

SANT GADGE BABA AMRAVATI UNIVERSITY, AMRAVATI



THREE YEAR UNDERGRADUATE PROGRAMME

B.Sc. ZOOLOGY (CBCS)

THIRD YEAR SEM V & VI

FACULTY: SCIENCE AND TECHNOLOGY

(Courses effective from Academic Year 2024-25)

SYLLABUS

CONTENTS	Page No
Curriculum Scheme for Third year B. Sc. SEM V	01
Curriculum Scheme for Third year B. Sc. SEM VI	02
Semester: V DSC-5-05 S	
Semester: V DSC-5-05 S: Animal Physiology (Theory)	03
Skill Enhancement Module for DSC 5	04
Semester: V DSC-5-05 S: Animal Physiology (Practicals)	05
Distribution of Marks for Practical Examination	05
General Elective Course (GIC) in Zoology	
GIC : Applied Zoology	06
Semester: VI DSE-06 S	
Semester: VI DSE-I-06 S	
Semester: VI DSE-I-06 S: Molecular Biology and Biotechnology (Theory)	08
Skill Enhancement Module for DSE - I	09
Semester: VI DSE-I-06 S: Molecular Biology and Biotechnology (Practicals)	11
Distribution of Marks for Practical Examination	11
Semester: VI DSE-II-06 S	
Semester: VI DSE-II-06 S: Animal Behaviour and Ecology (Theory)	13
Skill Enhancement Module for DSE - II	14
Semester: VI DSE-II-06 S: Animal Behaviour and Ecology (Practicals)	15
Distribution of Marks for Practical Examination	15

THREE YEAR UNDERGRADUATE PROGRAMME
B.Sc. ZOOLOGY under FACULTY: SCIENCE AND TECHNOLOGY
Board of Studies in Zoology (Including Apiculture)

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SANT GADGE BABA AMRVATI UNIVERSITY AMRAVATI

Scheme of Teaching, Learning & Examination leading to the Degree in Bachelor of Science in the Programme Zoology Science (Three years- Six Semester Degree Programme- C.B.C.S.) (B.Sc. Part III) Semester V

Curriculum Scheme for Third year B. Sc. SEM V (Zoology) (CBCS)															
Sr. No.	Course category	Subject code no.	Subject/Course	Credit	Teaching and Learning Scheme			Duration of Exam Hours	Examination and Evaluation Scheme						
					Lectures	Tutorial	Practical		Maximum Marks				Minimum Passing		
									Theory		Practical		Total Marks	Marks	Grade
								Theory + MCQ (EXT)	SEM (Int)	Internal	External				
01	B. Sc.	DSC-5-05S	Animal Physiology	4.50	06	---	----	03	80	20	-	-	100	40	P
02		Practical for DSC-5		2.25	---	-----	06	03	-	-	25	25	50	25	P
03		Mini-Project/ Hands-on Training/ Workshop/ DIY -	Related to Zoology	2.25	--	--	06	02	Internal Assessment by college/institute/department				50	25	P
04		Open Elective Course (OEC) (Optional)	Applied Zoology	(Maximum 75 hours) optional to extracurricular and co-curricular activities.				-	-	-	-	-	-	-	-
05		Internship/ Apprenticeship/ Field Work/ Work Experience	-	150 Hours cumulatively (from Sem II to Sem V)resulting into earning of 5 Credits (Minimum 120 Hours mandatory resulting intoearning of 4 Credits)				-	-	-	-	-	-	-	-
	Total			9.00	06	-	12	-	-	-	-	-	200	-	-

L: Lecture, T: Tutorial, P: Practical, DIY: Do It Yourself activity

Notes :

- Internship/Apprenticeship/Field Work/Work Experience is Mandatory.** It can be carried out cumulatively from Semester I to Semester V for a duration of 150 Hours resulting into earning of 5 Credits (**Minimum 120 Hours resulting into earning of 4 Credits is mandatory for every student**). Internship /Apprenticeship/Field Work / Work Experience will be conducted after I semester till Vth semester in vacations for minimum 120 hrs, cumulatively entailing 4 Credits. It's credits and grades will be reflected in final semester VI credit grade report.
- Teaching period in the various subjects in the faculty of science shall be as prescribed by the executive council dated 1/2-4-1977, 11-7-1977 Appendix- P**
- There shall be Skill Enhancement Module (SEM) in each course of DSC and DSE
- OEC (Optional) can be studied during semester I to V, Its credits and grades will be reflected in final semester VI credit grade report.** OEC may be opted from Sem I to Sem V. It is comprised of GIC, Skill Course and MOOC (through SWAYAM)
- Minimum 10% of the total credits of the UG (Bachelor's Degree) programme, that is, at least 12 credits are mandatory to be earned by all the students from Ancillary Credit Courses as mentioned in Table A (SGBAU, Direction No. 76/2022 ,Date 06/10/2022)
- Extra-curricular and co-curricular activities:** Maximum 5 Credits may be earned through Extra-curricular and co-curricular activities, which will be an option to OEC (maximum 75 hours and 5 credits), so that students performing in such activities shall be given exemption from undertaking OEC.

SANT GADGE BABA AMRVATI UNIVERSITY AMRAVATI

Scheme of Teaching, Learning & Examination leading to the Degree in Bachelor of Science in the Programme Zoology Science

(Three years- Six Semester Degree Programme- C.B.C.S.) (B.Sc. Part III) Semester VI

Curriculum Scheme for Third year B. Sc. SEM VI (Zoology) (CBCS)

Curriculum Scheme for Third year B. Sc. SEM VI (Zoology) (CBCS)															
Sr. No.	Course category	Subject code no.	Subject/Course	Credit	Teaching and Learning Scheme			Duration of Exam Hours	Examination and Evaluation Scheme						
					Lectures	Tutorial	Practical		Maximum Marks				Minimum Passing		
									Theory		Practical		Total Marks	Marks	Grade
									Theory + MCQ (EXT)	SEM (Int)	Internal	External			
01	B. Sc.	DSE-I-06S OR	Molecular Biology and Biotechnology	4.50	06	---	----	03	80	20	-	-	100	40	P
		DSE-II- 06S	Animal Behaviour and Ecology												
02		Practical for DSE-I OR	Practical for Molecular Biology and Biotechnology	2.25	---	-----	06	03	-	-	25	25	50	25	P
		Practical for DSE-II	Practical for Animal Behaviour and Ecology												
03		Mini-Project/ Hands-on Training/ Workshop/ DIY -	Related to Zoology	2.25	--	--	06	02	Internal Assessment by college/institute/department				50	25	P
	Total			9.00	06	-	12	-	-	-	-	-	200	-	-

L: Lecture, T: Tutorial, P: Practical, DIY: Do It Yourself activity

Notes :

- Internship/Apprenticeship/Field Work/Work Experience is Mandatory.** It can be carried out cumulatively from Semester I to Semester V for a duration of 150 Hours resulting into earning of 5 Credits **(Minimum 120 Hours resulting into earning of 4 Credits is mandatory for every student)**. Internship /Apprenticeship/Field Work / Work Experience will be conducted after I semester till Vth semester in vacations for minimum 120 hrs, cumulatively entailing 4 Credits. It's credits and grades will be reflected in final semester VI credit grade report.
- Teaching period in the various subjects in the faculty of science shall be as prescribed by the executive council dated 1/2-4-1977, 11-7-1977 Appendix- P**
- Students should select any one course from DSE- I OR DSE-II (Theory & Practicals).**
- There shall be Skill Enhancement Module (SEM) in each course of DSC and DSE
- OEC (Optional) can be studied during semester I to V, Its credits and grades will be reflected in final semester VI credit grade report.** OEC may be opted from Sem I to Sem V. It is comprised of GIC, Skill Course and MOOC (through SWAYAM)
- DSE (DISCIPLINE/DEPARTMENT SPECIFIC ELECTIVE): A BASKET CONTAINING AT LEAST TWO COURSES/SUBJECTS SHALL BE PROVIDED, SO THAT STUDENT HAS A CHOICE FOR THE SELECTION.**
- Minimum 10% of the total credits of the UG (Bachelor's Degree) programme, that is, at least 12 credits are mandatory to be earned by all the students from Ancillary Credit Courses as mentioned in Table A (SGBAU, Direction No. 76/2022 ,Date 06/10/2022)
- Extra-curricular and co-curricular activities:** Maximum 5 Credits may be earned through Extra-curricular and co-curricular activities, which will be an option to OEC (maximum 75 hours and 5 credits), so that students performing in such activities shall be given exemption from undertaking OEC.

Syllabus Prescribed for Three-Year UG Programme (CBCS)

B. Sc. III Zoology Semester V	
Name of the Programme: B.Sc. III	Class: Part 5S
Semester: V DSC-5-05 S	Subject: Zoology
Name of the course (Paper): ANIMAL PHYSIOLOGY (Theory)	

Course Outcomes Code: COs-05

About the course

The course is designed to develop in student a basic understanding of the functioning of an animal's body. Students are expected to demonstrate knowledge of the various systems, their interlinking and predict outcomes when a system malfunctions. The course aims to develop in students, global competencies in animal physiology. Students will demonstrate ability to use various animals for generating employment and revenue especially at rural level.

Course Outcome

1. Students should understand the morphology, structure and functions of important physiological systems including the Respiratory, Circulatory, Musculoskeletal, Nervous, Endocrine and Reproductive.
2. Students would be able to describe and compare the mechanisms of Thermo and osmoregulation.
3. Students will be able to describe and assess ecological role of insects and various methods of pest control.
4. Students will be able to discuss strategies for Aquaculture, Sericulture and Apiculture.

Units	Course Contents	Hours
Unit I	Respiration: • Structure of respiratory organs: Gills and Lungs. • Mechanism of respiration: Regulation of ventilation in lungs. • Transport and exchange of gases at respiratory surface. • Neurophysiologic control of respiration. • Respiratory pigments in animals: Hemoglobin, Hemocyanin, Hemerythrin, Chlorocruorin.	12
Unit II	Circulation: • Composition and functions of blood. • Blood clotting mechanism. • ABO system and Rh factor. • Heart: Structure of human heart, Pace maker, Cardiac cycle.	12
Unit III	Muscle Physiology: • Muscles: Types, E.M. Structure and Chemical Composition of Striated muscles. • Neuromuscular junction. • Sliding filament theory. • Physical and Chemical changes during muscle contraction: muscle twitch, tetanus, isometric and isotonic contraction, summation of Stimuli, all or none law, fatigue, rigor mortis.	12

Unit IV	Nerve Physiology : • Neuron: E.M. Structure and types of neuron. • Synapse and synaptic transmission. • Conduction of Nerve impulse: Resting potential, initiation and propagation of action potential, Saltatory transmission. • Neurotransmitters: Acetylcholine, dopamine, GABA, Serotonin, Epinephrine and Nor-Epinephrine.	12
Unit V	Reproductive Physiology and Endocrine System: • Estrous and menstrual cycle. • Hormonal control of reproduction in males and female, • Structure and physiology of mammalian Placenta. • Endocrine system: Hormones and their physiological roles of endocrine glands - Pituitary, Pineal, Thyroid, Parathyroid, Adrenal, Islets of Langerhans.	12
Unit VI	Homeostasis and conservative regulation: • Osmoregulation and ionic regulation in aquatic animals. • Osmoregulation in terrestrial animals. • Ammonotelism, ureotelism and uricotelism. • Thermoregulation in Poikilotherms and Homeotherms.	12

Skill Enhancement Module –

(Students should submit any one SEM from the mentioned topics.)

1. Study of Respiratory Pigments

- Types of Respiratory Pigments.
- Survey surrounding fauna having different types of respiratory pigments.
- Prepare a list of organisms having different respiratory pigments.
- Submit data in the form of Project.

2. Study the Diversity of Ammonotelic organisms.

- Collect the information of types of nitrogenous waste in the organisms.
- Visit local areas and search for Ammonotelic organisms.
- Prepare data with photographic evidence.
- Submit a report with a complete set of information.

3. Study the Diversity of Uricotelic organisms.

- Collect the information of types of nitrogenous waste in the organisms.
- Visit local areas and search for Uricotelic organisms.
- Prepare data with photographic evidence.
- Submit a report with a complete set of information.

B. Sc. III Zoology Semester V	
Name of the Programme: B.Sc. III	Class: Part 5S
Semester: V DSC-5-05 S	Subject: Zoology
Name of the course (Paper): ANIMAL PHYSIOLOGY (Practical)	

Practicals: Animal Physiology

1. Detection of blood groups in human being.
2. Estimation of hemoglobin percentage with the help of haemometer.
3. R.B.C. count.
4. W.B.C. count.
5. Preparation of haemin crystals
6. Measurement of blood pressure.
7. Action of salivary amylase on starch.
8. Qualitative detection of nitrogenous waste products (Ammonia, urea, uric acid) in given sample.
9. Peripheral blood smear (PBS) examination: a) DLC b) RBC Morphology

Distribution of Marks for Practical Examination:

External Practical Exam:

Time: 3 Hrs.

1. Physiological Expt.(Major)----- 10 Marks
2. Physiology Expt.(Minor)----- 10 Marks
3. Viva-voce ----- 05 Marks

Total : 25 Marks

Internal Practical

1. Submission of Blood group / Hb survey report----- 10 Marks
2. Class record duly signed by teacher-in-charge and certified by H.O.D. --- 05 Marks
3. Slide submission (PBS). ----- 05 Marks
4. Student Attendance ----- 05 Marks

Total : 25 Marks

REFERENCES:

1. Prosser and Brown : Comparative Animal Physiology
2. Histological Slides of Respirator systems, circulatory system, Muscles, Nervous system
Endocrine glands, Gonads, placentae
3. Guyton : Physiology
4. Best and Taylor : Physiological basis of Medical practice
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General Elective Course (GIC) in Zoology

B. Sc. III Zoology Semester V	
Name of the Programme: B.Sc. III	Class: Part 6 S
Semester: V GIC-05 S	Subject: Zoology
Name of the course : Applied Zoology	

About the course

The course is designed to develop in student a basic understanding of the functioning of an applied aspects of Zoology.

Course Outcome

1. Students will be able to describe and assess ecological role of insects and various methods of pest control.
2. Students will be able to discuss strategies for Aquaculture, Sericulture and Apiculture

Units	Course Contents	Hours
Unit I	Agricultural Zoology : - Ecological role of beneficial insects – Spider, Mantis, Ladybugs, Damsel bug, Mealy bug destroyer, Soldier beetle, Green lacewing, Syrphid fly, Tachinid fly, Ichneumon wasp, and Trichogramma wasp. - Mites as predators and parasites of insect/mite pests. - Mites as bio-control agents of weeds.	15
Unit II	Destructive insects: - Effect of Harmful Insects on crops – Cotton, Sugarcane and Jowar. - Damage and Control of Rodents, Snakes, Owls and Bats. - Locusts and their control – diagnosis, life history, damage, methods of control. - Termites and their control – diagnosis, damage, control measures.	15
Unit III	Aquaculture: - Aquaculture: Definition, scope, importance and present status in India. - Fresh water fish culture: Monoculture, Polyculture, Integrated aquaculture, Cage culture, Pen culture. - Types of fish ponds- Nursery, rearing and stocking. - Fish breeding : Hatching Happs, Chinese Circular Hatchery, Induced breeding and hypophysation, - Modern drugs used in fish breeding. - Fish products and byproducts: Fish liver Oil, Fish body oil, Fish manure and Fish leather.	15
Unit IV	Sericulture: - Life cycle of Bombyx mori, Structure of silk gland and secretion of silk. - Silkworm rearing technology; Spinning, harvesting and storage of cocoons. - Silk worm Pests and Diseases: Uzi fly; Protozoan, Viral, Fungal and Bacterial;	15

	• Control and prevention , Prospects of Sericulture in India	
Unit V	Apiculture: • Selection of Bee Species for Apiculture. Bee Keeping Equipment. • Methods of Extraction of Honey (Indigenous and Modern). • Bee Diseases and Enemies. • Products of Apiculture Industry and its Uses (Honey, Bees Wax). • Modern Method, products, factors affecting the process of apiculture.	15

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2. Text Book of Applied Zoology, Pradip. V Jabde (2005).
3. Atwal, A.S. (1986). Agricultural Pests of India and South East Asia, Kalyani Publishers.
4. Dennis, H. (2009). Agricultural Entomology. Timber Press (OR).
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Syllabus Prescribed for Three-Year UG Programme (CBCS)

B. Sc. III Zoology Semester VI	
Name of the Programme: B.Sc. III	Class: Part 6 S
Semester: VI DSE-I-06 S	Subject: Zoology
Name of the course (Paper): MOLECULAR BIOLOGY AND BIOTECHNOLOGY (Theory)	

Course Outcomes Code: COs-06 S

About the course

Students demonstrate knowledge of the central dogma of biology and predict outcomes when the process malfunctions. Students develop global competencies in the area of basic and applied biological sciences. Students will demonstrate ability to use evolutionary theory and related equations to model and predict population change or stability. Provide education that leads to comprehensive understanding of the principles and practices of biotechnology.

Course Outcome

1. Through this course the students are exposed to importance of biological macromolecules
2. They study the influence and role of structure in reactivity of biomolecules
3. The course teaches the students about genes at molecular level.
4. The course outcome is to train the students in understanding genetics and relate modern DNA technology for disease diagnostics and therapy.
5. The students learns about molecular basis of antigen recognition, hypersensitivity reaction, antigen-antibody reactions.
6. Students learn about transgenic animal, their application in pharmaceutical industry, cloning and its importance.
7. This course prepares the students in appreciating the its benefits and applications in biotechnological, pharmaceutical, medical and agricultural field

Units	Course Contents	Hours
Unit I	Genetic material • Experiments to prove DNA as genetic material: Griffith's transformation experiments with bacteriophage infections, Avery and co-workers experiments, and Hershey and Chase experiment. • Chemistry and types DNA (A, B, Z) Mitochondrial DNA. • Chemistry, types and function of RNA: mRNA, tRNA and rRNA and Non Genetic RNA.	12
Unit II	DNA replication: • Semi conservative method; experiment by Messelson and Stahl. • Concept of genes, one gene one enzyme hypothesis, one gene one Polypeptide theory. • A brief account of Concept and action of cistron, split genes, overlapping genes, jumping genes, • Genetic diseases: Spinocerebellar ataxia.	12
Unit III	Genetic Code and Gene Regulation • Genetic code and its features. • Protein synthesis transcription and processing of mRNA, translation-different steps,	12

	• Gene regulation: (promoter and operator), Operon models, and Lac-operon model of <i>E.Coli</i>. • Genetic regulation in Eukaryotes-Britten Davidson Model.	
Unit IV	Mutation and Techniques • Mutation: Definition-mutation theory of De Vries, different types of mutations, • Molecular basis of mutation: substitution and frameshift mutations, chromosomal aberrations structural (deletion, addition, inversion and translocation), numerical (euploidy and aneuploidy). • Natural and induced mutations-significance of mutations. DNA repair process. • Polymerase chain reaction (PCR). Southern, Northern and Western blotting techniques, DNA finger printing.	12
Unit V	Biotechnology: Genetic Engineering: • Recombinant DNA technology and gene cloning-enzymes in recombinant DNA technology. • Splicing and cloning of genes, vectors (plasmid and phage vectors), gene Transfer. • Somatic cell hybridization, hybridoma technology, and monoclonal antibodies. • Practical applications and suspected hazards of biotechnology and genetic engineering in animals.	12
Unit VI	Immunology: • Introduction to immune system: Innate and adaptive immunity, • Types and production of immune cells; Complement system. • Humoral Immunity: Antigen and haptens, Antibody: types, function, and production. • Cell mediated immunity: T-cell receptors, T helper cell and lymphocyte activation Role of cytotoxic T-cell. ELIZA and RIA Technique.	12

Skill Enhancement Module –

(Students should submit any one SEM from the mentioned topics.)

1. Exploring DNA

- Prepare and submit DNA model by using ball and stick.
- Collect information about Discovery of DNA.
- prepare list of DNA based experiment.
- Extract DNA from onion.
- Submit a report with photographs.

2. DNA Replication

- Prepare notes on different types of DNA replication.
- Explore the Taylors Experiment with diagrams.
- Study the difference between prokaryotic replication and eukaryotic replication.
- Construct the model of DNA replication.
- Submit a report.

3. Exploring genes.

- List out the 20 different genes for 20 proteins.
- Collect information about minimal genome.
- Draw chart of 20 amino acids with symbols.
- Submit a report.

4. Operon concept

- List out different operon model
- Collect information on any two operon
- Draw chart of lactose operon model
- Describe the role of different region
- submit a report

5. Working with mutation

- List out different mutations
- List out different mutagens
- Describe the cause of mutations
- Draw chart of mutations
- submit a report

6. Blotting technique

- List out different blotting technique
- Draw chart of blotting technique
- Comparison of different blotting technique
- Submit a report

7. All about PCR

- Discovery of PCR
- Importance of PCR
- Instruments for PCR
- Procedure of PCR
- Submit a report

8. Biotechnology

- Collect information about basic of Biotechnology
- Different Applications of Biotechnology
- Enlist the different vectors.
- Discovery of Cloning of animal
- Submit a report

9. Scope of Biotechnology

- Different enzymes use in Biotechnology and their role
- Biotechnology institute present in India
- Use of Biotechnology product in day to day life
- Submit a report

10. Immunology

- Write down the history of Immunology
- Enlist the different scientist involved in discovery of antibody
- Draw chart of different type of antibodies
- Submit a report

B. Sc. III Zoology Semester VI	
Name of the Programme: B.Sc. III	Class: Part 6 S
Semester: VI DSE-I-06 S	Subject: Zoology
Name of the course : MOLECULAR BIOLOGY AND BIOTECHNOLOGY (Practical)	

Practicals: MOLECULAR BIOLOGY AND BIOTECHNOLOGY

A. Microtechniques and Recombinant DNA Technology

1. Microtechnique scope and importance.
2. Preparation of fixatives - Alcohol, Acetone, Formalin, Bouin's fluid, Cornoy fluid, Formal sublimate.
3. Collection of various tissues/organs from slaughter house for micro-technique
4. Preparation of Alcoholic grades, dehydration and clearing of tissues
5. Use and care of Oven
6. Embedding and block making, trimming of block.
7. Use and Care of different types of Microtome.
8. Honing and stropping Knives
9. Section cutting and spreading.
10. Preparation of Stains – Eosin. Borax carmine, Acetocarmin, Aceto-orcein, Haematoxyline.
11. Staining of the sections, (Double Staining), mounting.
12. Camera Lucida. Use and Drawings
13. Oculomicrometer scale/ similar micro-measurements use
14. Introduction to models of PCR, Southern blotting through available resources.
15. Vital Staining of mitochondria by using Janus, Green B stain.
16. Extraction of DNA by using salt, detergent and enzymes from natural sources from any animal tissue / plant material.

B. General--

Compulsory visit to Microbiology/Biotechnology/ PHC laboratory and
Submit Study tour report.

Distribution of Marks for Practical Examination:

External Practical Exam:

Time: 3 Hrs.

1. Microtechnique.
 - a) Trimming and Section cutting of the Paraffin blocks ----- 05 Marks
 - b) Spreading of ribbons and staining----- 05 Marks
 - c) Use of camera Lucida/ Ocular micrometer scales----- 05 Marks
2. Any one practical based on Sr.14 to 16 of the practical list ----- 05 Marks
3. Viva-voce ----- 05 Marks

Total : 25 Marks

Internal Practical

1. Class record duly signed by teacher-in-charge and certified by H.O.D. --- 05 Marks
2. Submission of permanent stained slides ----- 10 Marks
3. Submission Visit Report ----- 05 Marks
4. Student Attendance ----- 05 Marks

Total : 25 Marks

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B. Sc. III Zoology Semester VI	
Name of the Programme: B.Sc. III	Class: Part 6 S
Semester: VI DSE-2-06 S	Subject: Zoology
Name of the course : Animal Behaviour and Ecology (Theory)	

About the course

The main objective of this course is to introduce the student about various behavioral aspects of animals and its application, chronology of ecological parameters.

Course Outcome

After successfully completing this course, the students will be able to:

- Learn a wide range of theoretical and practical techniques used to study animal behaviour.
- Develop skills, concepts and experience to understand all aspects of animal behaviour.
- Objectively understand and evaluate information about animal behaviour and ecology encountered in our daily lives.
- Understand and be able to objectively evaluate the role of behaviour in the protection and conservation of animals in the wild.
- Consider and evaluate behaviour of all animals, including humans, in the complex ecological world, including the urban environment
- Know the evolutionary and functional basis of animal ecology.
- Analyse a biological problem, derive testable hypotheses and then design experiments and put the tests into practice
- Acquire an in-depth knowledge on the diversity and relationships in animal

Units	Course Contents	Hours
Unit I	1.1 The science of animal behaviour- Definition and brief history 1.2 Innate Behaviour 1.3 Learning behaviour 1.4 Reasoning and motivation behaviour 1.5 Complex behaviour	12
Unit II	2.1 Ecological aspects of behaviour- Habitat selection, food selection. 2.2 Foraging behaviour 2.3 Territorial behaviour 2.4 Conflict Behaviour 2.5 Anti predator defenses	12
Unit III	3.1 Courtship behaviour- Mate selection 3.2 Female choice and maternal behaviour 3.3 Migratory behaviour (Birds and Fishes) 3.4 Social organization (Honey bee and Termites) 3.5 Biological rhythms- Circadian and Circa annual rhythms.	12
Unit IV	4,1 Pheromones and their biological action 4.2 Chemical Communication (Honey Bee and Termites) 4.3 Mimicry and Body Coloration. 4.4 Hormones in insects and Crustaceans metamorphosis 4.5 Parental care (Amphibian and Fishes)	12
Unit V	5.1 Introduction and Scope of Ecology 5.2 Structure and Function of Ecosystem 5.3 A biotic factors affecting survival and sustenance of organization EX : water, temperature, light, pH and salinity 5.4 Energy flow in ecosystem 5.5 Food chain and Food web.	12

Unit VI	6.1 Environmental pollution-Concepts and Types 6.2 Air, Water and Soil pollution-causes, effects and controls 6.3 Noise pollution causes effects and control 6.4 Hazards waste and human health risk 6.5 Solid waste management: control measures of municipal, biomedical and e-waste	12
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Skill Enhancement Module –
(Students should submit any one SEM from the mentioned topics.)

1. Study on ecological aspects of behavior from the local region.
 - Area of visit
 - Diversity of fauna in the area.
 - Observation foraging, territorial and conflict behavior with suitable examples.
 - Ecological status of the area.
2. Survey and count of social organization of honey bee and termites in the area.
 - Brief information about the local area.
 - Survey of socially healthy places for the termites and their count.
 - Count of honey bee hives and their organization in the area.
 - Status of the local area,
3. Records the examples of parental care of amphibian species in the local area.
 - Selection of sites and breeding seasons.
 - Find out the types of amphibians in the area.
 - Observe the breeding behavior and parents care for the young ones.
 - Prepare a document with photographic records.
4. Survey the most polluted places in your city and surrounding with relation to air, water and noise pollution.
 - Find out the list of places in the city and surrounding area.
 - Observed and analyzed air, water and noise pollution with listed parameters.
 - Compared the data with standard values.
 - Prepare a report.

B. Sc. III Zoology Semester VI	
Name of the Programme: B.Sc. III	Class: Part 6S
Semester: VI DSE-2-06 S	Subject: Zoology
Name of the course : Animal Behaviour and Ecology (Practical)	

Practicals: Animal Behavior and Ecology

Part-A

- 1. To study nests and nesting habits of the birds and social insects (with any suitable example).
- 2. To study social organization of honey bees with the help of models/ ICT tools/ Charts.
- 3. Study of circadian functions in humans (daily eating, sleep and temperature patterns).
- 4. To study parental care in amphibians with the help of models/ ICT tools/ Charts
- 5. Visit to Forest/ Wild life Sanctuary/Biodiversity Park/Zoological Park to study behavioral activities of animals and prepare a short report.

Part-B

- 6. Water and Soil analysis: pH, Total hardness and salinity.
- 7. To prepare charts of local terrestrial food chain and food web.
- 8. To identify harmful wastes in any given water or soil samples.
- 9. Studies on biological and other waste disposal mechanism of any nearby Health center or hospital and submit report.

Distribution of Marks for Practical Examination:

External Practical Exam:

Time: 3 Hrs.

1. Major Experiment- Part A -----	10 Marks
2. Minor Experiment - Part B-----	05 Marks
3. Submission of Field report-----	05 Marks
4. Viva-voce -----	05 Marks

Total	: 25 Marks

Internal Practical

1. Class record duly signed by teacher-in-charge and certified by H.O.D. -----	05 Marks
2. Submit report on behavioural activities of animals during visit-----	10 Marks
3. Student Performance -----	05 Mark
4. Student Attendance -----	05 Marks

Total	: 25 Marks

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- 4. Chronobiology Biological Timekeeping: Jay. C. Dunlap, Jennifer. J. Loros Patricia J. De Coursey (ed). 2004, Sinauer Associates, Inc. Publishers, Sunderland, MA, USA
- 5. Insect Clocks D.S. Saunders, C.G.H. Steel, X., Afopoulou (ed.) R.D. Lewis. (3rdEd) 2002 Barends and Noble Inc. New York, USA
- 6. Biological Rhythms: Vinod Kumar (2002) Narosa Publishing House, Delhi/ Springer-Verlag, Germany.
- 7. McFarland.D. 1985. Animal Behaviour Psychology, Ethology and Evolution. Pitman Publications.
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