Semester II

Practical I - Biochemistry and Ecobiology
Course Code: PZ20P1

No. of hours/week	No of credits	Total number of hours	Marks
4	4	60	100

Learning Objectives

1. To design and perform biochemical experiments.
2. To understand the interaction between abiotic and biotic environment.

Course Outcomes

CO	Upon completion of this course the students will be able to:	PSO addressed	CL
CO - 1	describe the knowledge necessary for professional or academic work in the field of biochemistry and ecology.	PSO - 1	U
CO - 2	analyse the biomolecules and physico-chemical parameters in samples.	PSO - 2	An
CO - 3	develop drawing and writing skills and design experiments.	PSO - 4	Ap
CO - 4	estimate the components of an ecosystem.	PSO - 2	E

Teaching Plan with Modules
Total Hours 30

S. No	Topics	Hours	Learning Outcome / CO addressed	Pedagogy	Assessment
1	Colorimetry- verification of Beer-Lambert's law.	2	Demonstrate the principle of Beer-Lambert's law in biological samples using colorimetry **CO 1**	Demonstration in lab, Virtual demonstration, Hands on training	Test Record Testing the skill in preparation of solutions
2	Preparation of Acid & Alkali solutions and acid-base titration applying Henderson-Hasselbalch' equation.	4	Prepare Acid & Alkali solutions and identify the pH of an unknown solution **CO 2**		
3	Preparation buffers of known pH and solutions of known molarity, normality, percentage, ppt, ppm.	4	Prepare solutions of different units and use in biochemical studies **CO 2**		
4	Chromatographic separation of amino acids.	2	Interpret the aminoacid composition of		

			biological samples **CO 2**		
5	Quantitative estimation of glucose (Blood/ Tissue).	3	Analyze the changes in glucose level of any sample **CO 3**		
6	Quantitative estimation of protein (standard graph).	3	Evaluate the protein level of any sample. **CO 3**		
7	Quantitative estimation of total lipid (Blood/ Tissue).	3	Analyze the changes in lipid level of any sample **CO 3**		
8	Quantitative estimation of ascorbic acid.	2	Explore the level of ascorbic acid **CO 3**		
9	Quantitative estimation of blood urea.	2	Analyse the changes in glucose level of any sample **CO 3**		
10	Determination of salivary amylase activity in relation to substrate applying Michaelis - Menten equation.	3	Interpret the role of salivary amylase activity on substrates **CO 2**		
11	**Instruments/Charts/ Models** Colorimeter, pH Meter, Centrifuge, Chromatogram, Electrophoretic unit	2	Identify the instruments and discuss its applications **CO1**	Video on the components of the insturments	

Course Instructor
Dr. J. Josephine Vinoliya Mary

Head of the Department
Dr. S. Mary Mettilda Bai

Teaching plan with Modules

Total Hours: 30 (Incl. Test)

Ecobiology (30 Hours)

Unit	Modules	Topics	Hours	Learning outcome / CO addressed	Pedagogy	Assessment
I	1	Measurement of primary	2	Recall primary productivity	Online Practical	

		productivity (O_2 measurement method).		and its measurement **(CO-2,3)**	Videos, You tube links, Record writing & submitting on Google Classroom	Self-assessment
	2	Sampling of animal population using quadrate method.	2	Identify various animal population of an area. **(CO-3)**	Online Practical Videos, Practical in the students house yard, Record writing & submitting on Google Classroom	Performance - based Assessment.
	3	Observation of life table in an insect.	4	Recognise the stages in the life table of an insect. **(CO-3)**	Online Practical Videos, You tube links, Record writing & submission	Model examination
	4	Collection and identification of fresh water planktons.	4	Identify the different freshwater planktons of an area. **(CO-3)**	Field Visit in the students' neighbourhood/ You tube links, Record writing & submitting on Google Classroom	
	5	Measurement of turbidity using Secchi disc.	2	Spot the turbidity of any water body. **(CO-2)**	Videos, You tube links	
	6	Estimation of LC_{50} of a pesticide.	4	Test the LC_{50} of a pesticide. **(CO-2)**	Practical Videos, You tube links	
	7	Estimation of H_2S in water sample.	2	Identify the H_2S content in any water sample. **(CO-2)**	Online Practical Videos, You tube links, Record writing & submitting on Google Classroom	

	8	Estimation of salinity in water sample.	2	Test the salinity of a water sample. **(CO-2)**	Online Practical Videos, You tube links, Record writing & submitting on Google Classroom	
	9	Estimation of CO_2 in water sample.	2	Identify the amount of CO_2 in water sample. **(CO-2)**	Online Practical Videos, You tube links, Record writing & submitting on Google Classroom	
	10	Study report of a pond ecosystem.	2	Document on a pond ecosystem that has been visited. **(CO-3)**	Field Visit in their neighbourhood/ You tube links, Record writing & submitting on Google Classroom	
	11	Commensalisms (Shark and *Echeneis*), Mutualism (Sea anemone and Hermit crab).	2	Discriminate between commensalism and mutualism. **(CO-3)**	e-Content on Spotters, PDF, Related Videos	
	12	Food chain, Food web, Conventional energy source (coal) and non-conventional energy source (wind mill).	2	Identify between conventional and non-conventional energy source. **(CO-3,5)**	e-Content on Spotters,PDF, Related Videos	

Course Instructor
Dr. Jeni Chander Padua

Head of the Department
Dr. S. Mary Mettilda Bai

Semester IV
Name of the Course : Microbiology
Course code : PZ1741

Teaching plan

Unit	Modules	Topics	Hours	Learning outcome	Pedagogy	Assessment
I	**Introduction, Classification of microorganisms** (18 hrs)					
	1.	History and Scope of Microbiology. Classification of microorganisms - Whittaker's five kingdom classification. Three domain classification.	4	Recall the history and scope of Microbiology, Classify and identify the microorganisms	Lecture, Discussion, PPT	MCQ Seminar Online Assignment Formative Assessment I (1,2,3,4,5, 6) Quiz I
	2.	Viruses - General properties. Structure of viruses. Viral taxonomy.	3	Identify the taxonomical status of a virus.	Lecture, PPT, YouTube learning	
	3.	Bacteriophages: Reproduction of DNA and RNA phages. Temperate bacteriophages and lysogeny.	4	Describe the bacteriophage reproduction	Lecture, PPT,Video - animation	
	4.	Cytocidal infections and cell damage, persistent, latent and slow virus infections.	3	Explain the viral infections	Lecture, PPT, video	
	5.	Cultivation of viruses and purification assays.	2	Cultivate the virus and purify the virus using different assays.	Lecture, Mind map	
	6.	Viruses and cancer. Viroids and Prions	2	Explain the relationship of cancer and virus.	Lecture and PPT, Xenography.	
II	**Bacteria** (18 hrs)					
	1.	Classification, Bergey's system of bacterial classification	2	Classify the microorganism	Lecture, PPT, Quiz	MCQ Seminar Online Assignment Formative Assessment I (1,2,3,4,5) Quiz I Formative Assessme
	2.	Bacterial morphology and fine structure of *Escherichia coli*.	2	Recite the structure of *E. coli.*	Lecture PPT, Reflective	
	3.	Bacterial nutrition - Common nutrient requirements. Nutritional classes. Uptake of nutrients.	3	Apply the types of nutrient to culture bacteria	Lecture, PPT, Project-based	
	4.	Bacterial growth and measurement of growth. Influence of environmental factors on growth. Synchronous growth.	3	Culture the bacteria and assess their growth.	Lecture, PPT Experiment	
	5	Continuous culture – Chemostat and turbidostat.	2	Culture bacteria using chemostat and turbidostat.	Lecture, Problem-based	
	6.	Types of culture media.	3	Select the	PPT,	

				appropriate culture media.	Experiment	nt II (6,7) Quiz II
	7.	Pure culture and methods of isolating pure cultures (streak plate technique and Pour-plate technique).	3	Culture the bacteria and isolate using different methods.	PPT Video Experiment	
III	**Industrial Microbiology** (18 hrs)					
	1.	Fermentation and microbes - fermenter and types of fermenters (air-lift fermenter and stirred tank fermenter).	3	Explain the types of fermenters	Lecture, Self learning	MCQ Short test Seminar Online Assignment Formative Assessment II (1,2,3,4, 5,6,) Quiz II
	2.	Production of microbial products: alcohol (ethanol), antibiotics (penicillin), vitamin B_2 and Vitamin B_{12}.	4	Make microbial products	Lecture, Demonstration, Team teaching	
	3.	Biofertilizers - steps for preparing bacterial biofertilizers.	2	Prepare biofertilizers.	Lecture, Video, Project-based	
	4.	Mass cultivation of Cyanobacteria and *Azolla.* Production of mycorrhizal fungi and VAM fungi.	4	Train and cultivate Cyanobacteria and *Azolla*, mycorrhizal and VAM fungi	Lecture, Virtual, Experiment	
	5.	Bacterial insecticides – *Pseudomonas* species and *Bacillus* species	3	Develop bacterial insecticides	Lecture, PPT, Problem-based	
	6.	Food spoilage and food preservation.	2	Preserve food	Lecture, PPT, Problem-based	
IV	**Environmental Microbiology**(18 hrs)					
	1.	Drinking water and microbiological analysis of water purity - Coliform test.	4	Analyze the purity of the drinking water	Lecture, Demonstration, Project-based	MCQ Seminar Online Assignment Formative Assessment II (1,2) Quiz II Formative Assessment III (3,4,5,6)
	2.	Most Probable Number (MPN) test, Membrane Filter (MF) test, Purification of water	2	Analyze the water using MPN and MF test	Lecture, PPT, Problem-based	
	3.	Sewage treatment – small scale, Large scale (primary, secondary , and tertiary) treatment	2	Explain sewage treatment	Lecture, Video, Project-based	
	4.	Biogas production – solubilization, acetogenesis and methanogenesis.	3	Discuss the use and method of production of biogas	Lecture, Video, Quiz	
	5.	Microbial leaching – copper and Uranium leaching.	3	Explain copper and uranium leaching using microbes	Lecture, PPT, Technology-based	
	6.	Biodegradation of petroleum and Xenobiotics.	4	Narrate the biodegradation of petroleum and xenobiotics	Video, PPT, Technology-based	

V	**Antimicrobial agents, Microbes and diseases** (18 hrs)					
	1.	Classification, Drug administration.	2	Classify microbial agents and drug usage.	Lecture, Chalk and talk	MCQ Seminar Online Assignment Formative Assessment - III (1,2,3,4, 5,6,7)
	2.	Determining of antimicrobial activity, Mechanism of antimicrobial agent, effectiveness of antimicrobial drugs, Drug resistance, drug dosage.	3	Narrate the mechanism of effectiveness of antimicrobial drugs.	Lecture, Mind map, Problem-based	
	3.	Antibacterial drug (penicillin), antifungal drug (nystatin), antiviral drug (amantadine), Current problems of antibiotic resistance in man.	3	Explain the antimicrobial drugs and their resistance.	Lecture, PPT, Project-based, team teaching	
	4.	Microbes and diseases- Gnotobiotic animals, distribution of normal microbiota of the human body.	1	Discuss the Gnotobiotic and micro biota of the human body.	Lecture, Group discussion	
	5.	Mechanism of microbial pathogenesis, Nosocomial infections.	1	Explicate the mechanism microbial pathogenesis.	Lecture, PPT, Project-based	
	6.	Protozoan diseases: Malaria and Amoebiasis, Fungal diseases: Mycotoxicosis and Aspergillosis, Bacterial diseases: Airborne diseases – Meningitis and Streptococcal pneumonia, Food and water borne diseases: Cholera and Typhoid. Soil borne diseases: Tetanus and Anthrax.	5	Elucidate the microbial diseases.	Lecture, PPT, Card method.	
	7.	Sexually transmitted and contact diseases – Gonorrhea and Syphilis, Viral diseases: Ebola, Hepatitis-B, Rabies and AIDS.	3	Give awareness on STD.	Lecture, Video, Case study	

Course instructor
Dr. A. Shyla Suganthi

Head of the Department
Dr. S. Mary Mettilda Bai

Semester IV
Name of the Course : Ecobiology
Course code : PZ1742

Teaching Plan

Unit	Modules	Topics	Hours	Learning outcome	Pedagogy	Assessment
I	**I** (18 Hrs)					
	1	Introduction: Scope of Ecobiology and need for public awareness.	3	Explain the advantages of being aware of ecobiology concepts.	Lecture, Chalk and talk	Short test, MCQ, Mind map Seminar, Online assignment, Formative assessment I (1,2,3,4,5) Quiz I
	2	Ecosystem: Concepts of ecosystem – structure and functions.	3	Summarize ecosystem and its functions.	Video classes, Lecture.	
	3	Energy flows – single channel energy model, Y - shaped energy flow models.	3	Differentiate between the various models of energy flow.	Lecture, Chalk and talk	
	4	Productivity - Primary production, secondary production, measurement of primary productivity.	4	Summarize productivity and its types.	Lecture, Chalk and talk	
	5	Habitat ecology: freshwater, marine, estuarine, mangrove and terrestrial.	5	Differentiate between the various ecological habitats.	Lecture, Blended learning.	
II	**II** (18 Hrs)					
	1	Population: Structure and regulation, growth form, population fluctuations, population processes.	4	Summarize the concept of population and various processes associated with it.	Lecture, Chalk and talk	MCQ , Seminar, Online assignment, Formative assessment I (1,2,3) Quiz I Online assignment, Seminar Formative assessment II (4,5) Quiz II
	2	Life table - diagrammatic and conventional life tables, Life history strategies.	3	Explain life table and life history strategies.	Lecture, Chalk and talk	
	3	Community: Concept, basic terms, community structure, composition and stratification.	4	Describe community concept, structure etc.	Lecture. Flipped learning	
	4	Ecological niche, Ecotone and Edge effect, Ecotype.	3	Explain ecological niche and ecotype.	Lecture, Flipped learning	

	5	Ecological succession: types, general process, Concept of climax.	4	Summarize ecological succession.	Lecture, PPT	
III	**III** (18 Hrs)					
	1	Environment in action: Climatic factors (climate, precipitation, temperature, light, oxygen, carbon dioxide and pH), topographic factors, edaphic factors (soil formation, soil profile, soil organisms).	6	Summarize the various environmental factors	Lecture , Chalk and talk	Short test, MCQ, Mind map Online assignment, Seminar Formative assessment II (1,2,3,4) Quiz II
	2	Biotic factors (symbiosis, commensalism, parasitism and competition).	4	Compare various biotic factors.	Lecture, Flipped learning.	
	3	Biological clock: biological rhythms and mechanism of biological clock.	3	Explain biological clock.	Lecture, PPT	
	4	Natural resource ecology: Concept and classification of resource, mineral resource, land resource, forest resource, water resource, energy resource (conventional and non-conventional).	5	Describe, differentiate and classify natural resources.	Lecture, Chalk and talk	
IV	**IV** (18 Hrs)					
	1	Biogeochemical cycles: water cycle, carbon cycle, nitrogen cycle, sulphur cycle and phosphorus cycle.	6	Summaries biogeochemical cycles and differentiate them.	Lecture, PPT	Short test, MCQ, Mind map Online assignment, Seminar Formative assessment II (1) Quiz II Formative assessment III (2,3,4,5)
	2	Biogeography: patterns of distribution (continuous, discontinuous, endemic), descriptive zoogeography, zoogeographical regions of the world. Dynamic biogeography (dispersal dynamics, dispersal pathways, migration, ecesis).	5	Explain the patterns of distribution and zoogeography.	Lecture, Flipped learning, Group discussion	
	3	Natural Disasters: Floods, earthquakes, cyclones, landslides, Tsunami, Mitigation and Disaster Management.	5	Evaluating the causes, effects and mitigation strategies for natural disasters.	Lecture, Interactive session.	

	4	Urbanization: Possible advantages of urbanization – problems, solutions.	1	Summarize the advantages, problems and solutions for urbanization.	Lecture, PPT	
	5	Remote sensing and its applications.	1	Describe the applications of remote sensing.	Lecture, Chalk and talk	
V	**V** (18 Hrs)					
	1	Pollution ecology: Causes, effects and control measures of air pollution, water pollution, soil pollution, noise pollution, thermal pollution, nuclear hazards.	7	Describe the causes, effects and control of pollution	Lecture, Chalk and talk	MCQ, Short test , Online assignment, Seminar Formative assessment III (1,2,3,4)
	2	Greenhouse Gas emission and climate change.	3	Evaluating climate change and possible intervention strategies.	Lecture, Interactive discussion.	
	3	Waste management: solid, liquid and gaseous wastes. E-wastes.	3	Describe the management of wastes.	Lecture, Chalk and talk	
	4	Toxicology: Biomagnification and bioaccumulation, toxicants, classification, toxicity (LC_{50} and LD_{50}), mode of action.	5	Identify toxicants, classify them and describe their mode of action.	Lecture, Chalk and talk	

Course instructor
Dr. Jeni Chandar Padua

Head of the Department
Dr. S. Mary Mettilda Bai

Semester IV
Name of the Course : Biotechnology & Nanobiology Course
code : PZ1743

Teaching Plan

Unit	Modules	Topics	Hours	Learning outcome	Pedagogy	Assessment
I	**Gene cloning** (18 hrs)					
	1	Basic steps of gene cloning, restriction and modifying enzymes, linkers and adaptors.	4	Explain gene cloning, restriction and modifying enzymes.	Lecture, Video class	MCQ, Short test, Seminar, Online Assignment, Formative Assessment I (1,2,3,4,5) Quiz I
	2	Cloning and expression vectors, construction of chimeric DNA	4	Analyse construction of chimeric DNA.	Lecture PPT	
	3	Nucleic acid probes, DNA libraries.	3	Gain knowledge on DNA libraries.	Lecture	
	4	Polymerase chain reaction, molecular markers.	3	Discuss the Polymerase chain reaction and molecular markers.	Lecture, Video class	
	5	DNA sequencing, synthesis of oligonucleotides. Human Genome Project.	4	Appreciate human genome project.	Lecture	
II	**Animal Biotechnology** (18 hrs)					
	1	Primary culture and cell lines; pluripotent stem cell lines; tissue engineering.	4	Appreciate the advances in tissue engineering.	Lecture, Video class	Short test, Mind map, Objective test, Formative Assessment I (1,2,3) Quiz I Formative Assessment II (4, 5) Quiz II
	2	*In vitro* fertilization and embryo transfer in animals; gene transfer methods.	4	Apply gene transfer methods in producing transgenic species.	Lecture, Video class	
	3	Primary explantation techniques – organ and embryo culture.	3	Explain organ and embryo culture.	Lecture, Group discussion	
	4	Transgenic animals and the knockouts.	3	Discuss transgenic animals.	Lecture, video	
	5	Biotechnology and aquaculture: ploidy induction, gynogenesis and androgenesis.	4	Describe ploidy induction, gynogenesis and androgenesis.	Lecture, PPT	
III	**Medical Biotechnology** (18 hrs)					
	1	Hybridoma technology and Monoclonal antibodies.	4	Prepare monoclonal antibodies.	Lecture, Video class	Short test, MCQ,

	2	Applications of biotechnology in medicine, Vaccines, diagnostics and forensics.	4	Apply biotechnology in medicine, Vaccines, diagnostics and forensics.	Lecture, Video class	Objective test, Seminar, Online Assignment, Formative Assessment II (1,2,3,4,5), Quiz II
	3	Enzyme biotechnology: Isolation and purification of enzymes, uses of enzymes in industries, immobilization of enzymes and their uses.	5	Demonstrate immobilization of enzymes and their uses.	Lecture, PPT	
	4	Biosensors. Terminator and traitor technology.	3	Describe the types and applications of biosensors.	Lecture	
	5	Intellectual Property Rights.	2	Gain knowledge on Intellectual Property Rights.	Lecture	
IV	**Industrial and Environmental Biotechnology** (18 hrs)					
	1	Production of metabolites - Downstream processing and *in situ* recovery of products.	4	Demonstrate downstream processing.	Lecture, Video class	MCQ, Formative Assessment II (1,2) Quiz II Formative Assessment III (3,4,5)
	2	Microbial biotransformation, microbial biomass production (SCP).	3	Discuss microbial biotransformation, microbial biomass production.	Lecture, PPT	
	3	Bioremediation and Phytoremediation.	3	Explain the process of bioremediation.	Lecture, Video class	
	4	Genetically engineered microorganisms (GEMs) - treating oil spills, detection of pesticide in soil and their degradation, sequestering heavy metals.	5	Summarizes the importance of GEMs	Lecture, PPT	
	5	Biomining and Biofuels.	3	Explain the production of biomining and biofuels.	Lecture, seminar	
V	**Nanomaterials**(18hrs)					Short test, Seminar, Online Assignment,
	1	Types and properties, DNA and protein nanoarrays	3	Explain the basics of nanotechnology	Lecture, PPT	
	2	Biosystems (microbes) as nanofactories.	3	Summarize biosystems as nanofactories.	Lecture, Video class	

	3	Application of nanotechnology - medical diagnostics, imaging and drug delivery, agro-practices and food related nanoproducts, cosmetics, contact lenses and dental implants.	5	Discuss the applications of nanotechnology.	Lecture, Video class	Formative Assessment III
	4	Nanotechnological approaches for environmental remediation, prevention of contamination, environment maintenance and quality enhancement.	4	Illustrate Nanotechnological approaches for environmental remediation.	Lecture, PPT	
	5	Risks and threats of nanoparticles in environment.	3	Describe Risks and threats of nanoparticles in environment.	Lecture, Group discussion	

Course instructor
Dr. A. Punitha

Head of the Department
Dr. S. Mary Mettilda Bai

Semester IV
Name of the Course : Medical Entomology
Course code : PZ1745

Teaching plan

Unit	Modules	Topics	Hours	Learning outcome	Pedagogy	Assessment
I	**Introduction,Insects of medical importance** (18 Hrs)					
	1	Fundamentals and scope of medical entomology.	3	Explain the meaning of terms of entomology.	Lecture, Chalk and talk	Short test, MCQ, Online Assignment, Seminar, Formative Assessment I (1,2,3,4,5), Quiz I
	2	Insects of medical importance: filth breeding insects.	3	Identify the filth breeding insects.	Lecture, PPT, Project.	
	3	Insects of medical importance: venomous insects.	4	Recall venomous insects.	Lecture, PPT, Quiz	
	4	Insects of medical importance: blood sucking insects.	4	Discuss on the blood sucking insects.	Lecture, PPT, You tube learning	
	5	Insects affecting physiology.	4	Explain the mechanism of insect physiology.	Lecture, PPT, Xenography	
II	**Life cycle of human parasitic insects** (18 Hrs)					
	1	Lice, fleas, mosquitoes, house flies and tsetse fly.	5	Describe the life cycle of human parasitic insects.	Lecture, PPT,	MCQ, Memory matrix, Online assignment, Seminar, Formative Assessment I (1,2,3), Quiz I, Formative Assessment II (4), Quiz II
	2	Immunity to human parasites.	5	Explain the mechanism of immunity to human parasites.	Lecture, PPT, Team teaching	
	3	Host-parasitic relationships.	3	Discuss the host-parasite relationship.	Lecture, PPT	
	4	Ecological adaptive features among human parasites.	5	Discuss different adaptive mechanism of human parasites.	Lecture, PPT, Chalk and talk, Virtual learning	
III	**Vector Entomology** (18 Hrs)					
	1	Scope of vector entomology Vector borne diseases.	4	Recall vector borne diseases.	Lecture, Self learning	MCQ Short test, Online assignment, Seminar, Formative Assessment II
	2	Mechanism of transmission in human beings-mechanical.	3	Explain the transmission of vector borne diseases.	Lecture, Reflective, PPT, Web based	
	3	Mechanism of transmission	5	Differentiate the	Lecture,	

		in human beings- biological, myiasis.		biological and mechanical mode of transmission.	PPT, Andragogy	(1,2,3,4,5) Quiz II Memory matrix
	4	Common vector insects and their identification: mosquitoes, sand flies, black flies, house fly, tsetse fly, human flea and human louse.	6	Recall the common vector insects.	Lecture, PPT, Project	
IV	**Medical importance and management** (18 Hrs)					
	1	Lice- body, head and pubic louse.	3	Differentiate different louse of human	Lecture, PPT, Project, Discussion	MCQ, Short test, Online assignment, Seminar, Formative Assessment II (1,2) Quiz II, Formative Assessment III (3,4,5)
	2	Fleas- flea nuisance, plague, flea-borne endemic typhus.	3	Discuss flea related diseases	Lecture, PPT, Virtual	
	3	Mosquitoes- nuisance, malaria, filariasis, yellow fever, dengue	4	Recall different mosquito related diseases	Lecture, PPT, Discussion	
	4	House flies- common and greater house fly- typhoid, dysentery, diarrhea, cholera, amoebiasis, gastroenteritis.	4	Differentiate dysentery, diarrhea, cholera and amoebiasis.	Lecture, PPT, Jigsaw	
	5	Tsetse fly- Gambian and Rhodesian sleeping sickness.	4	Discuss the symptoms and treatment for sleeping sickness.	Lecture, PPT	
V	**Vector control** (18 Hrs)					
	1	Insecticides - use and consequences.	4	Discuss different insecticides.	Lecture, PPT, Discussion	MCQ Short test, Online assignment, Seminar, Formative Assessment III (1,2,3,4,5)
	2	Use of bio-control agents and bio-pesticides.	4	Differentiate bio-pesticides and insecticides.	Lecture, PPT	
	3	Use of bio-control agents - bacillus and predatory fishes.	3	Identify predatory fishes.	Lecture, PPT, Project, Problem	
	4	National programmes related to vector borne diseases- malaria- N.M.E.P., N.M.C.P.	3	Explain different National programmes related to vector borne diseases.	Lecture, PPT, Discussion	
	5	National programmes related to vector borne diseases- filarial- N.F.C.P., N.F.E.P.	4	Explain different National programmes related to vector borne diseases.	Lecture, PPT, Discussion	

Course instructor
Dr. C. Josephine Priyadharshini

Head of the Department
Dr. S. Mary Mettilda Bai

Semester IV

Name of the Course :Practical IV - Microbiology, Ecobiology & Biotechnology and Nanobiology

Course Code : PZ17P4

Teaching plan

Unit	Modules	Topic	Hours	Learning outcome	Pedagogy	Assessment
I	**Microbiology**(30 Hrs)					
	1	Sterilization of glassware.	2	Recall the importance of sterilization of glassware.	Demonstration and practical	Pre-assessment.
	2	Preparation of culture media.	2	Prepare and select the appropriate culture media.	Demonstration, Practical	Performance-based Assessment.
	3	Isolation of bacteria from soil, air and water.	2	Isolate the bacteria from different samples.	Practical	
	4	Serial dilution – pure culture of bacteria.	4	Culture different bacteria.	Practical	
	5	Observation of bacterial motility – hanging drop method.	2	Recognize the motility of bacteria.	Demonstration, Practical	
	6	Simple staining of bacteria.	2	Identify bacteria by simple staining.	Demonstration, Practical	Self-assessment
	7	Gram staining of bacteria.	2	Categorize bacteria.	Practical	
	8	Negative staining of bacteria.	2	Spot the bacteria.	Practical	
	9	Methylene blue reductase test for testing the quality of milk.	4	Test the quality of milk.	Demonstration, Practical	
	10	Test for antibiotic sensitivity.	4	Analyze the resistance and sensitivity of the bacteria.	Demonstration, Practical	
	11	**Charts/ Models** *Streptococcus, Salmonella, Corynebacterium, Clostridium*, Influenza virus, Rabies virus, Hepatitis –B, HIV, *Entamoeba, Aspergillus*,	4	Discriminate different micro-organism and explain the apparatus used for microbiological studies.	Practical	

		root nodules, *Azolla*, ocular and stage micrometer, Autoclave, Laminar flow				
II	**Ecobiology**(30 Hrs)					
	1	Measurement of primary productivity (O_2 measurement method).	2	Recall primary productivity and its measurement	Practical	Self-assessment Performance-based Assessment. Model examination
	2	Sampling of animal population using quadrat method.	2	Identify various animal population of an area.	Practical	
	3	Observation of life table in an insect.	4	Recognise the stages in the life table of an insect.	Practical	
	4	Collection and identification of freshwater planktons.	4	Identify the different freshwater planktons of an area.	Practical	
	5	Measurement of turbidity using Secchi disc.	2	Spot the turbidity of any water body.	Practical	
	6	Determination of LC_{50} of a pesticide.	4	Test the LC_{50} of a pesticide.	Demonstration Practical	
	7	Estimation of H_2S in water sample.	2	Identify the H_2S content in any water sample.	Practical	
	8	Estimation of salinity in water sample.	2	Test the salinity of a water sample.	Practical	
	9	Estimation of CO_2 in water sample.	2	Identify the amount of CO_2 in water sample.	Practical	
	10	Study report of a pond ecosystem.	2	Document on a pond ecosystem that has been visited.	Practical	
	11	Commensalisms (Shark and *Echeneis*), Mutualism (Sea anemone and Hermit crab).	2	Discriminate between commensalism and mutualism.	Spotters	
	12	Food chain, Food web, Conventional energy source (coal) and non-conventional energy source (wind mill).	2	Identify between conventional and non-conventional energy source.	Spotters	
III	**Biotechnology and Nanobiology**(30 Hrs)					
	1	Extraction of genomic DNA.	4	Isolate the genomic DNA from animal tissue.	Practical	Self-assessment
	2	Estimation of DNA (DPA method).	3	Estimate the DNA.		
	3	Agarose gel electrophoresis in	2	Separation of DNA by Agarose gel		

		separation of DNA.		electrophoresis. Agarose gel electrophoresis.		
	4	Polymerase Chain reaction.	2	Demonstrate PCR	Demonstration	Performance-based Assessment. Model examination
	5	Bacterial culture and antibiotic selection media.	4	Analyze the resistance and sensitivity of the bacteria.	Practical	
	6	Immobilization of yeast cells.	2	Prepare Immobilization of yeast cells.		
	7	Preparation of wine.	2	Prepare wine from grape fruits.		
	8	Estimation of ethanolcontent in wine.	2	Estimate ethanol.		
	9	Production of amylase by bacteria.	4	Isolate bacteria from soil and produce amylase enzyme.		
	10	**Flow charts/ Instruments/ Figures**Plasmid DNA isolation, Insulin production by rDNA Technology, Hybridoma production, Synthesis of DNA nanoarray, Southern blotting, Biosensor (glucometer), Air-lift bioreactor, Buckyballs, Dendrimers.	5	Discriminate molecular technology and bioreactors.	Flow charts, instruments, Figures	

Course instructor
Dr. A. Shyla Suganthi
Dr. Jeni Chandar Padua Dr. A. Punitha

Head of the Department
Dr. S. Mary Mettilda Bai