

B.Sc. Zoology

Semester **II**

Name of the Course: **Chordate Zoology**

Course code : **ZC1721**

Teaching Plan

Unit	Module	Description	Hours	Learning Outcome	Pedagogy	Assessment
I	Prochordata (12 Hrs)					
	1	Introduction to Chordata: General characters of chordates and classification up to classes with names of examples only, Prochordata: General characters and classification up to classes with examples only.	3	Outline the general characters of chordates	Lecture, PPT, You Tube	MCQ, Short test, Mind Map, Assignment, Formative Assessment I (1,2,3), Quiz I
	2	Type study: Amphioxus – external features Digestive system Excretory system	4	Describe the external and internal features of Amphioxus	Lecture, Chalk and talk, PPT, Discussion	Formative Assessment II (4), Quiz II
	3	External features and biological significance of the following: <i>Ascidian</i> , <i>Balanoglossus</i> , <i>Salpa</i> .	3	Discuss on the external features and biological significance of Prochordates	Lecture, Chalk and talk, Jigsaw	
	4	Agnatha: <i>Petromyzon</i> – External morphology. Ammocoetes larva.	2	Explain the external features and biological significance of Agnatha.	Lecture, Chalk and talk, PPT	
II	Pisces (12 Hrs)					
	1	Pisces: General characters and classification up to	2	List the general characters and	Probing and interactive session,	

		sub classes with names of the examples only		classification of pisces	Lecture	Short test Mind map
	2	Type study: <i>Scoliodon</i> - external characters, placoid scales.	2	State the general characters of <i>Scoliodon</i> .	Lecture, Chalk and talk	Objective test Formative Assessment II (1,2,3), Quiz II
	3	Digestive system, respiratory system Circulatory system Nervous system Receptor organs, urino-genital system.	4	Describe the physiology of the different systems of shark.	Lecture, PPT, You tube	Formative Assessment III (4)
	4	Accessory respiratory organs in fishes Migration of fishes Lung fishes (Dipnoi).	4	Explain respiration and migration of fishes.	Lecture, video Discussion	
III	Amphibia & Reptilia (12 Hrs)					
	1	Amphibia: General characters and classification up to orders with names of the examples only.	2	List the general characters and classification of amphibian.	Lecture, PPT	Short test, MCQ, Objective test, Assignment, Formative Assessment I (4,5), Quiz I, Formative Assessment III (1,2,3)
	2	Type study: Frog – External characters Endoskeleton: Skull, typical vertebra, atlas, girdles and limbs.	3	Recall the characteristics of frog	Lecture, PPT Specimen	
	3	Biological significance of Axolotl larva, Ichthyophis Parental care in Amphibia.	2	Discuss the biological significance and parental care in axolotl larva and ichthyophis	Video, Lecture, Group discussion	
	4	Reptilia: General characters and classification up to orders with names of the examples only.	2	Outline the general characters and classification of reptiles.	Lecture, PPT, Flip class	

	5	Type study: <i>Calotes</i> – External characters, Circulatory system Excretory system. Identification and study of few poisonous snakes in India - first aid for snake bite and anti-venom.	3	Explain external characters of <i>Calotes</i> and functions of internal organs, Identify poisonous snakes	Lecture, PPT, Chalk and talk, Demonstration on identification of poisonous snakes	
IV	Aves (12 Hrs)					
	1	Aves: General characters and classification up to sub classes with names of the examples only.	1	List the general characters and classification of birds.	Probing and interaction, Discussion	Open book test, MCQ, Formative Assessment I (1,2), Quiz I, Formative Assessment II (3,4), Quiz II
	2	Type study: <i>Columba livia</i> - external characters, exoskeleton Flight muscles.	3	Explain the external characters and importance of flight muscles.	Observation of pigeon- Field study	
	3	Digestive system, Respiratory system, Urino-genital system	4	Discuss the systems of <i>Columba livia</i>	Interactive session, Lecture	
	4	Migration of birds Flight adaptation in birds Flightless birds (Ratitae): general characters and examples.	4	Compare the Flight adaptation in birds and their migratory behaviour.	Video, Lecture	
V	Mammalia (12 Hrs)					
	1	Mammalia: General characters and classification up to subclasses with names of the examples only.	2	Identify the key taxonomic characters and classify mammals.	Lecture, Chalk and talk	Short test, Quiz, Formative Assessment II (1) Quiz

	2	Type study: Rabbit - external morphology Structure of skin, dentition.	2	Describe the external morphology, skin and dentition of rabbit.	Observation of rabbit - to analyse the general characters	II Formative Assessment III (2,3,4,5)
	3	Digestive system, Respiratory system Urinogenital system.	3	Explain the structure of digestive, respiratory and urinogenital system of rabbit.	Lecture, PPT	
	4	Structure of heart Structure of brain.	2	Describe the structure of heart and brain.	Lecture, Video class	
	5	Egg laying mammals- Pouched mammals Adaptations of aquatic mammals.	3	Compare egg laying and pouched mammals.	Lecture, PPT, Chalk and talk	

Course instructors

Dr. J. Vinoliya Josephine Mary
Dr. A. Punitha

Head of the Department

Dr. S. Mary Mettilda Bai

Semester

: II

Major Practical II

Name of the Course

: Chordate Zoology

Course code

: ZC17P2

Teaching Plan

Module	Description	Hours	Learning outcome	Pedagogy	Assessment
1	Shark: Mounting of Placoid scales	2	Mount placoid scales	Practical	Pre assessment
2	Frog: Arterial system	2	Recall the parts of arterial system	Demonstration	Performance assessment.
3	Frog: Brain	2	Identify the parts of frog brain		
4	Reptiles: Key for Identification of poisonous and non-poisonous snakes	2	Recollect the key points	Charts	Practical
5	Pigeon: External features and	6	Identify different types	Observation of pigeon and PPT	

	identification of feathers, Digestive system, Respiratory system		of feathers and parts of internal organs.	of systems	
6	<i>Ampelisca</i> , <i>Balanoglossus</i> , <i>Ascidian</i> , <i>Petromyzon</i> , <i>Ammocoetes</i> larva, <i>Narcine</i> , <i>Hippocampus</i> , <i>Anguilla</i>	4	Identify and explain the biological significance	Specimens	
7	<i>Rhacophorus</i> , Axolotl larva, <i>Ichthyophis</i> , Salamander, House Lizard, Chamaeleon, <i>Draco</i> , <i>Chelone</i> , Cobra	4			
8	Sparrow, Woodpecker, Kingfisher, Pelican, Penguin, Owl, Pangolin, Kangaroo, Bat, Squirrel, Loris, Whale	4			
9	Typical vertebra (frog), atlas (frog), pectoral girdle (frog), pelvic girdle (frog), forelimb skeleton (frog), and hind limb skeleton (frog)	4			
10	Submission of an “Animal Album” containing photographs or paper cuttings of the locally available chordates of different taxa with brief write up				
11	Maintenance of campus Bird-watcher’s Diary (group work).				
12	Field visit to places of Zoological importance				

Course instructors

Dr. J. Vinoliya Josephine Mary
Dr. A. Punitha

Head of the Department

Dr. S. Mary Mettilda Bai

B.Sc. / B.A (Non-Major Elective Course)

Semester

II

Name of the Course : Common Ailments and Simple Remedies

Course code : ZNM172

Teaching Plan

Unit	module	Topics	Hours	Learning outcome	Pedagogy	Assessment
I	(12 Hrs)					
	1	Anaemia and types of anaemia.	2	Explains the details about anaemia	Lecture, Chalk and Talk	Evaluation through MCQ, Short test, Mind Map, Oral presentations, Formative Assessment I (1,2,3,4)
	2	Blood pressure-types, symptoms, treatments and prevention.	4	Summarize the pros and cons of blood pressure	Lecture, PPT	
	3	Stroke and Heart attack.	3	Compare the symptoms of stroke and heart attack	Lecture, Mind map	
	4	Diabetes- causes, symptoms, diagnosis and treatment.	3	Analyse the diagnosis and treatment of diabetes.	Lecture, PPT	
II	(12 Hrs)					
	1	Dental caries and Pyorrhoea-causes, symptoms, treatment and prevention	3	Point out the dental problems	Lecture, Chalk and Talk	Short test, Mind map, Objective test, Submission of summary report,
	2	Jaundice- causes, types, symptoms, treatment and prevention, Typhoid- causes, types, symptoms and treatment	4	Differentiate the symptoms and treatment of jaundice and typhoid	Lecture, Chart	

	3	Digestive disorders: Diarrhoea - causes and treatment	3	Summarize the digestive disorders	Discussion, PPT	Formative Assessment I (1,2,3,4)
	4	Chronic constipation-causes, prevention	2	Describe chronic constipation	Lecture, Chalk and Talk	
III	(12 Hrs)					
	1	Common cold, cough-treatment	3	Identify the treatment of common cold	Lecture, PPT, Flash cards	Short test, MCQ, Assignment, Poster presentation Formative Assessment II (1,2), Quiz II Formative Assessment III (3,4)
	2	primary complex-causes and treatment	3	State the causes of primary complex	Lecture, Video, Group discussion	
	3	Asthma- causes, symptoms and treatment	4	Gain knowledge about Asthma	Lecture, PPT	
	4	Headache- causes and types	2	Classify the types of headache	Lecture, Mind map, Flash cards	
IV	(12 Hrs)					
	1	Dengue fever- causes, types, symptoms and treatment	4	Understand the treatment of dengue fever	Lecture, PPT, Flow chart	MCQ, Poster presentation, Formative Assessment II (1,2) Formative Assessment III (3)
	2	Malaria - causes, types, symptoms and treatment	4	Recognize the symptoms of malaria	Lecture, Mind map, Flipped learning	
	3	Filariasis (Elephantiasis) - causes, types, symptoms and treatment.	4	Explains Elephantiasis	Lecture, PPT, Group discussion	
V	(12 Hrs)					
	1	Aging- old age related ailments- Depression of loneliness and some remedies to keep them engaged.	4	Summarize old age related ailments.	Lecture, Discussion, Video class	Short test, Quiz, Assignment, Oral presentation, Formative Assessment III (1,2,3)
	2	loss of memory, osteoporosis, Parkinson's disease, Alzheimer's disease	4	Interrelate various diseases	Lecture, Video, Team teaching	

	3	Fomentation and cleansing enema. Arthritis- causes, types, symptoms and treatments.	4	Point out the symptoms and distinguish the types of Arthritis.	Lecture, PPT, PPT	
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Course instructors
Dr. X. Venci Candida
Dr. S. Prakash Shoba

Head of the Department
Dr. S. Mary Mettilda Bai

Semester : IV
Name of the Course : Genetics
Course code : ZC1741

Teaching Plan

Unit	Module	Description	Hours	Learning	Pedagogy	Assessment
I	1	Mendelian laws of inheritance - Monohybrid cross.	2	Explain Mendel's principles of segregation, and independent assortment and solve the problems.	Lecture , Flipped, Problem solving	Short test, MCQ, Formative assessment I
	2	Dihybrid - back cross and test cross.	2	Solving dihybrid cross genetic outcomes utilizing Punnett squares. Differentiate test cross and back cross.	Lecture, Problem solving, Q and A session	(1,2,3,4,5) Quiz I Mind map Formative assessment II (6). Quiz II
	3	Complete, incomplete and codominance inheritance	1	Differentiate different	PPT, Flip class,	
	4	Interactions of genes: Complementary genes, Supplementary genes, Epistasis, Lethal genes.	3	Recognize different interactions	Lecture , Chalk and talk, Jigsaw, Discussion , Q &	
	5	Polygenic inheritance (Skin colour in man),	2	Differentiate the polygenic and Multiple	Lecture, Chalk and talk	

				inheritance		
	6	Multiple alleles: ABO blood group in man, Rh factor in man; coat colour in	2	Comprehend multiple allelism	Lecture, Chalk and talk	
II	1	Linkage - kinds, theories of linkage, linkage	1	Summarize the theories of linkage and its groups	PPT, Discussion, Mind map,	Short test, MCQ Formative assessment II (1,2,3,4,5). Quiz II Formative assessment III (6)
	2	Crossing over - mechanism, theories of crossing over, cytological evidence (Stern's experiment and Tetrad analysis), significance of crossing over.	3	Explain the mechanism of crossing over, its evidences and significance.	Lecture, Chalk and talk, Video	
	3	Chromosome map: two point and three point cross, construction of chromosome map.	3	Describing the methods to generate genetic maps and calculate gene	Lecture, Chalk and talk, PPT	
	4	Sex determination in man and <i>Drosophila</i> .	1	Explain how genetics can influence gender	Lecture, Chalk and talk, PPT	
	5	Nondisjunction - Primary and secondary nondisjunction in <i>Drosophila</i> .	2	Summarizing genetic anomalies caused by changes in	Lecture, PPT, Discussion, Jigsaw	
	6	Syndromes in man: Turner's, Klinefelter's and Down syndrome.	2	Relating variations in chromosome number and	Lecture, PPT, Jigsaw, Flip class	
III	1	Cytoplasmic inheritance - Kappa particles in <i>Paramecium</i> , milk factor in mice, shell	3	Summarize the concept of inheritance by means of different models	Lecture, Chalk and talk, Discussion	Short test, MCQ, Formative assessment

	2	DNA as genetic material - Bacterial transformation,	3	Comparing the process of transformation, conjugation and	Lecture, Chalk and talk, PPT	Quiz I Mind map Formative assessment
	3	Mutation: Chromosomal mutation - changes in structure and number,	3	Summarize mutation and the resulting structural changes.	Lecture, PPT, Jigsaw, Mind map	II (4) Quiz II
	4	Gene mutation - mutagens. DNA repair mechanisms.	3	Describe mutagens and repair mechanisms	Lecture, Chalk and talk	
IV	1	Human chromosomes: autosomes and allosomes - Karyotype and idiogram	2	Relating the various mechanisms taking	Lecture, PPT	Short test, MCQ, Formative assessment II (1,2,3,4),
	2	Simple Mendelian traits in man.	2	Explain Mendelian traits	Lecture, Chalk and talk, Mind	Quiz II Mind map
	3	Twins - types, development and application.	2	Evaluating the mechanism of formation of twins	Lecture, Flipped learning, Discussion	Formative assessment
	4	Inborn errors of metabolism. (Phenylketonuria, Alkaptonuria,	2	Summarize the inborn errors in metabolism using a few examples	Lecture, PPT, Flip class	III (5, 6)
	5	Sex - Linked genes and their inheritance.	2	Describe sex ² linked inheritance	Lecture , Chalk and talk, Jigsaw	
	6	X - Linked genes (Colour blindness and Haemophilia), holandric genes.	2	Summarizing the expression of X ^e linked genes.	Lecture, Chalk and talk, Flipped class	

V	1	Population genetics – Hardy Weinberg equilibrium – calculation of gene	3	Describe the genetics profile of populations as specified by Hardy Weinberg.	Lecture, Chalk and talk, Problem	Formative assessment III (1,2,3,4, 5)
	2	Factors affecting gene frequency – selection, mutation, genetic drift and migration.	3	Evaluating the mechanisms that change gene	Lecture, Chalk and talk, Role play	
	3	Inbreeding, outbreeding and	2	Describe the process leading to	Lecture, Chalk and talk, PPT	
	4	Eugenics, Euthenics and Euphenics. Pedigree analysis.	2	Identify ethical issues related to gene inheritance.	Lecture, Chalk and talk,	
	5	Genetic prognosis - Genetic counseling.	2	Describe the major trends in genetic analysis.	Lecture, Chalk and talk,	

Course instructors Dr. Jeni Chandar Padua
Dr. F. Brisca Renuga

Head of the Department
Dr. S. Mary Mettilda Bai

Semester : IV
Name of the Course : **Biostatistics and Computer Applications : ZC1742**
Course code

Teaching Plan

Unit	Module	Topics	Hours	Learning outcome	Pedagogy	Assessment
I	Basic concepts of biostatistics (12 Hrs)					
	1	Basic concepts of Biostatistics: Population,	2	State the Basic	Lecture, PPT,	MCQ, Class test,
	2	Collection of data - sampling methods.	2	Discuss the collection	Lecture, PPT, video	Assignment, Formative
	3	Processing of data: classification and tabulation.	4	Classify and tabulate the	Lecture, PPT,	Assessment I (1,2,3,4)
	4	Presentation of data:	4	Draw	Lecture,	

		Diagrams and graphs.		diagrams and graphs using	PPT, exercise	
II	Measures of central tendency & dispersion (12 Hrs)					
	1	Measures of central tendency – Arithmetic Mean, Median, Mode.	4	Apply Arithmetic Mean, Median &	Lecture, PPT	Quiz, Assignment, Formative
	2	Measures of dispersion – Range, Quartile deviation, Percentiles, Mean deviation, Coefficient deviation - standard deviation	5	Apply and relate the appropriate statistical	Lecture, PPT, Exercise	Assessment I (1) Quiz I
	3	Variance, coefficient of variation	2	Differentiate Variance, coefficient of variation.	Lecture, PPT, Problem solving	Formative Assessment II (2,3,4) Quiz II
	4	Standard error.	1	Find the Standard error.	Lecture, PPT, Problem	
III						
	1	Probability: Basic concepts – Types: apriori and aposteriori	1	Explain the Basic	Lecture, PPT,	Short test MCQ
	2	Probability theorems: Addition and multiplication – permutation and combination	3	Identify and apply the probability theorems.	Lecture, PPT, Exercise	Quiz, Assignment Objective test
	3	Test of significance: Chi square test	4	Relate and apply hypothesis testing.	Lecture, PPT,	Formative Assessment III (1,2,3,4)
	4	Test of significance: Student's <i>t</i> - test.	4	Find the significance using Student's <i>t</i> - test.	Lecture, Chalk and talk, Exercise	
IV	Components of computer & MS Office (12 Hrs.)					
	1	Introduction to computers: Types of	1	Know the types of	Lecture, PPT,	Short test, MCQ

	2	Components of computer: input devices, output devices, CPU,	3	Identify the components of	Lecture, video, Q & A session	Formative Assessment I (1 & 2) Quiz I Formative Assessment II (3 & 4) Quiz II	
	3	Operating system	3	Explain Operating system	Lecture, PPT, Q & A		
	4	MS-Office: MS word - Creating word document – editing - aligning – bulleting – printing.	5	Create a word document.	Lecture, Video, Jigsaw		
V	MS – Excel, Power point & Information network (12Hrs.)						
	1	MS - Excel: Entering and editing cell entries – adjusting row and column height	3	Edit cell entries in MS -	Lecture, PPT Exercise	Short test, Quiz Formative Assessment II (1) Formative Assessment III (2,3 & 4)	
	2	MS - Excel: charts	3	Create charts and graphs	Lecture, PPT,		
	3	MS – Power Point: Steps to create a presentation – slide presentation.	4	Prepare MS - PowerPoint	Lecture, video,		
	4	Information network: Internet, email, mail transfer, web	2	Send mail and Internet browsing	Lecture, PPT,		

Course instructors

Dr. A. Shyla
Suganthi Dr. P.T.
Arokya Glory

Head of the Department

Dr. S. Mary Mettilda Bai

Semester :IV Major Practical III
 Name of the : Genetics, Biostatistics and Computer Applications
 course Course : ZC17P4

Teaching Plan

Module	Description	Hou	Learning outcome	Pedagogy	Assessment
1	Observation of simple Mendelian traits in man.	2	Identify Mendelian	Practical	PreP assessment.
2	Verification of monohybrid and dihybrid ratio using beads.	4	Verify monohybrid and dihybrid	Practical	Performance P based Assessment.
3	Culture of <i>Drosophila</i> (wild) in the laboratory to study the various stages of life cycle, eye colour and sexual dimorphic characters.	4	Culture <i>Drosophila</i> and identify the stages of life	Demonstration	Self-assessment Model
4	Observation and study of polygenic inheritance of quantitative traits to be interpreted in graphs - length of pods / leaves.	2	Recollect the key points associated with	Practical	examinations
5	Blood group identification.	2	Identify different types of blood groups.	Practical	
6	Analysis of data (ungrouped) - mean, median, mode, standard deviation (using Neem leaves).	6	Analyse Central tendency of ungrouped data.	Calculation	
7	Study of Probability using coin tossing with one coin and testing the significance using chi square test.	2	Test the significance using chi square test.	Practical	
8	MS word	4	Create word document.	Demonstration	
9	Syndromes (Klinefelter's, syndrome, Turner's syndrome, Down syndrome)	2	Identify the characteristics of syndromes.	Charts	
10	Sex-linked inheritance (Color	2	Identify sex2 linked	Charts	

	Haemophilia, Hypertrichosis), Bar diagram, Histogram, Pie diagram.		inheritance. Represent data as graph and		
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Course instructors Dr.
Jeni Chandar Padua
Dr. A. Shyla Suganthi

Head of the Department
Dr. S. Mary Mettilda Bai

Allied Zoology

:IV

Semester : **Applied Zoology**

Name of the Course : **ZA1741**

Course code **Teaching Plan**

Unit	Module	Topics	Hou	Learning outcome	Pedagogy	Assessment
I	Apiculture (12 Hrs)					
	1	Classification and kinds of bees, Bees and their society.	3	Distinguish the kinds of bees and their	Lecture, Video class	Evaluation through MCQ,
	2	Caste distinction and their functions.	3	Point out the functions	Chalk and talk, Et	Short test, Mind Map,
	3	Methods of beekeeping (primitive and modern).	3	Describe the methods of beekeeping.	Flipped learning, Chalk and	Assignment, Formative Assessment I (1,2,3,4), Quiz I
	4	Honey Bee products: honey, bee wax, bee venom.	3	Identify the various honey bee products.	Lecture, team	
II	Sericulture (12 Hrs)					
	1	Moriculture – methods of propagation.	3	Discuss the methods in Moriculture.	Lecture, Team teaching, vocabulary drill	Short test, Mind map, Formative Assessment I (1,2,3),
	2	Common species of Silkworm, Life cycle of mulberry silkworm (egg, larva,	3	Relate the various stages of Silkworm.	Lecture/ Digital learning/	Quiz I Formative

					Video lesson	Assessment II (4), Quiz II
	3	Rearing of silkworm, mounting, spinning and	3	Describe the rearing of silkworm.	Lecture, Chalk and talk,	
	4	Silk Reeling, Silk Marketing.	3	Explain the process of silk reeling and	Lecture, Video	
III	Poultry Farming (12 Hrs)					
	1	Poultry housing, Types of poultry houses.	3	Draw Pictures of poultry houses.	Lecture, PPT, Digital	Short test, MCQ,
	2	Management of chick, growers, layers and broilers.	4	Explain the management of chick, growers,	Lecture, Chalk and Talk, video class	Formative Assessment II (1,2,3) Quiz II
	3	Sexing in chicks, Nutritive value of egg.	2	List the nutritive value	Lecture, Chalk and Talk, group	Formative Assessment III (4)
	4	Diseases of poultry– Ranikhet, Fowl pox, Coryza, Coccidiosis, Polyneuritic	3	Distinguish the diseases of poultry.	Lecture, PPT, Web based learning	
IV	Dairy Farming (12 Hrs)					
	1	Breeds of Dairy animals, Establishment of a typical Dairy farm.	4	Gain knowledge about dairy	Lecture, video lesson, Flipped	Diagram test Open book test MCQ Formative Assessment II (1,2), Quiz II
	2	Management of cow(New born, calf, Heifer, milking cow).	3	Understand how to manage cows.	Lecture, video lesson, ppt	
	3	Diseases (Mastitis, Rinderpest, Foot and	2	Compare the diseases of dairy	Lecture, Tabulation	Formative Assessment III (3,4,5)
	4	Dairy products (Standard milk, skimmed milk, toned milk and fermented milk - curd, ghee, cheese).	2	Identify dairy products.	Lecture, PPT, Gamificati	

	5	Pasteurization.	1	Recognize the process	Lecture, EL learning, video	
V	Aquaculture (12 Hrs)					Short test, Quiz, Formative Assessment III (1,2,3)
	1	Aquaculture in India.	2	Express ideas about Aquaculture in India.	PPT/Lecture/Digital learning	
	2	Important cultivable organisms and their qualities.	4	Identify the cultivable organisms.	Lecture/ Flipped Learning / Video class	
	3	Culture of Indian major carps, Marine prawn culture, Pearl culture, Integrated fish culture (paddy and fish culture)	6	Explain the culture of Indian major carps.	Lecture/ Web based learning/ PPT	

Course instructors

Dr. X. Venci Candida

Dr. S. Prakash

Shoba

Name of the Course

Course code

:IV

: General Zoology & Applied Zoology

:ZA17P1

Head of the Department

Dr. S. Mary Mettilda Bai

Allied Zoology Practical

Teaching Plan

Unit	Module	Description	Hours	Learning Outcome	Pedagogy	Assessment
I	1	Dissection: Cockroach – Nervous system.	4	Dissect nervous system of Cockroach and	Practical	Pre assessment
	2	Mounting: Prawn appendages	4	Mount Prawns appendages and recollect the name and functions of appendages.	Practical	Performance based assessment
	3	Mounting: Shark – Placoid scale.	4	Mount placoid	Practical	Internal assessment
	4	Observation of simple Mendelian traits in man.	2	Identify Mendelian traits	Survey	
	5	Observation of frog's	2	Recall the structure	Observati	

	egg.		of egg of frog.	on
6	Analysis of glucose and albumin in Urine.	2	Analyse the components present in	Practical
7	Testing milk using lactometer.	2	Analyse the water content of	Practical
8	Estimation of oxygen in water samples.	4	Analyse the amount of oxygen in	Practical
9	Estimation of salinity in water samples	4	Analyse the amount of salt in water	Practical
10	Visit to places having importance related to theory.	10	Visit to the places and gets practical knowledge	Visit
11	<i>Paramecium</i> , <i>Obelia</i> , <i>Ascaris</i> (male and female), <i>Penaeus</i> , Starfish	4	Observes the spotters and identify them and explains the	Observation
12	<i>Amphioxus</i> , Eel, <i>Najanaja</i> , Pelican, Rabbit.	2	the structure of the animals and the	
13	DNA (Watson & Crick Model), Colour blindness.	4	models.	
14	Shark and <i>Echeneis</i> , Ancon Sheep, Industrial melanism.	2		
15	Honey bee (worker, queen and drone), Newton's bee-hive.	2		
16	Silkworm (egg, larva, pupa and adult), Chandrika, Rearing stand.	4		
17	Poultry feeders, Fowl pox, Coccidiosis.	2		
18	<i>Catla catla</i> , Rohu, Mrigala.	2		

Course instructors

Dr. X. Venci Candida Dr. S. Prakash
Shoba

Head of the Department
Dr. S. Mary Mettilda Bai

B.Sc. Zoology Teaching Plan 2019-'20

Semester : VI
 Name of the Course : Biotechnology
 Course code : ZC1761

Major Core VIII

No. of hours/ week	No. of credits	Total number of hours	Marks
6	5	90	100

Learning Objectives

1. To learn the basic concepts of biotechnology and understand the various techniques pertaining to biotechnology.
2. To get employability in biotech industries.

Course Outcome

CO	Upon completion of this course the students will be able to:	PSO addressed	CL
CO - 1	acquire knowledge of basic concepts of biotechnology and central dogma.	PSO - 3	U
CO - 2	discuss the rDNA technology, DNA library, hybridoma technology, animal cell and tissue culture and gene therapy.	PSO - 4	U
CO - 3	decide and apply appropriate tools and techniques in biotechnological manipulation.	PSO - 6	Ap; An
CO - 4	explain the general principles of generating transgenic plants, animals and application of microbes pharmaceutical products.	PSO - 6	Ap
CO - 5	undertake any responsibility as an individual and as a team in a multidisciplinary environment for landing in a job.	PSO - 8	Ap

Teaching Plan with Modules

Total Hours: 90 (Incl. Assignment & Test)

Unit	Modules	Topics	Hours	Learning outcome/ CO addressed	Pedagogy	Assessment
I	Plant and Animal cell culture (18 Hrs.)					
	1	Introduction. Culture media - cell culture technique.	3	Explain the different types of culture media, their ingredients and cell culture technique. (CO-2)	Lecture, Discussion, Flow chart	MCQ, Formative assessment I, Quiz I Online Assignment,
	2	Establishment of cell culture – primary and sub-culture - Explant culture, callus culture.	3	Demonstrate primary, Explant and callus culture. (CO-2)	Lecture, PPT	
	3	Somatic hybridization and micro-propagation.	5	Discuss Somatic hybridization and micro-propagation. (CO-3)	Lecture, mind map, PPT	
4	Cell lines - large scale	4	Identify Cell lines and	Lecture,		

		culture of cell lines.		comprehend large scale culture of cell lines. (CO-2)	PPT	
	5	Organ culture - embryo culture.	3	Differentiate and discuss organ culture and embryo culture. (CO-2)	Lecture, video	
II	Tissue engineering, Transgenic animal technology, Hybridoma technology (18 Hrs.)					
	1	Artificial skin and cartilage. Stem cells: characteristics, types and applications.	4	Explain artificial skin and cartilage. Discuss characteristics, types and applications. (CO-3)	Group discussion, PPT, Chalk and talk	Slip test Assignment (Quizizz) Formative assessment I & Quiz I (1) Formative assessment II, Quiz II (2,3,4) Online Assignment
	2	Transgenic animal technology: Transgenesis – methods of transgenesis, applications of transgenic animals.	3	Outline transgenic animal technology. (CO-4)	Lecture, PPT, Discussion	
	3	Hybridoma technology: Production of Hybridoma, monoclonal antibodies: production and applications.	5	Identify the different steps involved in the production of monoclonal antibodies. (CO-2)	Lecture, Flow chart, Video	
	4	Bioreactors: stirred tank and air–lift bioreactor.	6	Discuss the common types of bioreactors. (CO-3)	Lecture , Chalk and talk, Model	
III	Metabolite production, Bioremediation (18 Hrs.)					
	1	Ethanol (primary metabolite), Penicillin (secondary metabolite). Immobilization of enzymes and their applications.	5	Demonstrate the production of ethanol and penicillin. (CO-5)	Lecture, PPT, Flow chart	MCQ Short test, Formative assessment II, Quiz II Online Assignment (Edmodo)
	2	Biosensors – types and applications. Bacterial SCP and its applications	4	Discuss biosensors and Comprehend SCP. (CO-3)	Lecture, PPT, mind map	
	3	Sewage and waste water treatment. Bioremediation: Types, Degradation of Xenobiotics (hydrocarbon, pesticide). Super bug – construction and application.	5	Narrate the steps involved in bioremediation. (CO-4)	Lecture, PPT, Flow chart	
	4	Biomining and bioleaching. Biocontrol – <i>Bacillus thuringiensis</i> .	4	Discuss biomining and biocontrol. (CO-4)	Lecture, PPT, mind map	
IV	Genetic Engineering (18 Hrs.)					
	1	Restriction enzymes, cloning	4	Explain the restriction	Chalk and	

		vectors: SV40, Ti plasmid.		enzymes and cloning vectors. (CO-1, 2)	talk, PPT	MCQ, Formative assessment I, Quiz I Online Assignment	
2		Preparation of desired gene - Isolation of plasmid vector - insertion of desired gene into the vector - Introduction of rDNA into host cell – Screening and identification of cloned gene.	6	Discuss the methods of rDNA technology. (CO-2)	Lecture, Video, Model		
3		DNA library. Genome editing – CRISP, Next Generation sequencing techniques. Molecular markers (RAPD & RFLP).	4	Recall the DNA library, Genome editing – CRISP, Next Generation sequencing techniques. (CO-3)	Lecture, video		
4		Polymerase chain reaction. Southern blotting. DNA sequencing: Sanger's method.	4	Recognize Polymerase chain reaction - Southern blotting and DNA sequencing: Sangers's method. (CO-3)	Lecture, PPT, Video, Mind Map		
V	DNA applications, Bioethics, Nanotechnology (18 Hrs)						
1		Disease diagnosis – DNA probes, disease treatment – production of human insulin. Gene therapy – types and methods. SNP's for mutations.	4	Discuss DNA probes, production of human insulin and gene therapy. (CO-5)	Lecture, PPT, video	Slip test Assignment (Quizizz) Formative assessment I & Quiz I (1,2) Formative assessment II, Quiz II (3,4) Online Assignment	
2		Finger printing and its application in forensic medicine. Human Genome Project.	4	Illustrate finger printing technology and human genome project. (CO-5)	Lecture		
3		Bioethics: Ethical implications of transgenic animals. Biosafety: Possible dangers of Genetically Engineered organisms (GEOs) and biohazards of rDNA technology.	6	Explain bioethics and biosafety. (CO-5)	Chalk and Talk		
4		Nanotechnology: applications of nanotechnology in medicine, drug designing and cancer treatment.	4	Comprehend the applications of nanotechnology. (CO-5)	Lecture, PPT, video		

Course instructors

Dr. A. Punitha

Dr. S. Mary Mettilda Bai

Head of the Department

Dr. S. Mary Mettilda Bai

Semester : VI Major Core IX
Name of the Course : Immunology and Microbiology
Course code : ZC1762

No. of hours/week	No. of credits	Total number of hours	Marks
6	5	90	100

Learning Objectives

1. To enable the students to become aware of the microbes around us and also to know about the processes involved in the elimination of invading microbes by the defense system of our body.
2. To provide proficiency in basic microbiological and immunological skills.

Course Outcomes

CO	Upon completion of this course the students will be able to:	PSO addressed	CL
CO - 1	identify the major components of the immune system at organ and cellular level.	PSO - 1	R
CO - 2	discuss the types of immune response and mechanisms to eliminate antigens.	PSO - 1	U
CO - 3	culture and identify the microorganisms based on morphological and staining techniques.	PSO - 3	Ap
CO - 4	apply knowledge of microorganisms on common pathological diseases.	PSO - 5	R; Ap
CO - 5	develop skills to monitor and maintain food safety.	PSO - 4	Ap
CO - 6	design analytical and experimental tasks involving microbiology and immunology.	PSO - 3	Ap; An

Teaching Plan with Modules Total Hours: 90 ((Incl. Assignments & Test))

Unit	Modules	Topics	Hours	Learning Outcome/ CO addressed	Pedagogy	Assessment
I	Immunity and Lymphoid organs (18 Hrs.)					
	1	History and scope of immunology.	2	Order the history of immunology year wise. (CO-1)	Lecture, PPT	Short test, online Assignment (MCQ),
	2	Types of immunity - Innate, acquired, passive and active.	3	Distinguish the types of immunity. (CO-1)	Lecture	
	3	Primary and Secondary lymphoid organs - Thymus, Bone marrow, Bursa of Fabricius.	4	Relate Primary and Secondary organs and their functions. (CO-1)	Flipped classroom	Formative assessment I- 1,2,3,4,5

	4	Spleen, Lymph node, Mucosa Associated Lymphoid Tissue.	4	Categorize Primary and Secondary organs and its functions. (CO-1)	Lecture, PPT	Quiz I	
	5	Lymphoid and myeloid lineage. Cells of immune system (T cells and B cells, macrophages)		Construct lymphoid and myeloid lineage and summarize T cells, B cells and macrophages. (CO-1)	Video lesson, Lecture		
II	Antigen and antibodies (18 Hrs.)						
	1	Haemopoietic stem cells and haemopoiesis.	4	Identify Haemopoietic stem cells. (CO-2)	Lecture	MCQ, online Assignment (Antigens and Immunogens), Formative assessment I – 1,2,3,4 Quiz I	
	2	Antigen. Immunogens, hapten and adjuvants.	4	Describe antigens, Immunogens, hapten and adjuvants. (CO-2)	Blended classroom		
	3	Immunoglobulin: Immunoglobulin classes, structure and functions of IgG.	5	Sketch the structure of Immunoglobulin. (CO-2)	Lecture, you tube video		
	4	Antigen – Antibody reactions. Secondary antibody, purification of antibody using protein A/G.	5	Explain antigen – antibody reactions and purification of antibody. (CO-2)	Lecture, PPT		
III	Immune Response (18 Hrs.)						
	1	Immune Response: Primary and secondary immune response.	3	Categorize immune response. (CO-2)	Lecture, PPT	Short test, Open book test, Formative assessment I – 1,2,3 Formative assessment II– 4,5 Quiz I, II	
	2	Immunity to bacterial infections - Humoral immune response, Cell-mediated immune response.	5	Enumerate humoral response. Illustrate cell mediated response. (CO-2)	Lecture, video		
	3	Hypersensitivity: Allergens and types of hypersensitivity.	4	Summarize Allergens and types of hypersensitivity. (CO-2)	Lecture, PPT		
	4	Tumour immunology. Autoimmunity - Rheumatoid arthritis.	4	Identify the causes, symptoms and treatment of Rheumatoid arthritis. (CO-2)	Lecture, PPT		
	5	Vaccines and Immunization schedule.	2	Indicate Immunization schedule. (CO-2)	Jigsaw		
IV	Microbiology (18 Hrs.)						
	1	History and scope of microbiology. Whittaker's classification of microbes with two examples.	4	Enumerate the history of microbiology. (CO-3)	Lecture, Chalk and Talk	Mind map, online Assignment	

	2	Bacteria: structure of <i>E. coli</i> , bacterial growth curve.	3	Explain the structure of <i>E. coli</i> . (CO-3)	Lecture, Chalk and Talk	(Structure of TMV and T ₄ Bacteriophage), Formative assessment II 1,2,3,4,5 Quiz II
	3	Culture media. Culture techniques - batch culture and continuous culture (chemostat and turbidostat).	5	Differentiate and apply culture media. Describe different culture technique. (CO-3)	Lecture/ PPT	
	4	Virus: structure (TMV and T ₄ phage) – reproduction of phages (lysogenic and lytic).	4	Illustrate the structure of Virus and its reproduction. (CO-3)	Lecture/ Video	
	5	Synthetic Biology	2	Outline Synthetic Biology. (CO-3)	Group discussion	
V	Food Microbiology, Industrial Microbiology and Medical Microbiology (18 Hrs.)					
	1	Food Microbiology - Food poisoning, food spoilage and preservation.	4	Explain food poisoning and spoilage. (CO-5)	Lecture, Chalk and Talk	Slip test, Formative assessment II - 1,2,3,4,5 Quiz II MCQ through Quizziz
	2	Industrial microbiology: Wine and vinegar production	4	Interpret Wine and vinegar production in the industries. (CO-5)	Lecture, Chalk and Talk	
	3	Medical microbiology: Bacterial diseases (Tuberculosis, Gonorrhea, Streptococcal dermal infection).	4	List bacterial diseases. (CO-4)	Poster, Flash cards	
	4	Viral diseases (AIDS, Chicken pox, Hepatitis B, Rabies).	4	Discuss viral diseases. (CO-4)	Lecture, PPT	
	5	Fungal diseases (Mycotoxicosis and Aspergillosis).	2	Categorize fungal diseases. (CO-4)	PPT	

Course instructor
Dr. X. Venci Candida

Head of the Department
Dr. S. Mary Mettilda Bai

Semester : VI
 Name of the Course: Evolutionary Biology
 Course Code : ZC1763

Major Core X

No. of hours/week	No. of credits	Total number of hours	Marks
5	5	75	100

Learning Objectives

1. To discern the evolutionary significance of animals and origin of species.
2. To provide methods of investigating animal evolution, construction of phylogenetic trees and to get job in educational institutions and paleontological departments.

Course Outcomes

CO	Upon completion of this course the students will be able to:	PSO addressed	CL
CO - 1	explain the concepts of evolution, origin of life, geological time scale and evidences of evolution.	PSO - 1	U
CO - 2	explain the theories of evolution, mechanism of speciation and extinction of organism.	PSO - 3	R
CO - 3	apply Hardy-Weinberg equilibrium in population genetics.	PSO - 6	Ap; E
CO - 4	outline the major transitions in evolution, from the origin of life to hominid evolution.	PSO - 6	Ap
CO - 5	perform, analyse and report experimental observations in evolutionary biology.	PSO - 2	Ap; An

Teaching Plan with Modules

Total Hours 60 (Incl. Assignments & Test)

Unit	Modules	Topics	Hours	Learning outcome/ CO addressed	Pedagogy	Assessment
I	Concepts and Evidences of Evolution (15 Hrs.)					
	1	Concepts and Evidences of Evolution: Origin of life - Theories and experiments.	4	Explain Origin of life - Theories and experiments. (CO-1) .	Lecture, Flipped learning	Short test, MCQ, Formative assessment I (1,2,3,4) Quiz I Online assignment
	2	Evidences insupport of evolution – morphology and comparative anatomy, embryology,	7	Comparing the process of evolution – morphology and comparative anatomy, embryology. (CO-1) .	Lecture, Chalk and talk, Blended learning	
	3	Physiology and biochemistry, palaeontology.	2	Comparing the process of evolution – Physiology and biochemistry, palaeontology. (CO-1) .	Lecture , Chalk and talk	

	4	Geological time scale.	3	Summarize Geological time scale. (CO-1)	Lecture , Chalk and talk	
II	Theories of Evolution (15 Hrs.)					
	1	Theories of Evolution: Lamarckism, Neo-Lamarckism.	3	Explain the theory of Lamarckism, Neo-Lamarckism. (CO-2).	Lecture, Chalk and talk, PPT	Short test, MCQ Formative assessment I (1,2,3,4,5). Quiz I
	2	Darwinism, Neo-Darwinism.	3	Explain the theory of Darwinism, Neo-Darwinism. (CO-2).	Lecture, Chalk and talk, Video	
	3	Mutation theory of De Vries. Modern synthetic theory.	4	Describing the Mutation theory of De Vries and Modern synthetic theory. (CO-2, 3).	Lecture, Chalk and talk	
	4	Variation – types, sources – mutation, combination, hybridization, genetic drift, Founder’s principle, polyploidy.	3	Explain different types and sources of variation. (CO-2).	Lecture, Chalk and talk, Cooperative teaching	
	5	Natural selection – Stabilizing, directional and disruptive selection.	2	Summarizing different types of natural selection. (CO-2).	Lecture, PPT	
III	Isolating mechanisms, Species Concept and Speciation (15 Hrs.)					
	1	Isolating mechanisms: Types, origin and evolution of isolating mechanisms, role of isolation in speciation.	3	Summarize the types, origin and evolution of isolating mechanisms, role of isolation in speciation. (CO-2).	Lecture, Chalk and talk, Flipped learning	Short test, MCQ, Formative assessment I (1,2,3) Quiz I Mind map Formative assessment II (4,5) Quiz II
	2	Species, sibling species, sub species, demes.	3	Explain the species, sibling species, sub species, demes. (CO-2).	Lecture, Chalk and talk	
	3	Species concept - morphological, genetic and biological.	2	Summarize morphological, genetic and biological Species concept. (CO-2).	Lecture, PPT, Peer group teaching	
	4	Speciation - Phyletic and true speciation, mechanism of speciation.	3	Describe phyletic and true speciation, mechanism of speciation. (CO-2).	Lecture, Chalk and talk, Video	
	5	Patterns of speciation – allopatric, sympatric, quantum and parapatric.	4	Compare the different patterns of speciation. (CO-2).	Lecture, PPT, Brain storming	
IV	Phylogenetic analysis (15 Hrs.)					

	1	Phylogenetic analysis: Tools for sequence alignment–BLAST, FASTA.	4	Explain the various tools for sequence alignment–BLAST, FASTA. (CO-4) .	Lecture, PPT, Flipped learning, E-learning	Short test, MCQ, Formative assessment II (1,2,3,4), Quiz II Mind map	
	2	Methods of phylogenetic analysis - phenetic and cladistic; phylogenetic trees.	4	Summarize the methods of phylogenetic analysis - phenetic and cladistic; phylogenetic trees. (CO-4) .	Lecture, Chalk and talk		
	3	Methods for determining evolutionary trees – maximum parsimony, distance and maximum likelihood.	7	Evaluating the methods for determining evolutionary trees – maximum parsimony, distance and maximum likelihood. (CO-4) .	Lecture, Chalk and talk, Peer group teaching		
V	Trends in Evolution, Mimicry and Colouration (15 Hrs.)						
	1	Trends in Evolution: Modes of evolution–micro, macro and megaevolution.	3	Describe the modes of evolution–micro, macro and megaevolution. (CO-5)	Lecture , Chalk and talk	Formative assessment II (1,2,3,4)	
	2	Heterochrony - Paedomorphosis and Peramorphosis.	1	Define and explain Paedomorphosis and Peramorphosis. (CO-2)	Lecture, PPT, Flipped learning		
	3	Rate of evolution. Human Evolution – organic, cultural and future evolution.	6	Evaluating the Rate of evolution. Human Evolution – organic, cultural and future evolution. (CO-5)	Lecture, Chalk and talk, PPT, Video		
	4	Mimicry and colouration.	2	Describe the Mimicry and colouration. (CO-5)	Lecture, Chalk and talk, Models		
	5	Extinction - types, causes and significance.	3	Summarize the types, causes and significance of extinction. (CO-5) .	Lecture, Chalk and talk		

Course instructor
Dr. S. Prakash Shoba

Head of the Department
Dr. S. Mary Mettilda Bai

Semester : VI Elective IV (a)
 Name of the Course : Applied Zoology
 Course code : ZC1764

No. of hours/week	No. of credits	Total number of hours	Marks
5	5	75	100

Learning Objectives

1. To deepen the knowledge of students in general and applied areas of Zoology.
2. To provide employment and job opportunities in the public, private and government sector

Course Outcomes

CO	Upon completion of this course the students will be able to :	PSO addressed	CL
CO - 1	apply the knowledge of animal husbandry in economic development.	PSO - 5	U
CO - 2	identify the kinds of bees and the methods of bee keeping.	PSO - 8	U
CO - 3	rear silkworms, harvest and market the cocoons.	PSO - 9	Ap
CO - 4	apply skills and experience about the management of poultry and Dairy farming.	PSO - 9	Ap
CO - 5	culture of economically important finfish and shell fishes.	PSO - 8	Ap

Teaching Plan with Modules Total Hours: 75 (Incl. Test)

Unit	Modules	Topics	Hours	Learning Outcome / CO addressed	Pedagogy	Assessment
I	Apiculture (15 Hrs)					
	1	Scope, Classification and kinds of bees, Bees and their society.	3	Categorize the kinds of bees and their features. (CO-1, 2)	Lecture, Chalk and Talk	MCQ, Slip test,
	2	Life cycle of <i>Apis indica</i> – food of honey bees - relationship between plants and bees.	4	Identify the various stages of bees. (CO- 2)	Lecture, Mind map	Mind Map,
	3	Methods of bee keeping (primitive and modern).	2	Explain the methods of bee keeping. (CO-3)	Lecture, Video	Online Assignment (Honey bee products),
	4	Honey Bee products: honey, bee wax, bee venom.	2	Analyse the various honey bee products. (CO-3)	PPT, Group Discussion	Formative Assessment I, Quiz I
5	Lac culture – scope – lac insect <i>Laccifer lacca</i> and its life cycle – processing of lac – lac products and importance.	4	Explain the various stages of lac insect. (CO-2, 3)	Lecture, Video.		

II	Sericulture (15 Hrs)					Open book test, Objective test, Formative Assessment I Quiz I
	1	Scope – Silk Road - CSB - Moriculture: varieties of mulberry.	2	Knowledge on the methods in Moriculture. (CO-1, 2)	Lecture, Chalk and Talk	
	2	Methods of propagation, harvesting of leaves.	2	Remember the methods of propagation and leaf harvesting. (CO-2, 3)	PPT, Lecture.	
	3	Common species of Silkworm, Life cycle of mulberry silkworm.	4	Compare the different stages of Silkworm. (CO-2, 3)	Lecture, Video.	
	4	Diseases of silkworm: pebrine, grasserie, sotto diseases, muscardine – pest of silkworm: uzifly.	3	Identify the different diseases of silkworm. (CO-3)	Lecture, Visit	
	5	Rearing of silkworm – mounting – spinning - harvesting of cocoons – silk reeling and marketing.	4	Explain the process of silk reeling and Marketing. (CO-3)	Lecture, Video	
III	Poultry Keeping (15 Hrs)					Slip test, MCQ, Objective test, Quiz I, Formative Assessment I (1,2,3) Short test, Formative Assessment II (4, 5), Quiz II
	1	Scope, commercial layers and broilers.	3	Characterize the layers and broilers. (CO-1, 2)	Lecture, PPT	
	2	Poultry housing, types of poultry houses.	2	Design the poultry houses. (CO-4)	Lecture, PPT	
	3	Management of chick, growers, layers and broilers.	4	Explain the management of chick, growers, layers and broilers. (CO-4)	Lecture, blended classroom,	
	4	Debeaking, Sexing in chicks, Nutritive value of egg.	3	Critique the nutritive value of egg. (CO-3)	Lecture, Chalk and talk	
	5	Diseases of poultry – Ranikhet, Fowl pox, Coryza, Coccidiosis, Polyneuritis – vaccination.	3	Analyse the diseases of poultry. (CO-3)	Lecture, Group Discussion, PPT	
IV	Dairy Farming (15 Hrs)					Diagram test, Short test, Open book test MCQ Formative
	1	Scope, Breeds of Dairy animals, Establishment of a typical Dairy farm.	3	Knowledge on dairy animals and construct the dairy farm. (CO-1, 3)	Lecture, Chalk and talk	
	2	Management of cow (New born, calf, Heifer, milking cow)	3	Understand the management of cows. (CO-3)	Lecture, video	
	3	Diseases (Mastitis, Rinder Pest, FMD).	2	Categorize the diseases of dairy animals. (CO-3)	Lecture, PPT	

	4	Nutritive value of milk-Dairy products (Standard milk, skimmed milk, toned milk and fermented milk - curd, ghee, cheese). Pasteurization.	4	Formulate dairy products and describe pasteurization. (CO-4, 5)	Lecture, PPT, Group Discussion.	Assessment II Quiz II
	5	Leather industry – scope – processing of skin.	3	Analyse the process involved in leather preparation. (CO-1, 3)	Lecture, video	
V	Integrated Farming (15 Hrs)					
	1	Definition and Scope, Agri-based fish farming, paddy cum fish culture, horticulture-cum fish culture.	4	Knowledge on integrated fish farming. (CO-1, 3)	Lecture, Chalk and Talk, PPT	Short test, Online Assignment (Integrated fish culture), Formative Assessment II, Quiz II
	2	Integrated bee keeping – Live-stock fish farming, Duck cum fish culture.	3	Understand the integrated bee keeping. (CO-1)	Lecture, Video	
	3	Fish cum poultry farming, fish cum dairy farming, goat cum fish integration.	4	Compare the different types of fish farming. (CO-2)	Lecture PPT	
	4	Fish cum pig farming – multi-trophic aquaculture-Livestock –poultry – fish - Horticulture.	4	Describe the multi-trophic aquaculture. (CO-3, 5)	Lecture, Group Discussion, Video	

Course instructor
Dr. C. Anitha

Head of the Department
Dr. S. Mary Mettilda Bai

Semester : V & VI **Major Practical VI**
Name of the Course : Ecology and Toxicology & Evolutionary Biology
Course code : ZC17P6

No. of hours/week	No. of credits	Total number of hours	Marks
4	2	60	100

Learning Objectives

1. To investigate the relationship between the organisms and their environment.
2. To know the phylogenetic relations of the animal phyla and their traits in understanding the evolutionary relationship.

Course Outcomes

CO	Upon completion of this course the students will be able to:	PSO addressed	CL
CO - 1	analyse the water quality of an aquatic ecosystem.	PSO - 3	Ap ; An
CO - 2	examine and identify the zooplanktons.	PSO - 1	Ap
CO - 3	assess the evolutionary concepts through experiments.	PSO - 4	E
CO - 4	study the natural ecosystem and report.	PSO - 7	C; Ap

Teaching plan with Module

Total Hours 60 (Incl. Demonstration, Observation & Test)

Units	Module	Topic	Hours	Learning Outcome/ CO addressed	Pedagogy	Assessment
I	Ecology and Toxicology (30 Hrs.) V semester					
	1	Detection of transparency of water by Secchi disc.	3	Measure transparency of water. (CO-1)	Experiment	Continuous Performance based assessment.
	2	Estimation of oxygen content of water samples.	3	Estimate oxygen content in water samples. (CO-1)	Experiment	
	3	Estimation of salinity of water samples.	3	Estimate salinity of water samples. (CO-1)	Experiment	
	4	Mounting of freshwater and marine planktons	3	Identify planktons and prepare temporary slides. (CO-2)	Demonstration & Observation	Internal Assessment.
	5	Analysis of producers and consumers in grass land.	3	Identify the producers and consumers in an ecosystem. (CO-1)	Field visit	
6	Determination of 48 hours LC ₅₀ of a pesticide.	3	Determine LC ₅₀ of a pesticide. (CO-1)	Experiment		

	7	Study of natural ecosystem and field report of the visit (compulsory).	3	Document the field trip. (CO-4)	Field Trip	
	8	Museum Specimens: Secchi disc, Mutualism (Hermit crab and Sea anemone), Commensalism (Echeneis and Shark), Parasitism (Sacculina on Crab), Cyclomorphosis (Daphnia).	9	Identify and Explain Secchi disc, Mutualism, Commensalism, Parasitism, Cyclomorphosis. (CO-3)	Observation of the spotters and specimen	
II	Evolutionary Biology (30 Hrs.) VI Semester					
	1	Serial homology in prawn.	2	Identify Serial homology in prawn. (CO-4)	Practical	Peer-assessment.
	2	Prodigality of nature - Frog.	2	Identify the prodigality of nature – Frog and explain the concept of over-production. (CO-4)	Practical	
	3	Mutant forms in <i>Drosophila</i> .	4	Culture <i>Drosophila</i> and identify Mutant forms in <i>Drosophila</i> . (CO-4)	Demonstration	
	4	Observation of variation in finger prints.	2	Identify the various patterns of finger prints and prove the theory “variation is universal.” (CO-4)	Practical	Performance-based Assessment.
	5	Variations in the markings of Umbonium shells.	2	Observe the markings of Umbonium shells and prove the theory “No two individuals are alike.” (CO-4)	Practical	
	6	Demonstration of Natural selection on gene frequency using beads.	2	Analyse the impact of Natural selection on gene frequency using beads. (CO-4)	Demonstration	Self-assessment Model examinations
	7	Demonstration of Genetic drift on gene frequency using beads.	2	Test the role of Genetic drift on gene frequency using beads. (CO-4)	Practical	
	8	Demonstration of DNA sequence alignment by BLAST and construction of cladogram.	4	Demonstrate DNA sequence alignment by BLAST and construction of cladogram. (CO-4)	Demonstration	
	9	Homology- fore limbs of vertebrates, Analogy - wings of animals.	2	Identify Homology and Analogy in animals and prove organic evolution. (CO-4).	Charts	

11	Darwin finches, Industrial melanism, Ancon sheep,	2	Prove the concepts of adaptive radiation, natural selection and mutation and explain Darwinism and DeVrism of Evolution. (CO-4)	Charts	
12	Monarch and Viceroy butterfly, Stick insect, Krait and Lycodon.	3	Identify mimicry and colouration and explain their role in evolution. (CO-4)	Charts	

Course Instructor

Dr. S. Prakash Shoba

Head of the Department

Dr. S. Mary Mettilda Bai

Semester : VI Major Practical VII
Name of the Course : Biotechnology & Immunology and Microbiology
Course code : ZC17P7

No. of hours/week	No. of credits	Total number of hours	Marks
4	2	60	100

Learning Objectives

1. To familiarize the students with various immunological and microbiological techniques.
2. To implement experimental protocols and adapt them to carry out using biotechnological techniques.

Course Outcomes

CO	Upon completion of this course the students will be able to :	PSO addressed	CL
CO - 1	isolate genomic DNA.	PSO - 3	Ap
CO - 2	perform quantitative, immunological and microbiological analysis.	PSO - 6	Ap
CO - 3	differentiate Gram positive and negative bacteria.	PSO - 3	An; Ap
CO - 4	identify lymphoid organs in a vertebrate model.	PSO - 4	R
CO - 5	develop skills needed for future research in immunology, microbiology and biotechnology.	PSO - 6	Ap

Teaching plan with Modules

Total Hours 60 (Incl. Demonstration, Observation & Test)

Units	Modules	Topic	Hours	Learning outcome/ CO addressed	Pedagogy	Assessment
I	Biotechnology (30 Hrs.)					
	1.	Isolation of genomic DNA.	4	Isolate DNA from biological samples.	Practical	Performance based assessment
	2.	Estimation of DNA by Diphenylamine (DPA) Method.	4	Estimate the quantity of DNA.	Practical	
	3.	Estimation of BOD in Sewage.	2	Estimate and analyse the oxygen content in sewage.	Practical	
	4.	Estimation of COD in sewage.	2	Analyse the CO ₂ content in sewage.	Practical	
	5.	Immobilization of enzyme (Amylase/ Invertase/ Protease) using sodium alginate - Demonstration.	2	Recall the techniques and Immobilize enzyme.	Practical	
	6.	Polymerase Chain Reaction –	2	Recall DNA	Practical	

	Demonstration.		amplification.		Internal assessment Model examination
7.	Production of Hybridoma and Monoclonal antibodies – Flow chart.	2	Recall hybridoma technique.	Practical	
8	Isolation of B and T lymphocytes using kits.	4	Isolate B and T lymphocytes	Practical	
9.	Model/ Charts / Photo pBR 322, λ phage, SV40, Recombinant DNA, Electroporation unit, Southern blotting, RFLP, organ culture (Plasma clot method), Knockout mice, Dolly, Sanger's method of DNA sequencing,	4	Identify different vectors and its role in hybridization techniques. Recall different molecular techniques.	Observation	
10	Biosensor, Callus, Explant, Micropropagation, Fermenter, rDNA, Human genome sequence, Penicillin, Biogas production.	4	Identify and explains the biotechnological importance of the Model/ Charts / Photo	Observation	
II	Immunology and Microbiology (30 Hrs.)				
1	Dissection of Lymphoid organs of Rat - (Virtual demonstration).	2	Identify immune organs and its role. (CO-4, 5)	Demonstration through virtual lab	Pre-assessment. Performance-based Assessment.
2	Cleaning and sterilization of glass wares and Preparation of culture media for microbes.	4	Point out steps in sterilization and preparation of media. (CO- 2, 5)	Practical	
3	Serial dilution technique.	2	Recall serial dilution. (CO-2, 5)	Practical	Self-assessment, Model examination
4	Examination of bacterial motility by Hanging drop technique.	2	Devise the hanging drop technique. (CO-2, 3, 5)	Practical	
5	Staining of bacteria – simple staining and gram staining.	4	Identify bacilli and coccus, positive and negative bacteria. (CO-2, 3, 5)	Practical	
6	Radial immuno diffusion	4	Recall antigen antibody reactions. (CO-2, 5)	Practical	
7	<i>Escherichia coli</i> , TMV, T ₄ phage.	2	Relate the structure of bacteria and virus. (CO-3, 5)	Charts	
8	Bacterial growth curve, Chemostat.	2	Recall the growth curve and chemostat. (CO-3, 5)		

	9	Autoclave, Hot air oven, Inoculation loop.	4	Apply the culture technique of bacteria. (CO-3, 5)		
	10	Haemocytometer, Stage and Ocular micrometer.	4	Recall the application of haemocytometer and ocular micrometer. (CO-5)	Demonstration	

Course instructor

Dr. F. Brisca Renuga

Dr. A. Punitha

Dr. X. Venci Candida

Head of the Department

Dr. S. Mary Mettilda Bai