop diagnostic skills, in the identification of virus infections.
- ❖ Impart knowledge about parasitic infections.
- ❖ Develop diagnostic skills, in the identification of parasitic infections.

### Course Outcomes:

- ❖ **CO1:** Cultivate viruses by different methods and aid in diagnosis. Perform purification and viral assay.
- ❖ **CO2:** Investigate the symptoms of viral infections and presumptively identify the viral disease.
- ❖ **CO3:** Diagnose various viral diseases by different methods. (serological, conventional and molecular)
- ❖ **CO4:** Educate public about the spread, control and prevention of parasitic diseases.
- ❖ **CO5:** Identify the protozoans and helminthes present in stool and blood specimens. Perform serological and molecular diagnosis of parasitic infections.

### UNIT I

General properties of viruses - Structure and Classification - viroids, prions, satellite RNAs and virusoids. Cultivation of viruses - Embryonated eggs, experimental animals and cell cultures. Purification and Assay of viruses - Physical and Chemical methods (Electron Microscopy, Protein and Nucleic acids studies.) Infectivity Assays (Plaque and End-point) Method.

### UNIT II

Virus Entry, Host Defenses Against Viral Infections, Epidemiology, pathogenic mechanisms, Pathogenesis, laboratory diagnosis, treatment for the following viruses: DNA Viruses- Pox, Herpes, Adeno, Papova and Hepadna, RNA Viruses- Picorna, Orthomyxo, Paramyxo, Rhabdo, Rota, HIV and other Hepatitis viruses, Arbo- Dengue virus, Ebola virus, Emerging and reemerging viral infections

### UNIT III

Bacterial viruses - ΦX 174, M13, MU, T4, lambda, Pi; Structural organization, life cycle and phage production. Lysogenic cycle-typing and application in bacterial genetics. Diagnosis of viral infections - conventional serological and molecular methods. Antiviral agents and viral vaccines.

### UNIT IV

Introduction to Medical Parasitology - Classification, host-parasite relationships. Epidemiology, life cycle, pathogenic mechanisms, laboratory diagnosis, treatment for the following: Protozoa causing human infections - *Entamoeba*, Aerobic and Anaerobic amoebae, *Giardia*, *Trichomonas*, *Leishmania*, and *Trypanosoma*.

### UNIT V

Classification, life cycle, pathogenicity, laboratory diagnosis and treatment for parasites - Helminthes-Cestodes *Taenia Solium*, *T. Saginata*, *Echinococcus*. Trematodes - *Fasciola Paragonimus*, *Schistosomes*. Nematodes - *Ascaris*, *Ankylostoma*, *Trichuris*, *Trichinella*, *Enterobius*, and *Wuchereria*. Other parasites causing infections in immunocompromised hosts and AIDS. Cultivation of parasites. Diagnosis of parasitic infections - Serological and molecular diagnosis. Anti-protozoan drugs.

### Text Books:

1.	KanungaR.(2017).AnanthanarayananandPanicker’sTextbookofMicrobiology.(10 <sup>th</sup> Edition).UniversitiesPress(India)Pvt.Ltd.
2.	Dubey,R.C.andMaheshwariD.K.(2010).ATextBookofMicrobiology.S.Chand&Co.
3.	RajanS. (2007).MedicalMicrobiology.MJPublisher.
4.	PanikerJ.(2006).TextBookofParasitology.JayPeeBrothers,NewDelhi.
5.	Arora,D.R.andAroraB.B. (2020).MedicalParasitology.(5 <sup>th</sup> Edition).CBS Publishers &DistributorsPvt.Ltd. NewDelhi.

**References:**

1.	CarterJ.(2001).Virology:PrinciplesandApplications(1 <sup>st</sup> Edition).Wiley Publications.
2..	WilleyJ.,SandmanK.andWoodD.Prescott’sMicrobiology.(11 <sup>th</sup> Edition).McGraw HillBook.
3.	JawetzE.,MelnickJ.L.andAdelbergE.A.(2000).Reviewof MedicalMicrobiology.(19 <sup>th</sup> Edition).LangeMedicalPublications,U.S.A.
4.	FinegoldS.M.(2000).DiagnosticMicrobiology.(10 <sup>th</sup> Edition).C.V.Mosby Company,St.Louis.
5.	LevanthalR.andCheadleR.S.(2012).MedicalParasitology.(6 <sup>th</sup> Edition). S.A.DaviesCo.Philadelphia.

**WebResources:**

1.	<a href="https://en.wikipedia.org/wiki/Virology">https://en.wikipedia.org/wiki/Virology</a>
2.	<a href="https://academic.oup.com/femsre/article/30/3/321/546048">https://academic.oup.com/femsre/article/30/3/321/546048</a>
3.	<a href="https://www.sciencedirect.com/science/article/pii/S0042682215000859">https://www.sciencedirect.com/science/article/pii/S0042682215000859</a>
4.	<a href="https://nptel.ac.in/courses/102/103/102103039/">https://nptel.ac.in/courses/102/103/102103039/</a>
5.	<a href="https://www.healthline.com/health/viral-diseases#contagiousness">https://www.healthline.com/health/viral-diseases#contagiousness</a>

**Relationship Matrix for COs, POs and PSOs**

Semester	Code	Title of the Course	Hours	Credits						
II	23PMB2CC5	Medical Virology and Parasitology	6	5						
Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)				
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
CO2	✓	✓	✓	✓	✓	✓	✓	✓	✓	
CO3	✓	✓	✓	✓		✓	✓	✓	✓	✓
CO4	✓	✓	✓	✓	✓			✓	✓	✓
CO5	✓	✓		✓	✓	✓	✓	✓	✓	
Number of Matches (✓) = 44      Relationship: High										

Mapping	1-29%	30-59%	60-69%	70-89%	90-100%
Matches	1-14	15-29	30-34	35-44	45-50
Relationship	Very Poor	Poor	Moderate	High	Very High

<b>Course Designed by</b>	<b>HOD</b>
	<b>Dr. R. ANBURAJ</b>

<b>CourseCode:</b> 25PMB2CP2	<b>SEMESTER-II</b>	<b>InstructionHours:6</b>
<b>CoreCourse-Medical Bacteriology and Mycology, Medical Virology and Parasitology -Practical II</b>		
<b>Credits:4</b>		<b>Examhours:6</b>

#### CourseObjectives:

- ❖ Develop skills in the diagnosis of bacterial infections and antimicrobial sensitivity.
- ❖ Impart knowledge on fungal infections and its diagnosis.
- ❖ Diagnose parasitic
- ❖ To gain knowledge about industrially important microbes.
- ❖ Screen and utilize microorganisms for effective industrial production of metabolites.

#### CourseOutcomes:

- ❖ **CO1:** Collection of different clinical samples, transport, culture and examination.
- ❖ **CO2:** Identify medically important bacteria, fungus and parasites from the clinical samples by staining and biochemical tests.
- ❖ **CO3:** Promote diagnostic skills; interpret laboratory tests in the diagnosis of infectious diseases.
- ❖ **CO4:** Perform antibiotic sensitivity tests and compare with the standard tests.
- ❖ **CO5:** Screening of industrially important microbes for metabolite production.

#### LIST OF EXPERIMENTS

1. Staining of clinical specimens - Wet mount, Differential and Special staining methods.
2. Isolation and identification of bacterial pathogens from clinical specimens.
3. Cultivation in basal, differential, enriched, selective and special media.
4. Biochemical identification tests.
5. Enumeration of bacteria in urine to detect significant bacteriuria.
6. Antimicrobial sensitivity testing - Kirby Bauer method and Stokes method.
7. Minimum inhibitory concentration (MIC) test.
8. Minimum bactericidal concentration (MBC) test.
9. Identification and Classification of common fungi. Mounting and staining of VAM spores.
10. Examination of different fungi by Lactophenol cotton blue staining.
13. Examination of different fungi by KOH staining.
14. Cultivation of fungi and their identification - *Mucor*, *Rhizopus*, *Aspergillus*, *Penicillium*.
15. Microscopic observation of different asexual fungal spores.
16. Microscopic observation of fungal fruiting bodies.
17. Identification of Dermatophytes.
18. Isolation and characterization of bacteriophage from natural sources by phage titration.
19. Cultivation of viruses - Egg Inoculation methods.
20. Diagnosis of Viral Infections - ELISA

21. HIA. Spotters of viral inclusions and CPE-stained smears.
22. Examination of parasites in clinical specimens- Ova/cysts in faeces.
23. Concentration: methods- Flootation methods- simple Saturated salt solution method- Zinc sulphate methods- Sedimentation methods- Formal ether method.
24. Blood smear examination for malarial parasites. Thin smear by Leishman's stain- Thick smear by J.B. stain.
25. Identification of common arthropods of medical importance - spotters of *Anopheles*, *Glossina*, *Phlebotomus*, *Aedes*, Ticks and mites.
26. Good Laboratory Practices in Industrial Microbiology laboratory.
27. Study of Bioreactor and its essential parts.
28. Culturing and Characterization of microorganisms used in Dairy and Pharmaceutical industry.
29. Screening for Enzyme producers (amylase/protease).
30. Optimization of parameters for Amylase production. Screening for Organic acid producers (acetic acid/lactic acid).
31. Screening for Antibiotic producers
32. Immobilization of microbial cells and enzyme and its assessment. Microbiological assays of fermentation products.
33. MIC- MBC. Microbiological assay of antibiotics by cup plate method and other methods. Sterility testing of pharmaceuticals.

### Text Books

1.	Cullimore D.R. (2010). Practical Atlas for Bacterial Identification, 2 <sup>nd</sup> Edition. Publisher- Taylor and Francis.
2.	Abbott A.C. (2010). The Principles of Bacteriology. Nabu Press.
3.	Parija S.C. (2012). Textbook of Practical Microbiology. Ahuja Publishing House.
4.	Cappuccino, J. and Sherman, N. (2002) Microbiology: A Laboratory Manual, (6 <sup>th</sup> Edition). Pearson Education, Publication, New Delhi.
5.	Morag C. and Timbury M.C. (1994). Medical Virology. 4 <sup>th</sup> edn. Blackwell Scientific Publishers.

**References:**

1.	Collee J. G., Fraser A. G., Marmion B. P. and Simmons A. (1996). Mackie & McCartney Practical Medical Microbiology. (14 <sup>th</sup> Edition). Elsevier, New Delhi.
2.	Chart H. (2018). Practical Laboratory Bacteriology. CRC Press.
3.	Moore V. A. (2017). Laboratory Directions for Beginners in Bacteriology. Triste Publishing Ltd.
4.	. Cheesbrough M. (2006). District Laboratory Practice in Tropical Countries. - Part 22 <sup>nd</sup> Edition. Cambridge University Press.
5.	Murray P. R., Rosenthal K. S. and Michael A. (2013). Medical Microbiology. Pfaller. 7 <sup>th</sup> Edition. Elsevier, Mosby Saunders

**Web Resources**

1.	<a href="http://textbookofbacteriology.net/">http://textbookofbacteriology.net/</a>
2.	<a href="https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7173454/">https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7173454/</a>
3.	<a href="https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3768729/">https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3768729/</a>
4.	<a href="https://www.ncbi.nlm.nih.gov/pmc/articles/PMC149666/">https://www.ncbi.nlm.nih.gov/pmc/articles/PMC149666/</a>
5.	<a href="https://www.intechopen.com/books/current-issues-in-molecular-virology-viral-genetics-and-biotechnological-applications/vaccines-and-antiviral-agents">https://www.intechopen.com/books/current-issues-in-molecular-virology-viral-genetics-and-biotechnological-applications/vaccines-and-antiviral-agents</a>

**Relationship Matrix for COs, POs and PSOs**

Semester	Code	Title of the Course					Hours	Credits			
II	23PMB2CC6P	Practical III					6	4			
Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)					
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	
CO1	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
CO2	✓	✓	✓	✓	✓	✓	✓	✓	✓		
CO3	✓	✓	✓	✓		✓	✓	✓	✓	✓	
CO4	✓	✓	✓	✓	✓			✓	✓	✓	
CO5	✓	✓		✓	✓	✓	✓	✓	✓		
Number of Matches (✓) = 44 Relationship: High											

<b>Mapping</b>	1-29%	30-59%	60-69%	70-89%	90-100%
<b>Matches</b>	1-14	15-29	30-34	35-44	45-50
<b>Relationship</b>	Very Poor	Poor	Moderate	High	Very High

<b>Course Designed by</b>	<b>HOD</b>
	<b>Dr. R. ANBURAJ</b>

<b>Course Code:</b> 25PMB1EC31	<b>SEMESTER-II</b>	<b>Instruction Hours:6</b>
<b>ELECTIVE-I-BIOINSTRUMENTATION</b>		
<b>Credits:3</b>		<b>Exam hours:3</b>

### Course Objectives:

- ❖ Explain the principles and working mechanisms of laboratory instruments.
- ❖ Discuss chromatography techniques and molecular biology techniques
- ❖ Illustrate molecular techniques in biological applications.
- ❖ Acquire knowledge on spectroscopic techniques
- ❖ Demonstrate the use of radioisotopes in various techniques

### Course Outcomes:

- ❖ **CO1:** Make use of the laboratory instruments- laminar air flow, pH meter, centrifugation methods, biosafety cabinets following SOP.
- ❖ **CO2:** Apply chromatography techniques in the separation of biomolecules.
- ❖ **CO3:** Perform molecular techniques like mutagenesis and their detection.
- ❖ **CO4:** Estimate molecules in biological samples by adopting UV spectroscopic techniques.
- ❖ **CO5:** Cultivate organisms anaerobically

### UNIT I

Basic laboratory Instruments. Aerobic and anaerobic incubator – Biosafety Cabinets - Fume Hood, pH meter, Lyophilizer, Flow cytometry. Centrifugation techniques: Basic principles of centrifugation-Standard sedimentation coefficient-measurement of sedimentation coefficient; Principles, methodology and applications of differential, rate zonal and density gradient centrifugation-Applications in determination of molecular weight

### UNIT II

General principles of chromatography - Chromatographic Performance parameters; Types- Thin layer chromatography, Paper Chromatography, Liquid chromatography (LPLC & HPLC), Adsorption, ion exchange, Gel filtration, affinity, Gas liquid (GLC). Flash Chromatography and Ultra Performance convergence chromatography. Two dimensional chromatography. Stimulated moving bed chromatography (SEC).

### UNIT III

Electrophoresis: General principles- moving boundary electrophoresis- electrophoretic mobility – supportive materials – electro endosmosis – types (horizontal, vertical and two dimensional electrophoresis)- Principle and applications - paper electrophoresis, Serum electrophoresis, starch gel electrophoresis, Disc gel, Agarose gel, SDS – PAGE, Immunoelectrophoresis. Blotting techniques- Southern, northern and western blotting.

### UNIT IV

Spectroscopic techniques: Principle, simple theory of absorption of light by molecules, electromagnetic spectrum, instrumentation and application of UV-visible, Raman, FTIR spectrophotometer, spectrofluorimetry, Atomic Absorption Spectrophotometer, Flame spectrophotometer, NMR, ESR, Emission Flame Photometry and GC-MS. Detection of molecules in living cells - FISH and GISH. Biophysical methods: Analysis of biomolecules by Spectroscopy UV/visible.

### UNIT V

Radioisotopic 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, autoradiography and its applications. Commonly used isotopes in biology, labeling procedures and safety aspects.

**TextBooks:**

1.	SharmaB.K.(2014).InstrumentalMethodofChemicalAnalysis.KrishnaPrakashanMedia(P)Ltd.
2.	ChatwalG.RandAnandS.K.(2014.)InstrumentalMethodsofChemicalAnalysis.HimalayaPublishingHouse.
3.	MitchellG.H.(2017).GelElectrophoresis:Types,ApplicationsandResearch.NovaSciencePublishersInc.
4.	HolmeD.PeckH.(1998).AnalyticalBiochemistry.(3 <sup>rd</sup> Edition).PrenticeHall.
5.	JayaramanJ.(2011).LaboratoryManualinBiochemistry.(2 <sup>nd</sup> Edition).WileyEastrnLtd.,NewDelhi.

**References:**

1.	PaviaD. L. (2012)Spectroscopy(4 <sup>th</sup> Edition). Cengage.
2.	SkoogA.andWestM.(2014).PrinciplesofInstrumentalAnalysis.(14 <sup>th</sup> Edition).W.B.SaundersCo.,Philadephia.
3.	MillerJ.M.(2007).Chromatography:ConceptsandContrasts(2 <sup>nd</sup> Edition)Wiley-Blackwell.
4.	GurumaniN.(2006).ResearchMethodologyforBiologicalSciences.(1 <sup>st</sup> Edition)MJPPublishers.
5.	PonmuruganP.andGangatharaP.B.(2012).Biotechniques.(1 <sup>st</sup> Edition).MJP Publishers.

**WebResources:**

1.	<a href="https://norcaloa.com/BMIA">https://norcaloa.com/BMIA</a>
2.	<a href="http://www.biologydiscussion.com/biochemistry/centrifugation/centrifuge-introduction-types-uses-and-other-details-with-diagram/12489">http://www.biologydiscussion.com/biochemistry/centrifugation/centrifuge-introduction-types-uses-and-other-details-with-diagram/12489</a>
3.	<a href="https://www.watelectrical.com/biosensors-types-its-working-and-applications">https://www.watelectrical.com/biosensors-types-its-working-and-applications</a> .
4.	<a href="http://www.wikiscales.com/articles/electronic-analytical-balance/">http://www.wikiscales.com/articles/electronic-analytical-balance/</a>
5.	<a href="https://study.com/academy/lesson/what-is-chromatography-definition-types-uses">https://study.com/academy/lesson/what-is-chromatography-definition-types-uses</a> .

**Relationship Matrix for COs, POs and PSOs**

Semester	Code	Title of the Course					Hours	Credits			
I	23PMB1EC11	Bioinstrumentation					6	3			
Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)					
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	
CO1	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
CO2	✓	✓	✓		✓	✓	✓		✓	✓	
CO3	✓	✓	✓	✓		✓	✓	✓	✓		
CO4	✓		✓	✓	✓	✓	✓	✓		✓	
CO5	✓	✓		✓	✓	✓	✓	✓	✓	✓	
Number of Matches (✓) = 43      Relationship: High											

Mapping	1-29%	30-59%	60-69%	70-89%	90-100%
Matches	1-14	15-29	30-34	35-44	45-50
Relationship	Very Poor	Poor	Moderate	High	Very High

<b>Course Designed by</b>	<b>HOD</b>
	<b>Dr. R. ANBURAJ</b>

<b>CourseCode:</b> <b>25PMB1EC32</b>	<b>SEMESTER-II</b>	<b>InstructionHours:6</b>
<b>ELECTIVEII- ESSENTIALS OF LABORATORY MANAGEMENT AND BIOSAFETY</b>		
<b>Credits:3</b>		<b>Examhours:3</b>

**CourseObjectives;**

- ❖ To utilize containment principles to ensure biosafety.
- ❖ To enrich the student role and responsibilities of laboratory hazards and their control.
- ❖ To know the importance of first aid technique for various common lab accidents.
- ❖ To acquire knowledge of biosafety level, risk assessment and maintain proper hygiene in the laboratory.
- ❖ To discuss the biosafety regulations and guidelines and implementation of safety programs.

**CourseOutcomes:**

- ❖ CO1: Employ skills on laboratory safety and avoid laboratory accidents.
- ❖ CO2: Prevent laboratory hazards by practicing safety strategies.
- ❖ CO3: Practice various first aid procedures during common laboratory accidents.
- ❖ CO4: Ensure biosafety strategies in laboratory
- ❖ CO5: Recognize the importance of biosafety guidelines.

**UNIT I**

Introduction to the laboratory and laboratory hazards- General laboratory facilities- Occupational safety- Lab accidents - Fires, chemical burns, slips and falls, Animal bites. Cuts from broken glass. Toxic fume inhalation. General laboratory rules, Good laboratory practice (GLP). Laboratory plan

**UNIT II**

Common hazards in laboratory: Chemical hazards- Safe handling of chemicals and gases, hazard labels and symbols. Material safety datasheet (MSDS), Chemical handling - Fumehood, Storage of chemicals. Chemical Waste Disposal Guideline. Physical hazards - Physical agent data sheets (PADS), Electric hazards- Electrical shock, Electrical explosions, Electrical burns. Safe work practices. Stages of Fire. Fire Extinguishers. Fire Response.

**UNIT III**

Prevention and First aid for laboratory accidents. Personal protective equipment (PPE), Proper attire (Eye/Face Protection, laboratory coats, gloves, respirators. Disposal/Removal of PPE. Emergency equipment safety- Showers/Eye Washes. Laboratory security and emergency response. First aid for - Injuries caused by broken glass, Acid/Alkali splashes on the skin, swallowing acid/alkali, burns caused by heat, electric shock.

**UNIT IV**

Biosafety - Historical background. Blood borne pathogens (BBP) and laboratory - acquired infections. Introduction to biological safety cabinets. Primary containment for biohazards. Biosafety levels of specific microorganisms. Recommended biosafety. Levels for infectious agents and infected animals. Risk groups with examples- Risk assessment. Safety levels. Case studies- Safe working, hand hygiene. Laboratory instruments, packing, sending, transport, import and export of biological agents. Hygiene, disinfection, decontamination, sterilization.

**UNIT V**

Biosafety regulations and guidelines. Centers for disease control and prevention and the National Institutes of Health. Occupational safety and health administration. Recombinant DNA advisory committee (RDAC), Institutional biosafety committee (IBSC), Review committee on genetic manipulation (RCGM), Genetic engineering approval committee (GEAC). Implementation of biosafety guidelines.

**TextBooks:**

1.	SateeshM. K.(2013).BioethicsandBiosafety,IKInternationalPvtLtd.ISBN:8190675702.
2.	MuthurajM.andUsharaniB.(2019).BiosafetyinMicrobiologicalLaboratories.(1sr Edition).NotionPress.ISBN10:1645878856
3.	BiosafetyinMicrobiologicalandBiomedicalLaboratories-U.S.HealthDepartment andHumanServices.(2016).(5 <sup>th</sup> Edition).Lulu.com.
4.	Kanai.L.Mukherjee.(MedicalLaboratoryTechnology(4 <sup>th</sup> Edition).CBSPublishers.
5.	Ramakrishnan(2012).ManualofMedicalLaboratoryTechniques.JP brothers.

**References:**

1.	WorldHealthOrganization,Biosafetyprogrammemanagement.(2010).(4 <sup>th</sup> Edition). WHOPublications.
2.	RashidN.(2013). ManualofLaboratorySafety(Chemical,Radioactive,and BiosafetywithBiocides)(1 <sup>st</sup> Edition).
3.	DayuanX.(2015).BiosafetyandRegulationforGeneticallyModifiedOrganisms, AlphaScience InternationalLtd,ISBN- 10:1842657917
4.	OcheiJ.Kolhatkar(2000).A.(MedicalLaboratoryScience–TheoryandPractice. ISBN;13:978-0074632239.
5.	LynneS. Garcia. ClinicalLaboratoryManagement(2 <sup>nd</sup> Edition).ASMPress

**WebResources:**

1.	<a href="https://www.cdc.gov/labs/pdf/CDC-BiosafetymicrobiologicalBiomedicalLaboratories-2009-P.pdf">https://www.cdc.gov/labs/pdf/CDC-BiosafetymicrobiologicalBiomedicalLaboratories-2009-P.pdf</a>
2.	<a href="https://ucanapplym.s3.ap-south-1.amazonaws.com/RGU/notifications/E_learning/Online_study/PG-SEM-IV-Biosafety%20regulation.pdf">https://ucanapplym.s3.ap-south-1.amazonaws.com/RGU/notifications/E_learning/Online_study/PG-SEM-IV-Biosafety%20regulation.pdf</a>
3.	<a href="https://consteril.com/biosafety-levels-difference/">https://consteril.com/biosafety-levels-difference/</a>
4.	<a href="https://www.cdc.gov/labs/pdf/CDC-BiosafetymicrobiologicalBiomedicalLaboratories-2009-P.pdf">https://www.cdc.gov/labs/pdf/CDC-BiosafetymicrobiologicalBiomedicalLaboratories-2009-P.pdf</a>
5.	<a href="https://www.who.int/publications/i/item/9789240011311">https://www.who.int/publications/i/item/9789240011311</a>

**Relationship Matrix for COs, POs and PSOs**

Semester	Code	Title of the Course					Hours	Credits			
I	23PMB1EC12	Essentials of Laboratory Management and Biosafety					6	3			
Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)					
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	
CO1	✓	✓	✓	✓	✓	✓		✓	✓		
CO2	✓	✓	✓	✓		✓		✓	✓		
CO3	✓	✓	✓		✓	✓	✓	✓	✓	✓	
CO4	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
CO5	✓	✓	✓	✓	✓	✓		✓	✓		
Number of Matches (✓) = 43      Relationship: High											

<b>Mapping</b>	1-29%	30-59%	60-69%	70-89%	90-100%
<b>Matches</b>	1-14	15-29	30-34	35-44	45-50
<b>Relationship</b>	Very Poor	Poor	Moderate	High	Very High

<b>Course Designed by</b>	<b>HOD</b>
	<b>Dr. R. ANBURAJ</b>

<b>Course Code:</b> 25PMB2EC41	<b>SEMESTER-II</b>	<b>Instruction Hours:5</b>
<b>CLINICAL AND DIAGNOSTIC MICROBIOLOGY</b>		
<b>Credits:3</b>		<b>Exam hours:3</b>

### Course Objectives

- ❖ Describe appropriate safety protocol and laboratory techniques for handling specimens and biomedical waste management.
- ❖ Develop working knowledge of techniques used to identify infectious agents in the clinical microbiology lab.
- ❖ Elucidate various diagnostic procedures in microbiology
- ❖ Acquire knowledge of different methods employed to check antibiotic sensitivity.
- ❖ Gain knowledge on hospital acquired infections and their control measures.

### Course Outcomes

- ❖ **CO1:** Apply Laboratory safety procedures and hospital waste disposal strategies.
- ❖ **CO2:** Collect various clinical specimens, handle, preserve and process safely.
- ❖ **CO3:**  
Identify the causative agents of diseases by conventional and molecular methods following standard protocols.
- ❖ **CO4:** Assess the antimicrobial susceptibility pattern of pathogens.
- ❖ **CO5:** Trace the sources of nosocomial infection and recommend control measures.

### UNIT I

Microbiology Laboratory Safety Practices - General Safety Guidelines, Handling of Biological Hazards, Infectious health care waste disposal - Biomedical waste management, Emerging and Re-emerging infections.

### UNIT II

Diagnostic procedures - General concept of Clinical specimen collection, transport, storage and general processing in Microbiology laboratory - Specimen acceptance and rejection criteria.

### UNIT III

Diagnosis of microbial diseases - Clinical, differential, Microbiological, immunological and molecular diagnosis of microbial diseases. Modern and novel microbial diagnostic methods. Automation in Microbial diagnosis.

### UNIT IV

Antibiotic sensitivity tests - Disc diffusion - Stokes and Kirby Bauer methods, E test - Dilution - Agar dilution & broth dilution - MBC/MIC - Quality control for antibiotics and standard strains.

### UNIT V

Nosocomial infections -

common types, sources, reservoir and mode of transmission, pathogenesis and control measures. Hospital Infection Control Committee (HICC) – Functions.

**TextBooks:**

1.	Collee J.G., Fraser A.G., Marmion B.P. and Simmons A. (1996). Mackie & McCartney Practical Medical Microbiology. (14 <sup>th</sup> Edition). Elsevier, New Delhi. ISBN-10:0443047219 / ISBN-13-978-0443047213.
2.	Tille P.M. (2021). Bailey and Scott's Diagnostic Microbiology. (15 <sup>th</sup> Edition). Elsevier. ISBN:9780323681056.
3.	Jawetz E., Melnick J.L. and Adelberg E.A. (2000). Review of Medical Microbiology. (19 <sup>th</sup> Edition). Lange Medical Publications, U.S.A.
4.	Mukherjee K.L. (2000). Medical Laboratory Technology. Vol. 1-3. (2 <sup>nd</sup> Edition). Tata McGraw-Hill Education. ISBN-10:0074632604.
5.	Sood R. (2009). Medical Laboratory Technology – Methods and Interpretations. (6 <sup>th</sup> Edition). Jaypee Brothers Medical Publishers (P) Ltd. New Delhi. ISBN:9788184484496.

**ReferenceBooks:**

1.	Murray P.R., Baron E.J., Tenover J.C., Tenover F.C. and Tenover R.H. (2003). Manual of Clinical Microbiology. (8 <sup>th</sup> Edition). American Society for Microbiology, Washington, DC. ISBN:1-555810255-4.
2.	Bennett J.E., Dolin R. and Blaser M.J. (2019). Principles and Practice of Infectious Diseases. (9 <sup>th</sup> Edition). Elsevier. EBook ISBN:9780323550277. Hardcover ISBN:9780323482554.
3.	Ridgway G.L., Stokes E.J. and Wren M.W.D. (1987). Clinical Microbiology 7 <sup>th</sup> Edition. Hodder Arnold Publication. ISBN-10:0340554231 / ISBN-13:9780340554234.
4.	Koneman E.W., Allen S.D., Schreckenbach P.C. and Winn W.C. (2020). Koneman's Color Atlas and Textbook of Diagnostic Microbiology. (7 <sup>th</sup> Edition). Jones & Bartlett Learning. ISBN:12843223789781284322378.
5.	Cheesbrough, M. (2004). District Laboratory Practice in Tropical Countries - Part 2, (2 <sup>nd</sup> Edition). Cambridge University Press. ISBN-13:978-0-521-67631-1 / ISBN-10:0-521-67631-2.

**WebResources**

1.	<a href="https://www.ncbi.nlm.nih.gov/books/NBK20370/">https://www.ncbi.nlm.nih.gov/books/NBK20370/</a>
2.	<a href="https://www.msmanuals.com/en-in/home/infections/diagnosis-of-infectious3disease/diagnosis-of-infectious-disease">https://www.msmanuals.com/en-in/home/infections/diagnosis-of-infectious3disease/diagnosis-of-infectious-disease</a>
3.	<a href="https://journals.asm.org/doi/10.1128/JCM.02592-20">https://journals.asm.org/doi/10.1128/JCM.02592-20</a>
4.	<a href="https://www.sciencedirect.com/science/article/pii/S2221169116309509">https://www.sciencedirect.com/science/article/pii/S2221169116309509</a>
5.	<a href="http://www.textbookofbacteriology.net/normalflora_3.html">http://www.textbookofbacteriology.net/normalflora_3.html</a>

**Relationship Matrix for COs, POs and PSOs**

Semester	Code	Title of the Course					Hours	Credits			
II	23PMB2EC41	Clinical and Diagnostic Microbiology					5	3			
Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)					
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	
CO1	✓	✓	✓	✓	✓	✓	✓	✓		✓	
CO2	✓	✓	✓	✓	✓	✓	✓	✓	✓		
CO3	✓	✓	✓	✓		✓	✓	✓	✓	✓	
CO4	✓	✓	✓	✓	✓			✓	✓	✓	
CO5	✓	✓		✓	✓	✓	✓	✓	✓		
Number of Matches (✓) = 44      Relationship: High											

<b>Mapping</b>	1-29%	30-59%	60-69%	70-89%	90-100%
<b>Matches</b>	1-14	15-29	30-34	35-44	45-50
<b>Relationship</b>	Very Poor	Poor	Moderate	High	Very High

<b>Course Designed by</b>	<b>HOD</b>
	<b>Dr. R. ANBURAJ</b>

<b>CourseCode:</b> 25PMB2EC42	<b>SEMESTER-II</b>	<b>InstructionHours:5</b>
<b>HERBALTECHNOLOGY</b>		
<b>Credits:3</b>		<b>Examhours:3</b>

### Course Objectives

- ❖ Understand the fundamental concepts of pharmacognosy, its history, and its relevance to Indian traditional systems of medicine (Ayurveda, Siddha, Unani).
- ❖ Identify and classify locally available medicinal plants based on taxonomy, morphology, chemical constituents, and therapeutic uses.
- ❖ Gain knowledge of the cultivation, processing, and evaluation of crude drugs and their role in traditional and modern medicine.
- ❖ Explore the use of herbal medicines in the treatment of various human ailments including cardiovascular, neurological, and respiratory disorders.
- ❖ Understand conservation, biotechnology, and regulatory aspects including plant propagation, drug adulteration, intellectual property rights, and herbal exports.

### Course Outcomes

- ❖ Define pharmacognosy and explain the role of traditional medicine systems in modern healthcare practices.
- ❖ Identify and describe medicinal plants by their vernacular names, families, morphological features, and geographical sources.
- ❖ Demonstrate knowledge of crude drug processing, including collection, storage, and market preparation.
- ❖ Classify and evaluate herbal drugs based on their pharmacological properties and usage in treating common diseases.
- ❖ Apply principles of plant propagation and biotechnology to conserve rare medicinal plants and understand legal and marketing frameworks for herbal products.

### UNIT-I

Pharmacognosy - Definition and history, Indian systems of medicine- Siddha, ayurvedha, and Unani systems. Taxonomy of locally available medicinal plants, their chemical constituents and medicinal uses - Classification of Crude drugs - Chemistry of Drugs - Future of pharmacognosy.

### UNIT -II

Classification of medicinal plants - Vernacular name and family - Geographical source, cultivation, collection, and processing for market and commerce included drugs. Morphological and histological studies, chemical constituents - Therapeutic and other pharmaceutical uses. Underground stem - ginger, Alpinia - Roots - Rauolfia - Belladonna - Aerial parts - Bark - Cinchona.

### UNIT-III

Leaves - Adathoda, Eucalyptus - Flower - Clove fruits seeds - Nuxvomica Nutmegs, Gooseberry - unorganized drugs - Gum - Acacia - Resin - Turpentine, fixed oil - castor oil.

### UNIT -IV

Herbal medicines for human ailments - Drugs acting on cardiac diseases, cerebral diseases, Nasal, diseases - Blood pressure Drugs acting on Nervous system - Depressants - Stimulants Respiration and Drugs - Urogenital system and drugs - Psychoactive plants.

### UNIT-V

Propagation of medicinal plants - Micro and macro propagation conservation of rare medicinal plants Role of biotechnology in medicinal plants banks - cultivation of medicinal and aromatic plants - Drug adulteration - methods of Drug evaluation, Herbal food - Food processing - packaging - Herbal sale and Export of medicinal plants - marketing - Intellectual property rights - Export laws.

## References

1.	GeorgeEdwardTreaseandW.C.Evans- Pharmacognosy12thedition,EnglishLanguageBooksSociety,BaelliereTindall.
2.	Handa,S.S.andKapoor,V.K.Pharamcognosyby2ndEdition,VallabhPrakashanPublishers,NewDelhi.
3.	Jain, S.K(1980)IndianMedicinalplants
4.	Kokate,C.K.,Durohit,A.P.andGokhale,S.R.,Pharmacognosyby12thedition-NiraliPrakashamPublishers,Pune.
5.	Wallis,T.E,Textbookof pharmacognosyby5thedition.CBSpublishersanddistributors,New Delhi.

### RelationshipMatrixforCOs,POsandPSOs

Semester	Code	TitleoftheCourse					Hours	Credits			
II	23PMB2EC42	HerbalTechnology					5	3			
CourseO utcomes( COs)	ProgrammeOutcomes(POs)					ProgrammeSpecificOutcomes(PSOs)					
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	
CO1	✓	✓	✓	✓	✓	✓	✓	✓		✓	
CO2	✓	✓		✓	✓	✓	✓	✓	✓		
CO3	✓	✓	✓	✓		✓	✓	✓	✓	✓	
CO4	✓	✓	✓		✓			✓	✓	✓	
CO5	✓	✓		✓	✓	✓	✓	✓	✓		
Number ofMatches(□) =41 Relationship:High											

Mapping	1-29%	30-59%	60-69%	70-89%	90-100%
Matches	1-14	15-29	30-34	35-44	45-50
Relationship	VeryPoor	Poor	Moderate	High	VeryHigh

Course Designed by	HOD
	Dr. R. ANBURAJ

<i>CourseCode:</i> <b>25PMB2N ME1</b>	<i>SEMESTER-II</i>	<i>InstructionHours:</i> <b>2</b>
<b>SERICULTURE</b>		
<b>Credits:</b> <b>2</b>		<b>Examhours:</b> <b>3</b>

### Course Objectives

- ❖ Acquire knowledge on the concepts of origin, growth and study of Sericulture as science and scientific approach of mulberry plant
- ❖ Describe the morphology and physiology of silkworm.
- ❖ Discuss effective management of silkworm diseases.
- ❖ Demonstrate field skills in mulberry cultivation and silkworm rearing with an Emphasis on technological aspects.
- ❖ Demonstrate entrepreneurship abilities, innovative thinking, planning, and setting up Small-scale enterprises.

### Course Outcomes

- ❖ **CO1:** Discuss the overall aspects of Sericulture and the biology and varieties of mulberry plant. Creates awareness among students about the economic importance and suitability of Sericulture in Indian conditions.
- ❖ **CO2:** Familiarize with the lifecycle of silk worm.
- ❖ **CO3:** Explain common diseases of silkworm encountered during rearing, sources of infection, disease symptoms, pre-disposing factors and their management practices.
- ❖ **CO4:** Attain thorough knowledge about the cultivation of mulberry, maintenance of the farm, seed technology, silkworm rearing, post cocoon techniques like stifling, reeling, and utilization of by-products.
- ❖ **CO5:** Analyze the importance of ericulture in entrepreneurship development

### Unit I

General introduction to Sericulture, its distribution in India. Botanical distribution and taxonomical characters of mulberry varieties and species. Biology of Mulberry plant and Mulberry crop cultivation and protection.

### Unit II

Silkworm- biology-morphology of silkworm. Life cycle of silkworm- egg, larva, pupa, and moth.

### Unit III

Silkworm pathology: Introduction to Parasitism, Commensalism, Symbiosis and Parasite relationship - Mulberry Silkworm Diseases: Introduction, types, Pebrine, Grasserie, Muscardine, Flacherie, Symptoms and Pathogens, Mode of Infection, Prevention and Control -Non – mulberry silkworm diseases: Pebrine, Bacterial and viral diseases. Brief Account of Pests and Predators of Silkworms, Nature of damage and control measures.

### Unit IV

Rearing of silkworm. Cocoon assessment and processing technologies. Value

added products of mulberry and silkworms

## Unit V

Entrepreneurship and rural development in sericulture: Planning for EDP, Project formulation, Marketing, Insectary facilities and equipments: Location, building specification, air conditioning and environmental control, furnishings and equipment, sanitation and equipment, subsidiary facilities.

### Text Books

1. Ganga, G. and Sulochana Chetty (2010). Introduction to Sericulture,, J., Oxford and IBH Pub. Co. Pvt. Ltd., New Delhi.
2. Dr. R. K. Rajan&Dr. M. T. Himantharaj(2005). Silkworm Rearing Technology, Central Silk Board, Bangalore
3. Dandin S B, Jayant Jayaswal and Giridhar K (2010). Handbook of Sericulture technologies,Central Silk Board, Bangalore
4. M. C. Devaiah, K. C. Narayanaswamy and V. G. Maribashetty(2010). Advances in Mulberry Sericulture,,CVG Publications, Bangalore
5. T.V.SATHEANDJADHAV.A.D.(2021). SERICULTURE AND PEST MANAGEMENT, Daya Publishing House.

### References Books

1. S. Morohoshi (2001). Development Physiology of Silkworms 2<sup>nd</sup> Edition, Oxford & IBH Publishing Co. Pvt. Ltd. New Delhi
2. Hamamura, Y (2001). Silkworm rearing on Artificial Diet. Oxford & IBH publishing Co., Pvt. Ltd. NewDelhi.
3. M.Johnson, M.Kesary (2019).Sericulture, 5<sup>th</sup>.Edition.Saras Publications.
4. Manisha Bhattacharyya (2019).Economics of Sericulture, Rajesh Publications
5. Muzafar Ahmad Bhat, Suraksha Chanotra, Zafar Iqbal Buhroo, Abdul Aziz and Mohd.Azam (2020).A Textbook on Entrepreneurship Development Programme in Sericulture, IP Innovative Publication.

### Web Resources

1. <https://archive.org › details › SericultureHandbook>
2. <https://egyankosh.ac.in › bitstream>
3. <https://www.academic.oup.com>
4. <https://www.sericulture.karnataka.gov.in>
5. <https://www.silks.csb.gov.in>

### Relationship Matrix for COs, POs and PSOs

Semester	Code	Title of the Course					Hours	Credits			
II	23PMB2NME1	SERICULTURE					2	2			
Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)					
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	
CO1	✓	✓	✓	✓	✓	✓	✓	✓		✓	
CO2	✓	✓	✓	✓	✓	✓	✓	✓	✓		
CO3	✓		✓	✓			✓	✓	✓	✓	
CO4	✓	✓	✓	✓	✓		✓		✓	✓	
CO5	✓	✓		✓	✓	✓	✓	✓	✓		
Number of Matches (✓) = 41      Relationship: High											

Mapping	1-29%	30-59%	60-69%	70-89%	90-100%
Matches	1-14	15-29	30-34	35-44	45-50
Relationship	Very Poor	Poor	Moderate	High	Very High

Course Designed by	HOD
	Dr. R. ANBURAJ