

## Teaching Plan (2019-2020) Semester - V

For those who joined in the programme from the academic year 2017-2018 and afterwards

### B. Sc. PROGRAMME OUTCOMES (PO)

PO No.	Upon completion of B.Sc. Degree Programme, the graduates will be able to:
PO - 1	apply the acquired scientific knowledge to face day to day needs.
PO - 2	create innovative ideas through laboratory experiments.
PO - 3	carry out field works and projects independently and in collaboration with other institutions and industries.
PO - 4	reflect upon green initiatives and take responsible steps to build a sustainable environment.
PO - 5	face challenging competitive examinations that offer rewarding careers in science and education.
PO - 6	impart communicative skills and ethical values.
PO - 7	equip students with hands on training through various courses to enhance entrepreneurship skills.

### B.Sc. Zoology PROGRAMME SPECIFIC OUTCOMES (PSO)

PSO	Upon completion, B.Sc. Zoology graduates will be able to:	PO
PSO - 1	acquire knowledge on biosystematics and functional organization of animals.	PO - 1
PSO - 2	undertake studies in different Zoological disciplines like Biochemistry, Cell Biology, Genetics, Physiology, Developmental Biology, Ecology, Evolution, Immunology, Microbiology, Biostatistics and Computer applications.	PO - 3
PSO - 3	demonstrate practical skills and to interpret results.	PO - 6
PSO - 4	communicate appropriately and effectively, in a scientific context using current technology.	PO - 6
PSO - 5	develop entrepreneurship skills by applying the knowledge gained from courses like Aquaculture, Sericulture, Apiculture, Poultry, Vermitechnology, Clinical Lab Technology and General Health Care.	PO - 2
PSO - 6	plan their career goals and pursue higher studies to meet global challenges.	PO - 7
PSO - 7	acquire the professional skills to handle ethical and legal issues and social responsibilities.	PO - 4
PSO - 8	apply the knowledge attained from principles and concepts learnt from specific subject areas to create a local and global impact.	PO - 5
PSO - 9	enhance professional empowerment to attain economic independence.	PO - 7

Semester : V  
 Name of the Course : Physiology  
 Course code : ZC1751

Major Core V

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

### Learning Objectives

1. To make students understand the functional significance of the different organs and organ systems of animals.
2. To provide job opportunities in academic institutions, National Health Service Centers.

### Course Outcomes

CO	Upon completion of this course the students will be able to:	PSO addressed	CL
CO - 1	understand the basic anatomy of digestive, respiratory, excretory, homeostatic, neuromuscular, endocrine and reproductive system.	PSO - 1	U
CO - 2	describe the functional mechanism of internal regulation by different organ systems.	PSO - 1	U; R
CO - 3	compare various organ systems and discuss the adaptations exhibited by animals.	PSO - 1	U; E
CO - 4	analyze the reason for diseases in man and other organisms.	PSO - 8	U; An
CO - 5	use anatomical knowledge to predict physiological consequences.	PSO - 8	Ap; C; An

### Teaching plan with Modules

Total Hours 90 (Incl. Assignments & Test)

Units	Modules	Topics	Hours	Learning outcome/ CO addressed	Pedagogy	Assessment
<b>I</b>	<b>Nutrition, Digestion and Absorption (18 Hrs.)</b>					
	1	<b>Nutrition:</b> Types, composition of food - importance of nutrients.	3	Explain the composition of food and importance of nutrients. <b>(CO-1)</b>	Lecture, Chalk and talk, Video	Short test, MCQ,
	2	Balanced diet, Basal metabolic rate (BMR) and Body mass index (BMI).	3	Recognize the balanced diet, basal metabolic rate and Body mass index. <b>(CO-1,4)</b>	Lecture, PPT	Online Assignment through Quizzz,
	3	Malnutrition (Marasmus, Kwashiorkor, Obesity, epidemic dropsy).	3	Discuss Malnutrition. <b>(CO-1,4)</b>	Lecture, PPT	Formative Assessment

	4	Digestive system of man.	3	Illustrates the digestive system of man. (CO-1,2)	Lecture, PPT, YouTube	I (1,2,3,4,5), Quiz I
	5	Digestion of carbohydrate, protein and fat. Absorption and assimilation of digested food materials.	4	Relates the Digestion of food materials. (CO-1,2)	Lecture, PPT	
	6	Physiology of ruminating stomach.	2	Recall the Physiology of ruminating stomach. (CO-1,2)	Lecture.	
<b>II</b>	<b>Respiration, Osmoregulation &amp; Thermoregulation (18 Hrs.)</b>					
	1	Respiratory organs, Respiratory pigments.	3	Explain the Respiratory organs, and Respiratory pigments. (CO-1,2)	Lecture, PPT, Video	MCQ, <b>Respiratory system of man, transport of O<sub>2</sub> and CO<sub>2</sub>.</b> Formative Assessment I (1,2,3), Quiz I, Formative Assessment II (4,5), Quiz II,
	2	Respiratory system of man, gaseous exchange - transport of O <sub>2</sub> and CO <sub>2</sub> , Dissociation curve, Bohr's effect.	5	Discuss the Respiratory system of man. (CO-1,2)	Lecture, PPT, Team teaching	
	3	Chloride shift, Anaerobiosis, Respiratory Quotient.	3	Explores the process of Chloride shift, Anaerobiosis and Respiratory Quotient. (CO-1,2)	Lecture, PPT	
	4	Osmoregulation: Osmoconformers, Osmoregulators, Osmoregulation in crustaceans, fishes and mammals.	4	Recognize the Process of Osmoregulation. (CO-1,2,3)	Lecture, PPT, Chalk and talk, Virtual learning	
	5	Thermoregulation: Poikilotherms and Homeotherms, thermoregulatory Mechanism.	3	Recognize the Process of Thermoregulation. (CO-1,2,3)	Lecture, PPT	
<b>III</b>	<b>Circulation, Excretion (18 Hrs.)</b>					
	1	Blood Composition. Myogenic and neurogenic heart, structure of human heart.	4	Explain the Structure of human heart. (CO-1,2)	Lecture, Self learning	MCQ Short test,  Online assignment through Edmodo,
	2	Heart beat - its origin and conduction, Pace maker, cardiac cycle, ECG, blood pressure.	4	Discuss the Heartbeat, Pace maker, cardiac cycle, ECG, blood pressure. (CO-1,2)	Lecture, Reflective teaching, PPT	

	3	Heart diseases: atherosclerosis, acute coronary occlusion, Myocardial infarction.	2	Discuss Heart diseases. <b>(CO-1,4,5)</b>	Lecture, PPT	Formative Assessment II (1,2,3,4,5,6)  Quiz II, Quizizz.	
	4	Excretion: Patterns of excretion, excretory organs in invertebrates.	3	Recall the process of Excretion. <b>(CO-3)</b>	Lecture, PPT,		
	5	Structure of kidney in man, nephron and Mechanism of urine formation.	3	Discuss the structure and functions of kidney in man. <b>(CO-1,2)</b>	Lecture, PPT, Web based class		
	6	Composition of urine. Nephritis and Dialysis.	2	Recall the Composition of urine. Nephritis and Dialysis. <b>(CO-1,3,5)</b>	Lecture, PPT		
<b>IV</b>	<b>Muscle physiology, Neurophysiology, Receptors (18 Hrs.)</b>						
	1	Types of muscles, Ultrastructure and properties of skeletal muscle.	3	Explain the types of muscles, ultrastructure and properties of skeletal muscle. <b>(CO-1,2)</b>	Lecture, PPT, Discussion.	MCQ, Short test,	
	2	Mechanism of muscle contraction and Rigor mortis.	3	Discuss the mechanism of muscle contraction and Rigor mortis. <b>(CO-1,2)</b>	Lecture, PPT, Video lesson.	Formative Assessment II (1,2)	
	3	Structure and types of neurons, Neurotransmitters.	2	Explain Nervous system and Structure of a neuron. <b>(CO-1,2)</b>	Lecture, PPT, Discussion.	Quiz II,	
	4	Conduction of nerve impulse through myelinated and non-myelinated nerve, Conduction of nerve impulse through synapse and neuro muscular junction.	5	Recall the conduction of nerve impulse. <b>(CO-1,2)</b>	Lecture, PPT.	Formative Assessment III (3,4,5,6),	
	5	Reflex action.	1	Discuss the Reflex action. <b>(CO-1,2)</b>	Lecture, PPT		
	6	Receptors: Types, Physiology of photoreception and phonoreception.	4	Recognize receptors. <b>(CO-1,2,5)</b>	Lecture, PPT, Video		
<b>V</b>	<b>Endocrine Physiology, Reproductive Physiology (18 Hrs.)</b>						
	1	Hormones and Pheromones.	2	Discuss hormones and pheromones. <b>(CO-1,2)</b>	Lecture, PPT, Discussion	MCQ Short test,	
	2	Endocrine glands - Pituitary, Thyroid, Parathyroid, Adrenal, Islets of Langerhans.	5	Discuss the endocrine glands. <b>(CO-1,2,5)</b>	Lecture, PPT	Formative Assessment III (1,2,3,4,5),	
	3	Biological clock and biological rhythms.	2	Discuss the biological clock and biological	Lecture, PPT		

				rhythms. <b>(CO-1,2)</b>		<b>Assignment on Female reproductive system.</b>
4	Male reproductive system. Female reproductive system, structure of graffian follicle.	4	Recall the structure of reproductive system. <b>(CO-1,2,5)</b>	Lecture, PPT, Discussion, Video		
5	Sexual cycles: Oestrus cycle, menstrual cycle- Menopause.	3	Recognize sexual cycles. <b>(CO-1,2,5)</b>	Lecture, PPT, Discussion		
6	Hormonal regulation of menstruation, pregnancy and lactation.	2	Explain the hormonal regulation of menstruation, pregnancy and lactation. <b>(CO-1,2,5)</b>	Lecture, PPT		

**Course instructor**  
Dr. A. Punitha

**Head of the Department**  
Dr. S. Mary Mettilda Bai

**Semester : V**  
**Name of the Course : Developmental Zoology**  
**Course code : ZC1752**

**Major Core VI**

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

### Learning Objectives

1. To understand the sequential changes from cellular grade of organization to organ grade of organization in the development of multicellular organisms.
2. To pursue a wide range of career related to women's health and also in fields concerned with maternal and reproductive medicine.

### Course Outcomes

CO	Upon completion of this course the students will be able to:	PSO addressed	CL
CO - 1	explain gametogenesis, fertilization and parthenogenesis.	PSO - 2	U
CO - 2	describe cleavage, morphogenetic movements and gastrulation.	PSO - 2	R
CO - 3	acquire knowledge on Organizer, gradient system foetal membranes and placentation in mammals	PSO - 6	U
CO - 4	demonstrate metamorphosis and regeneration	PSO - 2	R
CO - 5	discuss Nuclear cytoplasmic interaction, assisted reproductive technology and birth control measures.	PSO - 8	R

### Teaching plan with Modules

**Total Hours 90 (Incl. Assignments & Test)**

Units	Modules	Topics	Hours	Learning Outcome/ CO addressed	Pedagogy	Assessment
<b>I</b>	<b>Gametogenesis, Fertilization, Asexual Reproduction &amp; Parthenogenesis (18 Hrs.)</b>					
	1	Gametogenesis: Introduction, Spermatogenesis, Oogenesis.	4	Explains the process of spermatogenesis and oogenesis. (CO-1)	Flow Chart, PPT.	MCQ Short test
	2	Types of sperm and egg, egg membranes. Structure of sperm and egg of frog, chick and human.	5	Differentiates the structure of sperm and egg of frog, chick and human. (CO-1)	Lecture, PPT.	Open book test Formative Assessment I
	3	Fertilization: significance, types, chemical and cytological factors involved	5	Identifies the cytological and physiological changes during fertilization.	Group discussion, Lecture.	(1,2,3,4), Quizizz.

		in fertilization - physiological changes in fertilization. Asexual reproduction.		(CO-1)		<b>Assignment on Parthenogenesis: types and significance.</b>
4		Asexual reproduction. Parthenogenesis: types and significance.	4	Illustrates the process of parthenogenesis. (CO-1)	Lecture, video - you tube.	
<b>II</b>	<b>Cleavage &amp; Organogenesis (18 Hrs.)</b>					
1		Cleavage: Planes and patterns of cleavage, cleavage and blastulation in frog.	4	Relates the different planes and patterns of cleavage. (CO-2)	Lecture, pictographic method.	Quiz, Slip test Formative Assessment I (1,2,3) Formative Assessment II (4,5,6), Online assignments using Edmodo.
2		Fate map of frog. Morphogenetic movements.	3	Relates the morphogenetic movements during blastulation. (CO-2)	Video lesson, Lecture, blended classroom.	
3		Gastrulation in frog.	2	Explores the process involved in gastrulation. (CO-2)	PPT, Lecture.	
4		Stem cells. Development of brain, eye, heart and digestive system in frog.	6	Records how the different organs are developed. (CO-3)	Lecture/ Video lesson.	
5		Development of digestive system in frog.	2	Recognize the development of digestive system. (CO-3)	Lecture, flipped classroom.	
6		Transplantation.	1	Identifies the process of transplantation. (CO-3)	Lecture.	
<b>III</b>	<b>Organizer, Gradient theory &amp; Extra embryonic membranes (18 Hrs.)</b>					
1		Organizer: Spemann's experiments- organizer in amphibian embryo.	4	Identifies organizer through experimental study. (CO-3)	Brain storming, Lecture.	Open book test Quiz, Slip test Formative Assessment II (1,2,3,4.5.6), Kahoot Quiz.
2		Embryonic induction - neural induction. Competence.	2	Explains the embryonic and neural induction. (CO-3)	Group discussion, Lecture.	
3		Gradient theory: gradient system - types, experimental evidences.	4	Differentiates the different types of gradient system. (CO-3)	Lecture, vocabulary drills.	
4		Morphogenetic fields.	2	Identifies morphogenetic fields. (CO-3)	Lecture, video lesson.	
5		Extra embryonic membranes: Development of foetal membranes.	3	Illustrates the development of foetal membranes. (CO-3)	Lecture, flash cards.	
6		Placenta in mammals - classification, functions and development. Placental	3	Relates the different types of placenta. (CO-3)	Lecture, PPT using smart board.	

		preservation.				
<b>IV</b>	<b>Metamorphosis &amp; Regeneration (18 Hrs.)</b>					
	1	Metamorphosis: Types, Insect and Amphibian metamorphosis.	5	Explores the process of metamorphosis. <b>(CO-4)</b>	Flow Chart, PPT.	MCQ Formative Assessment II (1) Formative Assessment III (2,3,4), <b>Assignment</b> through Edmodo: <b>Physiological changes involved in regeneration.</b>
	2	Hormonal control of metamorphosis in Insect and Amphibian.	3	Records how hormones control metamorphosis. <b>(CO-4)</b>	Lecture, PPT.	
	3	Regeneration: types, regeneration in Planaria, Amphibia and human liver.	5	Recognize the regeneration process in Planaria, amphibian and human. <b>(CO-4)</b>	Group discussion, Lecture	
	4	Factors influencing regeneration, physiological changes involved in regeneration.	5	Identifies the factors involved in regeneration. <b>(CO-4)</b>	Lecture, online video lesson	
<b>V</b>	<b>Nucleo-cytoplasmic interaction, In vitro fertilization &amp; Birth Control (18 Hrs.)</b>					
	1	Nucleo-cytoplasmic interaction: Acetabularia.	2	Explains the Nucleo-cytoplasmic interaction. <b>(CO-5)</b>	Lecture, pictographic method.	Quiz, Slip test Formative Assessment III (1,2,3,4,5,6), Quizizz.
	2	In vitro fertilization: Infertility – causes and diagnostic parameters – hormonal imbalance.	4	Recalls the causes of infertility. <b>(CO-5)</b>	Video lesson, lecture.	
	3	Poly Cystic Ovarian Diseases (PCOD) - artificial insemination.	4	Identifies PCOD diseases. <b>(CO-5)</b>	PPT, lecture.	
	4	Cryopreservation of sperm and ovum - test tube babies – amniocentesis.	3	Illustrates the process of cryopreservation. <b>(CO-5)</b>	Lecture/ Video lesson.	
	5	Birth control: contraceptive devices - surgical method.	2	Relates the different contraceptive devices. <b>(CO-5)</b>	Lecture, flipped classroom.	
	6	Hormonal and therapeutic methods of birth control - physical barriers - IUCD.	3	Explores the hormonal and therapeutic methods of birth control. <b>(CO-5)</b>	Lecture, models and pictographic method.	

**Course Instructor**  
Dr. X. Venci Candida

**Head of the Department**  
Dr. S. Mary Mettilda Bai



Semester : V  
 Name of the Course : Ecology and Toxicology  
 Course code : ZC1753

Major Core VII

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

### Learning Objectives

1. To provide the opportunity for students to develop a deep understanding of various aspects of the environment and apply that knowledge to current environmental issues and for wise environmental management.
2. To seek employment in Food and Drug Administration agency and Environmental Protection Agency.

### Course Outcomes

CO	Upon completion of this course the students will be able to:	PSO addressed	CL
CO - 1	discuss the abiotic and biotic factors of the natural ecosystem.	PSO - 1	U
CO - 2	identify the natural resources and its conservation.	PSO - 2	R
CO - 3	critically evaluate the environmental degradation and suggest measures for remediation.	PSO - 3	Ap; E
CO - 4	identify hazardous environmental factors and assess their effects.	PSO - 7	Ap; An
CO - 5	utilize scientific literature and database to effectively communicate aspects of toxicology.	PSO - 5	Ap

### Teaching plan with Modules Total Hours 75 (Incl. Assignments & Test)

Units	Modules	Topics	Hours	Learning Outcome/ CO addressed	Pedagogy	Assessment
I	<b>Ecology, Biotic factors and Habitat ecology (15 Hrs.)</b>					
	1	Scope - Branches of ecology, Abiotic factors: Biological effects of temperature and light.	5	Explains the scope of ecology and biological effects of abiotic factors. <b>(CO-1)</b>	Lecture, PPT	MCQ Short test Open book test
	2	Concept of limiting factors: Liebig's law of minimum,	2	Illustrate the concept of limiting factors. <b>(CO-1)</b>	Lecture, Video	Formative

		Shelford's law of tolerance.			lesson	Assessment I (1,2,3,4), Quiz I Online assignment
3	Biotic factors: mutualism – commensalism – antagonism (antibiosis, parasitism, predation and competition).	2	Identifies the species interaction. <b>(CO-1,2)</b>	Flipped learning, Lecture		
4	Habitat ecology: Characteristics and communities of Aquatic – freshwater (pond) and marine – terrestrial (forest, grass land, Desert) and adaptations of organisms.	6	Relates the different organism living in different habitats. <b>(CO-1)</b>	Lecture, PPT, Experiential learning		
<b>II</b>	<b>Ecosystem, Biogeochemical cycle and Population ecology (15 Hrs.)</b>					
1	Ecosystem: Structure (abiotic and biotic) - food chain and food web - Trophic levels - energy flow and ecological pyramids.	6	Describes the structure and function of ecosystem. <b>(CO-1)</b>	Lecture, PPT, Video class	Quiz, Formative Assessment I (1,2) Formative Assessment II (3), Online assignments through Edmodo	
2	Biogeochemical cycle: nitrogen and phosphorous cycle.	4	Explains the bio-geochemical cycle. <b>(CO-1,2)</b>	Video, Lecture		
3	Population ecology: density, natality, mortality, age distribution, population growth, biotic potential, population dispersal and dispersion, regulation.	5	Describes the different characteristics of population. <b>(CO-1)</b>	PPT, Lecture blended classroom		
<b>III</b>	<b>Community &amp; Ecological succession (15 Hrs.)</b>					
1	Community: Community structure, composition and stratification.	4	Illustrate the community structure and stratification. <b>(CO-1)</b>	Lecture, PPT	Quiz MCQ Short test  Formative Assessment II (1,2,3,4.), Quiz II	
2	Ecological niche, Ecotone and Edge effect, Ecotype.	3	Explains ecological niche, ecotone and edge effect. <b>(CO-1)</b>	Lecture, Discussion,		
3	Ecological succession: types, general process, Concepts of climax, patterns of succession.	5	Differentiates the ecological succession and climax community. <b>(CO-1)</b>	Lecture, flipped learning		
4	Animal distribution – continuous, discontinuous. Zoogeographical regions of world.	3	Describes the distribution of animals. <b>(CO-1)</b>	Lecture, PPT		
<b>IV</b>	<b>Wild life conservation &amp; Urbanization (15 Hrs.)</b>					
1	Wild life conservation: Necessity, causes, endangered species	3	Explain the wild life conservation, necessity and causes. <b>(CO-2,4)</b>	Flow Chart, PPT	Online assignment: <b>Urbanization - advantages,</b>	
2	Methods of conservation - in situ (sanctuaries and	2	Records conservation methods and gain	Lecture, PPT, Mind		

		national parks) and ex situ (zoo and germplasm bank).		knowledge on national parks. <b>(CO-2,3)</b>	map	<b>problems, solutions</b> Formative Assessment II (1,2) Formative Assessment III (3,4)
3		Remote sensing and its applications in agriculture, fisheries, forest management and food management.	5	Gain knowledge on remote sensing application agriculture, fisheries, forest management and food management. <b>(CO-2,4)</b>	PPT, Lecture	
4		Urbanization: Possible advantages of urbanization – problems, solutions.	5	Explains the advantages problems and solutions of urbanization. <b>(CO-2,4)</b>	Lecture, blended learning	
<b>V</b>	<b>Toxicology &amp; Environmental toxicology (15 Hrs.)</b>					
1		Toxicology: toxicants - classification - toxicity (LC <sub>50</sub> , and LD <sub>50</sub> ), toxic agents and their mode of action.	4	Explains the toxicants and their classification and toxicity. <b>(CO-4,5)</b>	Lecture, Flow chart	Quiz, Formative Assessment III (1,2,3,4).  <b>Online Assignment: Toxic effects of pesticides.</b>
2		Toxic effects of metals, solvents, pesticides, carcinogens, food additives, drugs and poisons and radiations.	4	Records the toxic effects of metals, solvents, pesticides, carcinogens, food additives, drugs and poisons and radiations. <b>(CO-4,5)</b>	Video lesson, lecture, PPT	
3		Environmental toxicology: environmental pollutants, toxicants and contaminants.	4	Identifies environmental pollutants, toxicants and contaminants. <b>(CO-4,5)</b>	PPT, lecture	
4		Behaviour of toxicants in the environment – effect of xenobiotics.	3	Illustrates the behaviour of toxicants in the environment. <b>(CO-4,5)</b>	Lecture, Video lesson	

**Course Instructor**  
Dr. S. Prakash Shoba

**Head of the Department**  
Dr. S. Mary Mettilda Bai.

**Semester** : V  
**Name of the Course** : Sericulture  
**Course code** : ZC1755

**Major Elective III (b)**

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

### Learning Objectives

1. To develop skills in sericulture in order to enable the students to adopt it as a vocation after their graduation as it is rural based and welfare-oriented agro based industry.
2. To develop entrepreneurial way of thinking that will allow them to identify and create business opportunities that may be commercialized successfully.

### Course Outcomes

CO	Upon completion of this course the students will be able to :	PSO addressed	CL
CO - 1	Explain the cultivation and maintenance of mulberry plantation.	PSO - 5	U
CO - 2	Identify the diseases and pests of mulberry plant and silk worm.	PSO - 5	R
CO - 3	Rear silkworms and gain knowledge on silk reeling.	PSO - 9	Ap
CO - 4	Evaluate the quality of cocoon and marketing.	PSO - 9	An; E
CO - 5	Acquire skills necessary for self-employment in sericulture.	PSO - 8	Ap; C

### Teaching plan with Modules Total Hours 75 (Incl. Assignments & Test)

Units	Modules	Topic	Hours	Learning outcome/ CO Addressed	Pedagogy	Assessment
<b>I</b>	<b>Introduction to Sericulture and Moriculture (15 Hrs.)</b>					
	1	Importance to Sericulture. Silk Road.	2	Appreciate Sericulture. Recall Silk Road. (CO-5)	Lecture, Map	Short test, MCQ,
	2	Sericulture industry in India. Sericulture as cottage industry.	2	Illustrate Sericulture as cottage Industry. (CO-5)	Lecture	Formative Assessment I (1-7),
	3	Birth and role of CSB.	2	Recognize the role of CSB. (CO-5)	Flow chart	
	4	Important mulberry varieties. Optimum conditions for mulberry growth.	2	Discuss the Optimum conditions for mulberry growth. (CO-1)	PPT	Quiz I
5	Planting system. Methods of propagation - seedling, vegetative and new methods - irrigation.	3	Explain the Planting system of mulberry and the methods of propagation and irrigation. (CO-1)	Lecture, PPT	Quizizz	

	6	Biofertilizers - Green manuring, Triacontanol and Seriboost.	2	Appreciate green manuring. (CO-1)	Lecture	
	7	Pruning - harvesting of leaves. Preservation of leaves. Nutritive value of mulberry.	2	Explain pruning, harvesting and preservation of leaves. (CO-1)	Lecture, Demonstration	
<b>II</b>	<b>Diseases of Mulberry (15 Hrs.)</b>					
	1	Diseases: Fungal - white and violet root rot and Fusarium root rot.	3	Explain fungal root diseases of Mulberry. (CO-2)	Lecture, PPT, Discussion	Short test, MCQ, Open book test, Formative Assessment II (1-7), Quiz II  Quizizz Assignment on "Diseases of Mulberry".
	2	Fungal stem rot and stem canker and wilt diseases.	2	Explain fungal stem diseases of Mulberry. (CO-2)		
	3	Leaf spot and powdery mildew diseases.	2	Explain fungal leaf diseases of Mulberry. (CO-2)		
	4	Bacterial - leaf blight and rot diseases	2	Explain bacterial diseases of Mulberry. (CO-2)		
	5	Viral - dwarf and leaf mosaic diseases	2	Explain viral diseases of Mulberry. (CO-2)		
	6	Nematode - root knot disease	2	Explain root knot disease of Mulberry. (CO-2)		
	7	Deficiency diseases - nitrogen, phosphorus, magnesium and potassium	2	Explain deficiency diseases of Mulberry. (CO-2)		
<b>III</b>	<b>Pests of Mulberry, Biology of silkworm, Diseases of silkworm (15 Hrs.)</b>					
	1	Leaf eating insect pests. Mulberry pyralid - Bihar hairy caterpillar.	3	Identify pests of mulberry and explain the control measures. (CO-2)	Lecture, PPT, Discussion	MCQ, Quiz, Open text book, Short test, Formative Assessment I (3-5), Formative Assessment III (1&2)
	2	Wasp moth and Almond leaf bore. Borer pest - Stem girdler beetle and stem borer.	3			
	3	Taxonomic position of Bombyx mori. Habit and habitat of silkworm. Classification of silkworms.	3	Outline the taxonomic position, habit and habitat of silk worm (CO-3)	Lecture & PPT	
	4	Life cycle of <i>B. mori</i> . Morphology of egg, larva, pupa and adult.	3	Explain the life history of <i>B. mori</i> . (CO-3)	Lecture & PPT	
	5	Diseases of silkworm: Pebrine, Grasserie, Flacherie, Nucleo Polyhedral Viral (NPV) Disease and Muscardine.	3	Differentiate and Describe bacterial and viral diseases. (CO-3)	Lecture & PPT	
<b>IV</b>	<b>Silkworm rearing, Cocoon marketing, Grainage technology (15 Hrs.)</b>					
	1	Rearing appliances.	2	Apply rearing appliances for silkworm rearing. (CO-3)	Lecture, PPT	MCQ,
	2	Rearing operations - Maintenance of optimum conditions for rearing. Feeding, bed cleaning, spacing, care during moulting.	3	Outline the conditions for rearing silkworm. (CO-3 & CO-5)	Lecture, You tube	Quiz, Open text book, Short test,
	3	Rearing methods - Chawki, shelf, floor and shoot rearing. Sampoorna.	2	Explain rearing methods. (CO-3)	Lecture	Formative Assessment I (1),
	4	Mounting - Methods of mounting	2	Summarise mounting methods.	Lecture,	

		– Precautions to be taken during mounting.		(CO-3 & CO-5)	PPT	Formative Assessment II (2-6), Quiz  Formative Assessment III (7),	
5		Harvesting, Transport of cocoons. Physical characteristic of cocoons, Defective cocoons, cocoon markets.	2	Explain harvesting and transport of cocoons. Differentiate defective cocoons. (CO- 4 & CO-5)	Lecture, PPT		
6		Grainages. Procedures in a grainage.	2	Illustrate grainage procedure. (CO-3& CO-5)	Lecture, PPT		
7		Diapause and non – diapausing eggs. Transport of eggs.	2	Explain the transport of eggs (CO-3& CO-5)	Lecture, PPT		
<b>V</b>	<b>Silk reeling and Wild silkworm rearing (15 Hrs.)</b>						
1		Stifling - sun drying – steam stifling – Hot air stifling.	2	Describe Stifling. (CO-3)	Lecture, Industrial visit	Industrial visit report, Formative Assessment III (1-7),  Online assignment through Edmodo.	
2		Storage of cocoons - sorting of cocoons – deflossing - Cocoon riddling – cocoon mixing.	2	Explain Storage, sorting, deflossing, riddling and mixing of cocoons. (CO-3)			
3		Cocoon cooking - open pan and three pan system. Brushing	3	Illustrates cocoon cooking. (CO-3)			
4		Reeling - Country charka, cottage basin. Multi-end reeling.	3	Describe reeling of silk. (CO-3)			
5		Re-reeling - lacing – skeining. Raw silk testing marketing.	2	Appreciate silk marketing. (CO-4)			
6		By products of sericulture.	1	Recognise the Byproducts of sericulture. (CO-5)	Lecture, PPT		
7		Wild silk worm rearing – Eri, Tasar and Muga	2	Recall wild silk worms. (CO-3)			

**Course instructors**

Dr. S. Mary Mettilda Bai  
Dr. F. Brisca Renuga

**Head of the Department**

Dr. S. Mary Mettilda Bai

Semester : V  
 Name of the Course : Vermitechnology  
 Course code : ZSK175

Skill Based Course

No. of hours/week	No. of credits	Total number of hours	Marks
2	2	30	100

### Learning Objectives

1. To impart knowledge on the production of vermicompost, a nutrient rich fertilizer.
2. To enable the students to generate and promote employment and organic farming.

### Course Outcomes

CO	Upon completion of this course the students will be able to:	PSO addressed	CL
CO - 1	discuss the classification and categories of earthworms.	PSO - 1	U
CO - 2	explain the biology of earthworms.	PSO - 1	U
CO - 3	assess the importance of earthworms in soil fertility, medicine and pharmaceuticals.	PSO - 5	E
CO - 4	design the methodology for vermiculture and for the production of vermicompost and vermivash.	PSO - 8	Ap
CO - 5	prepare and market the vermicompost.	PSO - 7	Ap

### Teaching Plan with Modules

Total Hours 30 (Incl. Assignments & Test)

Units	Modules	Topics	Hours	Learning outcome/ CO addressed	Pedagogy	Assessment
<b>I</b>	<b>Vermitechnology (6 Hrs.)</b>					
	1	Definition and importance. Earthworm–Systematic position and salient features.	2	Discuss the salient features and importance of earthworm. (CO- 1)	Lecture, Chalk and talk	MCQ Short test
	2	Categories of earthworm – Anecic, Endogeic, Epigeic species.	1	Categorize the earthworm species. (CO- 1)	Lecture, PPT, Demonstration	Memory matrix Quizziz
	3	Biology of <i>Eisenia fetida</i> , <i>Lumbricus terrestris</i> , <i>Eudrilus eugenia</i> , <i>Megascolex mauritii</i> .	3	Discuss the structure and biology of different earthworms. (CO- 2)	Seminar, Lecture, Video.	Schoology
<b>II</b>	<b>Role of earthworms (6 Hrs.)</b>					
	1	Soil fertility and productivity.	1	Appreciate the role of earthworm in soil fertility.	Lecture	MCQ

	2	Earthworm and microorganisms.	1	Explain the role of microorganism in earthworm. (CO- 3)	Lecture, Suggestopedia	Short test Mind Map Edmodo
	3	Pest and diseases of earthworm.	2	Differentiate the diseases of earthworm. (CO- 3)	Lecture, PPT	
	4	Economic and medicinal importance.	2	Explain the Medicinal importance of earthworm. (CO- 3)	Lecture, PPT	
<b>III</b>	<b>Vermiculture (6 Hrs.)</b>					
	1	Collection and preservation.	1	Describe the preservation of earthworm. (CO- 4)	Lecture, PPT Demonstration.	MCQ Short test Online assignment through Edmodo
	2	Vermiculture techniques -Types (monoculture and polyculture).	2	Illustrate types of vermitechniques. (CO- 4)	Lecture, Video	
	3	Vermicast - formation, shape, composition and importance.	1	Recognize vermicast. (CO- 4)	Lecture, Video. Demonstration.	
	4	Vermiwash – preparation, composition and applications.	2	Demonstrate the preparation of vermiwash. (CO- 4)	Lecture, Video.	
<b>IV</b>	<b>Vermicomposting (6 Hrs.)</b>					
	1	Requirements–earthworm, site, bed, feed, moisture and oxygen.	1	Explain the dos and don'ts in vermitechnique. (CO- 4)	Lecture, PPT	Short test MCQ Online worksheet through Kahoot
	2	Steps of vermicomposting - selection of site, containers, species, food, preparation of vermibed, inoculation of worms, feeding, watering the wormbed.	3	Demonstrate the vermibed preparation. (CO- 4)	Seminar, Lecture Demonstration, Heutogogy	
	3	Methods of vermicomposting.	2	Describe the different methods of vermicomposting. (CO- 4)	Lecture, PPT	
<b>V</b>	<b>Harvesting and Marketing (6 Hrs.)</b>					
	1	Harvesting of earthworms and vermicompost	1	Describe the technique in harvesting. (CO- 4)	Demonstration.	Short test Quizizz Objective test Schoolgy
	2	Packaging, storing, and marketing of vermicompost. Economic viability of vermicomposting.	2	Discuss the economic viability of compost. (CO- 4, 5)	Lecture, PPT Demonstration.	
	3	Vermi-remediation.	1	Explain vermi- remediation. (CO- 4)	Lecture	
	4	Financial Support by Government and Non-Government funding agencies.	2	Find out the financial support by Government. (CO- 4, 5)	Lecture	

**Course Instructors**

Dr. C. Josephine Priyatharshini  
Dr. C. Anitha

**Head of the Department**

Dr. S. Mary Mettilda Bai



**Semester : V Major Practical V**  
**Name of the Course : Physiology and Developmental Zoology**  
**Course code : ZC17P5**

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

### Learning Objectives

1. To understand the basic principles of animal physiology and report experimental data.
2. To identify the stages of embryonic development and the structures in the temporary and permanent preparations.

### Course Outcomes

CO	Upon completion of this course the students will be able to:	PSO addressed	CL
CO - 1	explain the effect of abiotic factors on physiological process.	PSO - 3	Ap
CO - 2	analyse major nutrients qualitatively and describe the principles of analytical instruments and its uses in physiology.	PSO - 4	An; Ap
CO - 3	perform scientific mode of thinking; planning experiments, analysing and evaluating data skills as scientific laboratory reports.	PSO - 6	Ap; An
CO - 4	develop methodological approach to embryonic development.	PSO - 7	An
CO - 5	identify instruments, tissues, embryonic structures in preparations, photographs and diagrams.	PSO - 8	R; An

### Teaching plan with Modules

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

Units	Modules	Topics	Hours	Learning Outcome/ CO addressed	Pedagogy	Assessment
<b>I</b>	<b>Physiology (30 Hrs.)</b>					
	1	Rate of oxygen consumption in a fish.	4	Find out the rate of oxygen consumption. (CO-1)	Demonstration & practical	Continuous Performance based assessment.  Internal Assessment.
	2	Effect of temperature in the opercular movement of a fish and calculation of $Q_{10}$ .	4	Find out the effect of temperature in the opercular movement of a fish and calculate $Q_{10}$ . (CO-1,3)	Demonstration & practical	
	3	Effect of temperature on the ciliary movement of a bivalve.	4	Find out the effect of temperature on the ciliary movement of a bivalve. (CO-1)	Demonstration & practical	
	4	Action of salivary amylase in relation to pH.	4	Find out the action of salivary amylase in	Demonstration & practical	

				relation to pH. <b>(CO-1)</b>		
	5	Action of salivary amylase in relation to enzyme concentration.	4	Find out the action of salivary amylase in relation to enzyme concentration. <b>(CO-1)</b>	Demonstration & practical	
	6	Estimation of haemoglobin-demonstration	2	Estimate haemoglobin content of blood. <b>(CO-2,3)</b>	Demonstration & Observation	
	7	Counting of blood cells using haemocytometer (Demonstration).	4	Count blood cells using haemocytometer. <b>(CO-2,3)</b>	Demonstration & Observation	
	8	Haemoglobin, ECG, Sphygmomanometer, Kymograph, Cardiac muscle, Striated muscle, Non-striated muscle, Simple muscle curve.	4	Identify the apparatus/ equipments/ slides/ charts and comment on it. <b>(CO-2)</b>	Observation of apparatus/ equipments/ slides/ charts	
<b>II</b>	<b>Developmental Zoology (30 Hrs.)</b>					
	1	Observation of sperm and egg of Frog.	4	Explain the structure of sperm and egg of Frog. <b>(CO-4)</b>	Observation of slides	Continuous Performance based assessment.
	2	Temporary mounting and observation of Chick embryo.	4	Prepare temporary slides of chick embryo and identify the developmental stage. <b>(CO-4)</b>	Demonstration & practical	
	3	Induced ovulation in frog (demonstration only).	4	Induce ovulation in frog. <b>(CO-4)</b>	Demonstration & Observation	
	4	Effect of thyroxin on Amphibian metamorphosis (demonstration only).	4	Explain the impact of thyroxin on Amphibian metamorphosis. <b>(CO-5)</b>	Demonstration & Observation	Internal Assessment.
	5	Observation of developmental stages in an insect.	4	Recognize the developmental stages of the insects. <b>(CO-5)</b>	Observation	
	6	Sperm and egg of Human.	2	Identify the spotters and explains the structure of the specimens and the models. <b>(CO-5)</b>	Observation of slides, specimen	
	7	Egg of insect, frog and bird.	2			
	8	Chick embryos of 24, 48, 72 and 96 hours.	2			
	9	Cleavage (2, 4, 8 and 16 cell stage), blastula and gastrula of frog.	2			
	10	Placenta – Diffuse, Discoidal, Zonary and Cotyledonary.	2			

**Course Instructors**

Dr. A. Punitha

Dr. X. Venci Candida

**Head of the Department**

Dr. S. Mary Mettilda Bai

Semester : V Major

Practical VI

Name of the Course : Ecology and Toxicology

Course code : ZC17P6

### Learning Objectives

To investigate the relationship between the organisms and their environment

### 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

### Teaching plan with Module

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

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

	7	Study of natural ecosystem and field report of the visit (compulsory).	3	Document the field trip. <b>(CO-4)</b>	Field Trip	
	8	<b>Museum Specimens:</b> 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. <b>(CO-3)</b>	Observation of the spotters and specimen	

**Course Instructor**

Dr. S. Prakash Shoba

**Head of the Department**

Dr. S. Mary Mettilda Bai