# B.Sc. Zoology Teaching Plan 2019-'20

Semester: VIName of the Course: BiotechnologyCourse 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**

СО	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	PSO - 3	U
	dogma.		
CO - 2	discuss the rDNA technology, DNA library, hybridoma technology,	PSO - 4	U
	animal cell and tissue culture and gene therapy.		
CO - 3	decide and apply appropriate tools and techniques in biotechnological	PSO - 6	Ap;
	manipulation.		An
CO - 4	explain the general principles of generating transgenic plants, animals	PSO - 6	Ар
	and application of microbes pharmaceutical products.		
CO - 5	undertake any responsibility as an individual and as a team in a	PSO - 8	Ap
	multidisciplinary environment for landing in a job.		

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

Unit	М	dula	Topies	Uo	11 MG	Looming outcomo/	Dodogogy	According
Um	IVIC	Juules	ropics	по	urs	CO addressed	reuagogy	Assessment
						CO audi esseu		
Ι	Pla	nt and	Animal cell culture (13	8 Hrs	s.)			
	1	Introd	uction.	3	Expl	ain the different	Lecture,	
		Cultur	e media - cell culture		type	s of culture media,	Discussion,	MCQ,
		techni	que.		their	ingredients and cell	Flow chart	
					cultu	re technique.		Formative
					(CO	-2)		assessment I,
	2	Establ	ishment of cell culture	3	Dem	onstrate primary,	Lecture,	Quiz I
		– prim	ary and sub-culture -		Expl	ant and callus	PPT	
		Explai	nt culture, callus		cultu	are. (CO-2)		Online
		culture	2.					Assignment,
	3	Somat	ic hybridization and	5	Disc	uss Somatic	Lecture,	
		micro-	-propagation.		hybr	idization and micro-	mind map,	
					prop	agation. (CO-3)	PPT	
	4	Cell li	nes - large scale	4	Iden	tify Cell lines and	Lecture,	

		culture of cell lines.		comprehend large scale	PPT	
				culture of cell lines.		
				(CO-2)		
	5	Organ culture - embryo	3	Differentiate and discuss	Lecture,	
		culture.		organ culture and embryo	video	
				culture. (CO-2)		
II	Tis	sue engineering, Transgenic a	nim	al technology, Hybridoma	technology (1	8 Hrs.)
	1	Artificial skin and cartilage.	4	Explain artificial skin	Group	Slip test
		Stem cells: characteristics,		and cartilage. Discuss	discussion,	Assignment
		types and applications.		characteristics, types and	PP1, Chalk	(Ouizizz)
		Turner and a surface at	2	applications. (CO-3)	and talk	(Quizizz) Formative
	2	I ransgenic animal	3	Outline transgenic animal	Lecture,	assessment I
		methods of transgenesis		technology. (CO-4)	PP1, Discussion	&
		applications of transgenic			Discussion	Ouiz I(1)
		applications of transgeme				
	3	Hybridoma technology:	5	Identify the different	Lecture.	Formative
		Production of Hybridoma.	-	steps involved in the	Flow chart.	assessment
		monoclonal antibodies:		production of	Video	II, Quiz 1I
		production and applications.		monoclonal antibodies.		(2,3,4)
				(CO-2)		
	4	Bioreactors: stirred tank	6	Discuss the common	Lecture,	Online
		and air-lift bioreactor.		types of bioreactors.	Chalk and	Assignment
				(CO-3)	talk, Model	
III	Me	tabolite production, Bioremed	liati	on (18 Hrs.)		
	1	Ethanol (primary	5	Demonstrate the	Lecture,	MCQ
		metabolite), Penicillin		production of ethanol and	PPT, Flow	Short test,
		(secondary metabolite).		penicillin. (CO-5)	chart	Formative
		Immobilization of enzymes				assessment
	2	and their applications.	4	Diama hiagangan and	Lastar	
	2	Biosensors – types and	4	Discuss biosensors and	DDT mind	Quiz II
		applications. Bacterial SCP		$(CO_3)$	PP1, IIIIIa	Online
				(0-3)	шар	Assignment
	3	Sewage and waste water	5	Narrate the steps	Lecture,	(Edmodo)
		treatment Rioremodiation		involved in	DDT Flow	(Lamouo)
		treatment. Dioremediation.			FF1, Flow	
		Types, Degradation of		bioremediation. (CO-4)	chart	
		Types, Degradation of Xenobiotics (hydrocarbon,		bioremediation. (CO-4)	chart	
		Types, Degradation of Xenobiotics (hydrocarbon, pesticide). Super bug –		bioremediation. (CO-4)	chart	
		Types, Degradation of Xenobiotics (hydrocarbon, pesticide). Super bug – construction and application.		bioremediation. (CO-4)	chart	
		Types, Degradation of Xenobiotics (hydrocarbon, pesticide). Super bug – construction and application.	4	bioremediation. (CO-4)	chart	
	4	Types, Degradation of Xenobiotics (hydrocarbon, pesticide). Super bug – construction and application. Biomining and bioleaching.	4	Discuss biomining and	Lecture,	
	4	Types, Degradation of Xenobiotics (hydrocarbon, pesticide). Super bug – construction and application. Biomining and bioleaching. Biocontrol – Bacillus	4	Discuss biomining and biocontrol. ( <b>CO-4</b> )	Lecture, PPT, mind	
187	4	Types, Degradation of Xenobiotics (hydrocarbon, pesticide). Super bug – construction and application. Biomining and bioleaching. Biocontrol – <i>Bacillus</i> <i>thuringiensis</i> .	4	Discuss biomining and biocontrol. ( <b>CO-4</b> )	Lecture, PPT, mind map	
IV	4 <b>Ge</b>	Types, Degradation of Xenobiotics (hydrocarbon, pesticide). Super bug – construction and application. Biomining and bioleaching. Biocontrol – <i>Bacillus</i> <i>thuringiensis</i> .	4	Discuss biomining and biocontrol. (CO-4)	Lecture, PPT, mind map	

		vectors: SV40, Ti plasmid.		enzymes and cloning vectors. ( <b>CO-1</b> , <b>2</b> )	talk, PPT	MCQ,
	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	6	Discuss the methods of rDNA technology. (CO-2)	Lecture, Video, Model	Formative assessment I, Quiz I Online
	3	of cloned gene. 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	Assignment
	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	DN	A applications, Bioethics, Nat	note	echnology (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
	2	Finger printing and its application in forensic medicine. Human Genome Project.	4	Illustrate finger printing technology and human genome project. (CO-5)	Lecture	assessment I & Quiz I (1,2 )
	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	Formative assessment II, Quiz 1I (3,4) Online
	4	Nanotechnology: applications of nanotechnology in medicine, drug designing and cancer treatment.	4	Comprehend the applications of nanotechnology. (CO-5)	Lecture, PPT, video	Assignment

Dr. A. Punitha Dr. S. Mary Mettilda Bai

Semester	: <b>VI</b>	Major Core IX
Name of the Course	: Immunology and Micr	obiology
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.

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	PSO - 3	Ap;
	microbiology and immunology.		An

# **Course Outcomes**

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

Unit	M	odules	Topics	H	ours	Learning Outcome/	Pedagogy	Assessment
Ι	I     Immunity and Lymphoid organs (18 Hrs.)							
	1	History immun	and scope of ology.	2	Orde imm (CO	er the history of unology year wise. -1)	Lecture, PPT	Short test, online
	2	Types of acquire	of immunity - Innate, d, passive and active.	3	Dist imm	inguish the types of unity. ( <b>CO-1</b> )	Lecture	Assignment (MCQ),
	3	Primar lympho Bone n Fabrici	y and Secondary bid organs - Thymus, harrow, Bursa of us.	4	Rela Secc func	te Primary and ondary organs and their tions.( <b>CO-1</b> )	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. ( <b>CO-1</b> )	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	Aı	ntigen and antibodies (18 Hrs.)				
	1	Haemopoietic stem cells and haemopoiesis.	4	Identify Haemopoietic stem cells. (CO-2)	Lecture	MCQ,
	2	Antigen. Immunogens, hapten and adjuvants.	4	Describe antigens, Immunogens, hapten and adjuvants. ( <b>CO-2</b> )	Blended classroom	online Assignment (Antigens and
	3	Immunoglobulin: Immunoglobulin classes, structure and functions of IgG.	5	Sketch the structure of Immunoglobulin. (CO-2)	Lecture, you tube video	Immunogens), Formative assessment I –
	4	Antigen – Antibody reactions. Secondary antibody, purification of antibody using protein A/G.	5	Explain antigen – antibody reactions and purification of antibody. ( <b>CO-2</b> )	Lecture, PPT	1,2,3,4 Quiz I
III	In	mune Response (18 Hrs.)			·	
	1	Immune Response: Primary and secondary immune response.	3	Categorize immune response. ( <b>CO-2</b> )	Lecture, PPT	Short test,
	2	- Humoral immune response, Cell-mediated immune response.	5	response. Illustrate cell mediated response. (CO-2)	video	Formative assessment I –
	3	Hypersensitivity: Allergens and types of hypersensitivity.	4	Summarize Allergens and types of hypersensitivity. (CO-2)	Lecture, PPT	1,2,3 Formative
	4	Tumour immunology. Autoimmunity - Rheumatoid arthritis.	4	Identify the causes, symptoms and treatment of Rheumatoid arthritis. ( <b>CO-2</b> )	Lecture, PPT	assessment II– 4,5 Quiz I, II
	5	Vaccines and Immunization schedule.	2	Indicate Immunization schedule. (CO-2)	Jigsaw	
IV	M	icrobiology (18 Hrs.)	4		T (	<b>N</b> <i>A</i> <sup>1</sup>
	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 E. coli,	3	Explain the structure of	Lecture,	(Structure of
		bacterial growth curve.		<i>E. coli.</i> ( <b>CO-3</b> )	Chalk and	TMV and $T_4$
					Talk	Bacteriophage),
	3	Culture media. Culture	5	Differentiate and apply	Lecture/ PPT	
		techniques - batch culture and		culture media. Describe		Formative
		continuous culture (chemostat		different culture technique.		assessment II
		and turbidostat).		(CO-3)		1,2,3,4,5
	4	Virus: structure (TMV and T <sub>4</sub>	4	Illustrate the structure of	Lecture/	
		phage) – reproduction of phages		Virus and its reproduction.	Video	Quiz II
		(lysogenic and lytic).		(CO-3)		
	5	Synthetic Biology	2	Outline Synthetic Biology.	Group	
				(CO-3)	discussion	
V	Fo	od Microbiology, Industrial Mic	rob	iology and Medical Microbio	logy (18 Hrs.)	
	1	Food Microbiology - Food	4	Explain food poisoning and	Lecture,	Slip test,
		poisoning, food spoilage and		spoilage. (CO-5)	Chalk and	
		preservation.			Talk	Formative
	2	Industrial microbiology: Wine	4	Interpret Wine and vinegar	Lecture,	assessment II -
		and vinegar production		production in the industries.	Chalk and	1,2,3,4,5
				(CO-5)	Talk	
	3	Medical microbiology:	4	List bacterial diseases.	Poster, Flash	Quiz II
		Bacterial diseases		(CO-4)	cards	
		(Tuberculosis, Gonorrhea,				MCQ through
		Streptococcal dermal infection).				Quizziz
	4	Viral diseases (AIDS, Chicken	4	Discuss viral diseases.	Lecture, PPT	
		pox, Hepatitis B, Rabies).		(CO-4)		
	5	Fungal diseases (Mycotoxicosis	2	Categorize fungal diseases.	РРТ	
		and Aspergillosis).		(CO-4)		

Dr. X. Venci Candida

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

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	PSO	CL
	to:	addressed	
CO - 1	explain the concepts of evolution, origin of life, geological	PSO - 1	U
	time scale and evidences of evolution.		
CO - 2	explain the theories of evolution, mechanism of speciation and	PSO - 3	R
	extinction of organism.		
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	PSO - 6	Ар
	life to hominid evolution.		_
CO - 5	perform, analyse and report experimental observations in	PSO - 2	Ap; An
	evolutionary biology.		

# **Teaching Plan with Modules**

Total Hours 60 (Incl. Assignments & Test)

Unit	Μ	odules	Topics	H	ours	Learning outcome/ CO addressed	Pedagogy	Assessment
Ι	Co	oncepts	and Evidences of Evolut	ion	(15 H	[rs.)		
	1	Conce	pts and Evidences of	4	Expl	ain Origin of life -	Lecture,	Short test,
		Evolut	ion: Origin of life -		Theo	ories and	Flipped	
		Theori	es and experiments.		expe	eriments. (CO-1).	learning	MCQ,
	2	Evider	nces insupport of	7	Com	paring the process of	Lecture,	
		evolut	ion – morphology and		evol	ution – morphology	Chalk and	Formative
		compa	rative anatomy,		and	comparative	talk,	assessment I
		embry	ology,		anat	omy, embryology.	Blended	(1,2,3,4)
					(CO	-1).	learning	Quiz I
	3	Physic	ology and	2	Com	paring the process of	Lecture,	Online
		bioche	emistry,		evol	ution – Physiology	Chalk and	assignment
		palaeo	ntology.		and	biochemistry,	talk	
					pala	eontology. (CO-1).		

	4	Geological time scale.	3	Summarize Geological time scale. ( <b>CO-1</b> )	Lecture , Chalk and talk	
	T	heories of Evolution (15 Hrs.)		•		
	1	Theories of Evolution: Lamarckism, Neo- Lamarckism.	3	Explain the theory of Lamarckism, Neo- Lamarckism. ( <b>CO-2</b> ).	Lecture, Chalk and talk, PPT	Short test, MCQ
	2	Darwinism, Neo- Darwinism.	3	Explain the theory of Darwinism, Neo-Darwinism. ( <b>CO-2</b> ).	Lecture, Chalk and talk, Video	Formative assessment I (1,2,3,4,5).
п	3	Mutation theory of De Vries. Modern synthetic theory.	4	Describing the Mutation theory of De Vries and Modern synthetic theory. ( <b>CO-2</b> , <b>3</b> ).	Lecture, Chalk and talk	Quiz I
	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	Is	olating mechanisms, Species Co	ncej	pt 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
	2	Species, sibling species, sub species, demes.	3	Explain the species, sibling species, sub species, demes. ( <b>CO-2</b> ).	Lecture, Chalk and talk	(1,2,3) Quiz I Mind map
	3	Species concept - morphological, genetic and biological.	2	Summarize morphological, genetic and biological Species concept. (CO-2).	Lecture, PPT, Peer group teaching	Formative assessment II (4,5)
	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	Quiz II
	5	Patterns of speciation – allopatric, sympatric, quantum and parapatric.	4	Compare the different patterns of speciation. (CO-2).	Lecture, PPT, Brain storming	
IV	Pł	nylogenetic analysis (15 Hrs.)				

		1	Phylogenetic analysis:	4	Explain the various	Lecture,	Short test,
			Tools for sequence		tools for sequence	PPT,	MCO
			alignment-BLASI,		alignment-BLASI, $E_{A}ST_{A}$ (CO-4)	Flipped	meg,
			TASTA.		TASTA. (CO-4).	learning, L-	Formative
	•	2	Methods of phylogenetic	4	Summarize the	Lecture,	assessment II $(1, 2, 2, 4)$
			analysis - phenetic and		methods of	Chalk and	(1,2,3,4),
			cladistic; phylogenetic		phylogenetic	talk	Quiz II
			trees.		analysis - phenetic		
					and cladistic;		Mind map
					phylogenetic trees.		
		3	Methods for determining	7	(CO-4). Evaluating the	Lecture	
		5	evolutionary trees –	, '	methods for	Chalk and	
			maximum parsimony,		determining	talk, Peer	
			distance and maximum		evolutionary trees –	group	
			likelihood.		maximum	teaching	
					parsimony, distance		
					and maximum		
_	<b>X</b> 7	Tr	ands in Evolution Mimiany and		$\frac{11 \text{Kell}(1000\text{ G}, (\text{CO-4}))}{10000000000000000000000000000000000$		
	v	1	Trends in Evolution.		Describe the modes of	Lecture	Formative
		1	Modes of evolution-	5	evolution-micro, macro	Chalk and	assessment II
			micro, macro and		and megaevolution. (CO-	talk	(1,2,3,4)
			megaevolution.		5)		
		2	Heterochrony -	1	Define and explain	Lecture,	
			Paedomorphosis and		Paedomorphosis and	PPT,	
			Peramorphosis.		Peramorphosis. (CO-2)	Flipped	
		2	Data of evolution Human	6	Evolucting the Data of	learning	
		3	Fixed Figure - organic cultural	0	evolution Human	Chalk and	
			and future evolution		Evolution – organic	talk PPT	
					cultural and future	Video	
					evolution. (CO-5)		
		4	Mimicry and colouration.	2	Describe the Mimicry	Lecture,	
					and colouration. (CO-5)	Chalk and	
						talk,	
	ŀ	5	Extinction trace courses or 1	2	Summonize the trues	Models	
		3	Exunction - types, causes and significance	3	causes and significance	Chalk and	
			significance.		of extinction ( <b>CO-5</b> )	talk	

Dr. S. Prakash Shoba

Semester	: VI
Name of the Course	: Applied Zoology
Course code	: ZC1764

Elective IV (a)

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	PSO	CI					
CO	to:	addressed	CL					
CO - 1	apply the knowledge of animal husbandry in economic	PSO - 5	U					
	development.							
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	Ар					
CO - 4	apply skills and experience about the management of poultry	PSO - 9	Ар					
	and Dairy farming.							
CO - 5	culture of economically important finfish and shell fishes.	PSO - 8	Ap					

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

Unit	Μ	odules	Topics	He	ours	Learning Outcome / CO addressed	Pedagogy	Assessment
Ι	A	oiculture	e (15 Hrs)		•			
	1	Scope,	Classification and	3	Cate	gorize the kinds of	Lecture,	MCQ,
		kinds o	f bees, Bees and		bees	and their features.	Chalk and	
		their so	ciety.		(CO	-1, 2)	Talk	Slip test,
	2	Life cy	cle of Apis indica –	4	Iden	tify the various stages	Lecture,	
		food of	honey bees -		of be	ees. (CO- 2)	Mind map	Mind Map,
		relation	ship between plants					
		and bee	es.					Online
	3	Method	ls of bee keeping	2	Expl	ain the methods of	Lecture,	Assignmen
		(primiti	ive and modern).		bee l	keeping. (CO-3)	Video	t (Honey
	4	Honey	Bee products: honey,	2	Anal	yse the various honey	PPT,	bee
		bee way	x, bee venom.		bee p	products. (CO-3)	Group	products),
							Discussion	
	5	Lac cu	lture – scope – lac	4	Expl	ain the various stages	Lecture,	Formative
		insect I	Laccifer lacca and its		of la	c insect.	Video.	Assessment
		life cyc	le – processing of lac		(CO	-2, 3)		l,
		-lac pr	oducts and					Quiz I
		importa	ance.					

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

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

Dr. C. Anitha

# Semester: V & VIMajor Practical VIName of the Course: Ecology and Toxicology & Evolutionary BiologyCourse 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**

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

# **Teaching plan with Module**

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

Units Modul		dule	Торіс	Hours		Learning Outcome/ CO addressed	Pedagogy	Assessment
Ι	Eco	logy	and Toxicology (30 Hrs.)	V se	emest	I		
	1	Dete wate	ection of transparency of er by Secchi disc.	3	Mea wate	sure transparency of er. ( <b>CO-1</b> )	Experiment	
	2	Esti cont	mation of oxygen ent of water samples.	<ul> <li>3 Estir</li> <li>wate</li> <li>3 Estir</li> <li>sample</li> </ul>		mate oxygen content in er samples. (CO-1)	Experiment	Continuous Performance
	3	Esti wate	mation of salinity of er samples.			mate salinity of water ples. (CO-1)	Experiment	based assessment.
	4	Mou mar	inting of freshwater and ine planktons	3	Iden prep (CO	tify planktons and are temporary slides. -2)	Demonstration & Observation	
	5	Ana cons	lysis of producers and sumers in grass land.	3	Iden cons (CO	tify the producers and sumers in an ecosystem. -1)	Field visit	Internal Assessment.
	6	Dete LC <sub>5</sub>	ermination of 48 hours $_0$ of a pesticide.	3	Dete pest	ermine $LC_{50}$ of a icide. ( <b>CO-1</b> )	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		
	Evo	olutionary Biology (30 Hrs.) VI	Ser	nester			
	1	Serial homology in prawn.	2	Identify Serial homology in prawn. ( <b>CO-4</b> )	Practical		
	2	Prodigality of nature - Frog.	2	Identify the prodigality of nature – Frog and explain the concept of over- production. ( <b>CO-4</b> )	Practical		
Π	3	Mutant forms in Drosophila.	4	Culture <i>Drosophila</i> and identify Mutant forms in Drosophila. ( <b>CO-4</b> )	Demonstration	Peer-	
	4	Observation of variation in finger prints.	2	Identify the various patterns of finger prints and prove the theory "variation is universal." ( <b>CO-4</b> )	Practical	assessment. 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." ( <b>CO-</b> <b>4</b> )	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		
	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	Model examinations	
	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. ( <b>CO-4</b> ).	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. ( <b>CO-4</b> )	Charts	

Dr. S. Prakash Shoba

# Semester: VIMajor Practical VIIName of the Course: Biotechnology & Immunology and MicrobiologyCourse 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**

СО	Upon completion of this course the students will be able to :	PSO addressed	CL
CO - 1	isolate genomic DNA.	PSO - 3	Ар
CO - 2	perform quantitative, immunological and microbiological analysis.	PSO - 6	Ар
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	Ар

#### Teaching plan with Modules Total Hours 60 (Incl. Demonstration, Observation & Test)

Units	Мо	dules	Торіс	Ho	ours	Learning outcome/	Pedagogy	Assessment
Ι	<b>Biotechnology</b> (30 Hrs.)							
	1. Isolation of genomic DNA.		4	4 Isolate DNA from		Practical	Performance	
					biol	ogical samples.		based
	2.	Estim	ation of DNA by	4	Esti	mate the quantity of	Practical	assessment
		Dipne	inylamile (DPA) Method.	2		A.	D ( 1	_
	3.	Estim	ation of BOD in Sewage.	2	esti oxy	gen content in sewage.	Practical	
	4.	Estim	ation of COD in sewage.	2	Ana	lyse the $CO_2$ content	Practical	
		-			in se	ewage.		
	5.	Immo	bilization of enzyme	2	Rec	all the techniques and	Practical	
		(Amy	lase/ Invertase/ Protease)		Imn	nobilize enzyme.		
		using	sodium alginate -					
		Demo	onstration.					
	6.	Polyn	nerase Chain Reaction –	2	Rec	all DNA	Practical	

		Demonstration.		amplification.		Internal
				-		assessment
	7.	Production of Hybridoma and	2	Recall hybridoma	Practical	
		Monoclonal antibodies – Flow		technique.		Model
	0	chart.		Lalata Dan 1 T lamanta antes		examination
	8	8 Isolation of B and I lymphocytes		Isolate B and T lymphocytes	Practical	
	9	Model/ Charts / Photo	4	Identify different vectors	Observation	
	2.	pBR 322 $\lambda$ phage SV40		and its role in	o ober varion	
		Recombinant DNA.		hybridization techniques		
		Electroporation unit, Southern		hybridization teeninques.		
		blotting, RFLP, organ culture		Recall different molecular		
		(Plasma clot method),		techniques.		
		Knockout mice, Dolly,		1		
		Sanger's method of DNA				
	10	sequencing,	4			
	10	Biosensor, Callus, Explant,	4	litentify and explains the	Observation	
		rDNA Human genome		importance of the Model/		
		sequence. Penicillin, Biogas		Charts / Photo		
		production.				
П	Im	nunology and Microbiology (30 H	rs.)			
	1	Dissection of Lymphoid organs	2	Identify immune organs	Demonstration	Pre-
		of Rat - (Virtual		and its role. (CO-4, 5)	through virtual	assessment.
		demonstration).			lab	
	2	Cleaning and sterilization of	4	Point out steps in	Practical	
		glass wares and Preparation of		sterilization and		Performance-
		culture media for microbes.		preparation of media.		based
				(CO-2,5)		Assessment.
	3	Serial dilution technique.	2	Recall serial dilution.	Practical	
	4	Examination of heatenial	2	(CO-2, 5)	Due et e 1	
	4	Examination of bacterial	2	Devise the hanging drop	Practical	Self-
		technique		(CO-2, 3, 5)		assessment,
	5	Staining of bacteria – simple	Δ	Identify bacilli and	Practical	Model
	5	staining and gram staining.		coccus, positive and	Thettear	examination
		Source & and & and Source Sources.		negative bacteria.		
				(CO-2, 3, 5)		
	6	Radial immuno diffusion	4	Recall antigen antibody	Practical	
				reactions.		
				(CO-2, 5)		
	7	<i>Escherichia coli</i> , TMV, T <sub>4</sub>	2	Relate the structure of	Charts	
	phage.			bacteria and virus.		
				(CO-3, 5)		
	8	Bacterial growth curve,	2	Recall the growth curve		
1	1	Cnemostat.	1	and chemostat. (CO-3, 5)		

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

Dr. F. Brisca Renuga Dr. A. Punitha Dr. X. Venci Candida