Department of Zoology

Program Outcomes, Program Specific Outcomes and Course Outcomes of S. Y. B. Sc. in Zoology

B. Sc. (Zoology) Programme

B.Sc. in Zoology is an undergraduate Program in Zoology. Zoology is the branch of science which deals with the study of animal kingdom including the evolution, structure, Physiology, classification, embryology, habits, habitat and distribution of all the animals. The B.Sc. Zoology course is premeditated to introduce students to the study of zoology at the organismal and organ function levels. The theoretical part of the program deals with the general principles of classical as well as modern zoology. The program provides the student with an introduction to the recent advances in zoology in the areas of systematic, evolution, reproduction, development, animal diversity, biochemistry, cytology and animal ecology. This course is offered for candidates who are interested in the study of animals. The minimum time required to complete the course is three years.

Objectives:

Imparting quality education in Zoology has been the focus of the department right from its inception. Emphasis is given on education both within and outside the classroom.
The Department is dedicated to fulfil the following objectives through the curricular and cocurricular activities:

- To provide students with knowledge of fundamental principles in zoology that will provide a foundation for their later advanced course in more specific biological subjects.
- To make students familiar with animal classification schemes and other applied courses as well as developing an understanding of and ability to apply basic zoological principles.
- To integrate the laboratory and lecture sections of the course and directed toward teaching students both in the classroom and on the field.
- To provide quality education offering skill based programs and motivate the students for self-employment in applied branches of Zoology.
- To inculcate the value based education and entrepreneurial skills among the students.
- To create awareness on environmental issues through various activities.

Programme Outcomes:

After successfully completing B. Sc. (Zoology) Programme students will be able to:

PO1. Communicate scientific information through effective formal and informal methods generally used in sciences.
PO2. Conduct basic scientific research and provide inputs for societal benefits.
PO3. Develop competence in basic sciences and in the content of the specific courses that constitute the principal knowledge of their degree.
PO4. Compare and contrast the characteristics of animals that differentiate them from other forms of life.
PO5. Acquire the skills in handling scientific instruments, planning and performing in laboratory experiments.
PO6. Understand and be aware of relevant theories, paradigms, concepts and principles of zoology.
PO7: Understand the structure and functions of cell types
PO8: Acquire time management and self-management skills.
PO9: Relate the various abiotic factors with health of living forms and ecosystems.
PO10: Explain the role of various biomolecules in living systems
PO11: Apply the knowledge of Zoology to understand the complex life life Processes and phenomena.
PO12: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning.

Programme Specific Outcomes

PSO1. Ability to connect and apply biological knowledge to other disciplines and to integrate knowledge into their personal and professional lives.
PSO2. Explain the origin of life with context to the origin of eukaryotic cell and endo-symbiotic theory of origin., fossil records, Darwinism and Neo- Darwinism, experimental evidences.
PSO3. Illustrate zoological science for its application in branches like medical entomology, apiculture, aquaculture and agriculture etc
PSO4. Understand animal interactions with the environment and identify the major groups of organisms with an emphasis on animals and classify them within a phylogenetic framework.

Course Outcomes

Zoology old Syllabus – 2014 pattern

B. Sc. (Zoology) First Year B.Sc.

Course ZY 101 -Animal Systematics and Diversity I & II

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

CO1: Demonstrate anatomical and physiological attributes of each animal group and why these have led to their success.
CO2: Identify a range of invertebrate and vertebrate animals
CO3: Describe the morphology, habit and habitat. Systematic position and various systems in *Paramecium.*
CO4: Describe the morphology, habit and habitat. Systematic position and various systems in Frog.
CO5: List the various animals in a given phylum. CO6: State the animal classification.
CO7: Enlist the examples of the phylums studied.
CO8: Comment on the modifications of common animal forms of the groups studied.

Course: ZY 102 Fundamentals of Cell Biology; Genetics.

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

CO1: Differentiate prokaryotic and Eukaryotic cells.
CO2: Explain the principles of staining.
CO3: Describe the structure and functions of cell organelles. CO4: Label the various cell parts and Cell organelles.
CO5: Explain the cell division process and its significance.
CO6: Explain Mendel's principle, its extension and chromosomal basis and determination of gene action from genotype to phenotype and concepts of inheritance.
CO7: Define the terminologies in genetics.
CO8: Describe the chromosome anomalies and associated diseases

Course: ZY 103 Practicals in Zoology:

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

CO1: Identify various animals based on morphological features.
CO2: Prepare the culture of *Paramecium*
CO3: Prepare stained slides of mitosis. CO4: Identify the cell division phases CO5: Detect human blood group
CO6: Identify the human genetic traits. CO7: Identify the cell organelles.
CO8: Explain the morphology and sexual dimorphism of *Drosophila* and Frog.

B. Sc. (Zoology) Second Year B.Sc.

Course ZY 211-Animal Systematics and Diversity III.

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

CO1: List the various animals in a given phylum of invertebrates
CO2: Identify various larval stages and development in invertebrate groups
CO3: Explain various modifications in these groups and the need of the modification for survival.
CO4: Explain various adaptations in insects including mimicry and metamorphosis
CO5: Describe the morphology, habit and habitat, systematic position and various systems in Star fish.
CO6: State the outline of animal classification of non-chordates
CO7: Classify the higher invertebrate groups.
CO8: Categorize the diversity found in the invertebrate groups of animals like Arthropoda, Mollusca and Echinodermata.

Course ZY 212: Applied Zoology I

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

CO1: Define the concepts of the applied subjects like Fisheries, Aquaculture and Pest Control.
CO2: Identify, freshwater, Marine water fishes.
CO3: Explain the tools and techniques used in aquaculture and agricultural practices. CO4: Describe the fish species commonly used in fishery business.
CO5: Describe the common agricultural pests from nearby area. CO6: Illustrate the diseases in aquaculture and agriculture.
CO7: Classify freshwater and Marine water fishes. CO8: Categorize economically important fish species.

Course ZY 221-Animal Systematics and Diversity IV.

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

CO1: List the various vertebrate animals in a given class.
CO2: Identify poisonous and non-poisonous snakes.
CO3: Explain various modifications in the given group of animals.
CO4: Explain various adaptations in avian group as well as migration and flight in birds.
CO5: Describe the morphology, habit and habitat. Systematic position and various systems in *Scoliodon*.
CO6: State the outline of chordate classification. CO7: Classify the higher vertebrate groups.
CO8: Categorize the diversity found in the vertebrate groups of animals like reptiles, birds and mammals.

Course ZY 222: Applied Zoology II

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

CO 1: Define the concepts of the applied subjects like Apiculture and Sericulture. CO 2: Identify different species and casts of honeybees and species of silkworm. CO 3: Explain the tools and techniques used in apiculture and sericulture.
CO 4: Explain the important pests of apiculture and sericulture.
CO 5: Describe the economic importance of honeybee and silkworm. CO 6: Illustrate management of

the apiary and sericulture units.
CO 7: Classify of *Apis, Bombyx* and *Anthereria.*
CO 8: Select economically important species of *Apis* for unifloral and multifloral honey production.

Course ZY 223: Practicals in Zoology:

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

CO1: Identify animals of higher groups in Invertebrates and Vertebrates. CO2: Distinguish between poisonous and non-poisonous snakes
CO3: Label various parts of the animals and their modifications
CO4: Observe the various tools, crafts and gears used in Apiary, Fishery, Sericulture and Pest control.
CO5: Identify the pests in agriculture and enemies in Apiary
CO6: Explain the modifications and adaptations in animals
CO7: Explain the use of tools in Apiary, Sericulture and appliances in Pest control.
CO8: Describe External features and economic importance of freshwater and Marine water fishes and other aquaculture organisms
CO9: Describe the morphology, habit and habitat. Systematic position and various systems in starfish and *Scoliodon*

Zoology Syllabus – 2019-20 pattern

Choice Based Credit System

Course Structure:

Course Structure with Credit Distribution of the Undergraduate Science Program inZoology

Course	Course Code and Name of the Course		Credits
F.Y.B.Sc. 2019	**SEMESTER I**	**SEMESTER II**	
CC	ZO-111 Animal Diversity I	ZO-121 Animal Diversity II	2+2
CC	ZO-112 Animal Ecology	ZO-122 Cell Biology	2+2
CC	ZO-113 Zoology Practical Paper	ZO-123 Zoology Practical Paper	1.5 +1.5
S.Y.B.Sc. 2020	**SEMESTER III**	**SEMESTER IV**	
CC	ZO-231 Animal Diversity III	ZO-241 Animal Diversity IV	2+2
CC	ZO-232 Applied Zoology I	ZO-242 Applied Zoology II	2+2
CC	ZO-233 Zoology Practical Paper	ZO-243 Zoology Practical Paper	2+2
AECC	EVS 231-Environment Awareness	EVA 241-Environment Awareness	2+2
AECC	LA 231-English/Marathi	LA 241- English /Marathi	2+2

Detailed Syllabus of F.Y.B.Sc.

Course Title: Animal Diversity –I Course Code-ZO-111: Semester I (2 credits-30 lectures)
Course Title: Animal Ecology Course Code: ZO 112: Semester I (2 Credits-30 Lectures)
Course Title: Animal Diversity –II Course Code: ZO-121: Semester II (2 credits-30 lectures)

After successfully completing these courses, students will be able to:

CO1. Identify and critically evaluate their own beliefs, values and actions in relation to professional and societal standards of ethics and its impact on ecosystem and biosphere due to the dynamics in population.
CO2. To understand anticipate, analyse and evaluate natural resource issues and act on a lifestyle that conserves nature.
CO3. To understands and appreciates the diversity of ecosystems and applies beyond the syllabi to understand the local lifestyle and problems of the community.
CO4. Link the intricacies of food chains, food webs and link it with human life for its betterment and for non-exploitation of the biotic and abiotic components.
CO5. The working in nature to save environment will help development of leadership skills to promote betterment of environment.

Course Title: Cell biology Course Code: ZO122: Semester II (2 credits-30 lectures)

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

CO1. Understand the importance of cell as a structural and functional unit of life.
CO2. Understands and compares between the prokaryotic and eukaryotic system and extrapolates the life to the aspect of development.
CO3. The dynamism of bio membranes indicates the dynamism of life. Its working mechanism and precision are responsible for our performance in life.
CO4. The cellular mechanisms and its functioning depends on endo-membranes and structures. They are best studied with microscopy.

Course Title: Zoology Practical Paper Course Code: ZO113: Semester I (1.5 Credits-45 Hours)

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

Animal Diversity –I
1. Museum Study of phylum Protozoa: Euglena, Paramecium, Amoeba, Plasmodium sp.
2. Museum study of Phylum Porifera: *Sycon, Euplectella, Chalina,* Spongilla.
3. Museum study of phylum Cnidaria: *Hydra, Physalia, Aurelia, Metridium*.
4. Museum Study of phylum Platyhelminthes: *Planeria, Faciola hepatica, Taenia solium*
5. Study of Paramecium: Culture, External morphology, Conjugation and Binary fission.
6. Study of permanent slides: Spicules and Gemmules in Sponges, T.S. of *Sycon*, T.S. of Hydra, Taeniasolium: Scolex, Gravid proglottid.
7. Identification of any three museum specimen with help of taxonomic identification key.
8. Visit to Zoological survey of India/ Museum/National Park.

Animal Ecology:
1. Estimation of Dissolved oxygen from given water sample.
2. Estimation of Water Alkalinity from given water sample.
3. Study of animal community structure by quadrate method (Field or Simulation).
4. Determination of density, frequency and abundance of species by quadrat method.
5. Study of microscopic fauna of freshwater ecosystem (from pond).

6. Estimation of water holding capacity of given soil sample.
7. Estimation of dissolved and free carbon dioxide from water sample.
8. Study of Eutrophication in lake/river.

Course Title: Zoology Practical Paper Course Code: ZO123: Semester II (1.5 Credits-45 Hours)

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

Animal Diversity –II

1. Museum study of Phylum Aschelminthes: Ascaris lumbricoides,
2. Museum study of phylum Annelida: Neries, Earthworm, Leech.
3. Museum study of phylum Arthropoda: Prawn, Cockroach, Centipede, Millipede, Crab
4. Museum study of phylum Mollusca: Pila, Chiton, Bivalve, Octopus.
5. Museum study of phylum Echinodermata: Sea Star, Sea urchin, Brittle Star, sea cucumber.
6. Study of permanent slides: Mouthparts of Insects -Mandibulate, Piercing and sucking, Chewing and Lapping.
7. Types of Shells in Mollusca. Pila, Bivalve, Chiton, Sepia.
8. Economic importance of honey bees, Lac insects silk worms, red cotton bug, Anopheles mosquito
9. Earthworm: vermicomposting bin preparation and maintenance.
10. Visit to a vermicomposting unit/ field for insect pest collection and its identification

Cell Biology

1. Study of Microscope: Simple and Compound
2. Micrometry: Measurement of microscopic objects
3. Study of cell: Preparation of temporary mount of human buccal epithelial cells.
4. Preparation of blood smears to observe the blood cells
5. Temporary preparation of mitotic cell from onion roots
6. Study of Cell organelles (any three) by using microphotographs

Detailed Syllabus of S.Y.B.Sc.

Course Title: Animal Diversity - III Course Code: ZO – 231, Semester – III (2 credits – 30 Hours)
Course Title: Animal Diversity - IV Course Code: ZO – 241, Semester – IV (2 credits – 30 Hours)

After successfully completing these courses, students will be able to:

CO1. The students will be able to understand, classify and identify the diversity of higher vertebrates.
CO2. The students will able to understand the complexity of higher vertebrates
CO3. The students will be able to understand different life functions of higher vertebrates.
CO4. The students will be able to understand the linkage among different groups of higher vertebrates.
CO5. The student will become aware regarding his role and responsibility towards nature as a protector, to understand his role as a trustee and conservator of life which he has achieved by learning, observing and understanding life.

Course Title - Applied Zoology I Course Code - ZO – 232 Semester III2 (Credits - 30 lectures)
Course Title - Applied Zoology II Course Code - ZO-242 Semester IV 2 (Credits- 30 lectures)

After successfully completing these courses, students will be able to:

CO1. The learner understands the basics about beekeeping tools, equipment, and managing beehives.
CO2. The learner understands the basic information about fishery, cultural and harvesting methods of fishes and fish preservation techniques.

CO3. The learner understands the biology, varieties of silkworms and the basic techniques of silk production.
CO4. The learner understands the types of agricultural pests, Major insect pests of agricultural importance and Pest control practices.

Course Title: Zoology Practical Paper Course Code: ZO – 233 Semester - III (2 credits – 60 Hours)

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

Animal Diversity - III
1. Museum study of Group Protochordata : *Balanoglossus, Herdmania, Petromyzon*. (D)
2. Museum study of Class Pisces: Labeo, *Scoliodon, Hippocampus.* (D)
3. Museum study of Class Amphibia :*Salamandra*, *Rana*, *Ichthyophis*. (D)
4. Study of types of scales in fishes: Placoid scale, Cycloid scale, Ctenoid scale & Ganoid scale. (D)
5. Study of types of tail fins in fishes: Homocercal, Heterocercal &Diphycercal. (D)
6. Study of external characters & digestive system of locally available fish. (E) - Compulsory
7. Study of brain of locally available fish. (D)
8. Temporary preparation of scales & its identification from locally available fish. - (E) Compulsory

9. Compulsory field visit to study pond ecosystem with reference to Pisces and amphibians, report writing and submission. (**2 P**)

Sericulture –
1. Study of external morphology and life-cycle of *Bombyx mori.* (D)
2. Study of five equipments in Sericulture. (E) - Compulsory
3. Preparation of a map showing distribution of silk moth and rearing/ sericulture practices in India. (E)
4. Compulsory submission of Photographs/ sketches of Mulberry, Tassar, Eri and Muga silkmoths. (E)

Agricultural Pests and their control -
1. Study of following insect pests with respect to marks of identification, nature of damage, economic importance and control measures. (D)
a) Jowar stem borer,
b) Red cotton bug,
c) Brinjal fruit borer,
d) Mango stem borer.
2. Study of following pests with respect to marks of identification, nature of damage, economic importance and control measures. (D)
a) Blister beetle,
b) Rice weevil,
c) Pulse beetle,
d) Tick.
3. Study of any two non insect pests corresponding to theory course. (D)
4. Compulsory submission of at least five Insect Pests/ Photographs/ Sketches. (E)
5. Study of pest control appliances (as per theory course). (D)
6. Compulsory field visit to Sericulture farm/ Agricultural farm, report writing and submission. **(2 P).**

Course Title: Zoology Practical Paper Course Code: ZO – 243 Semester - IV (2 credits – 60 Hours)

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

Animal Diversity - IV

1. Museum study of Class Reptilia: Venomous & Non-venomous snake – Two each. (D)
2. Identification of Venomous & Non-venomous snakes with the help of pictorial taxonomic keys. – (D) -Compulsory
3. Museum study of Class Aves: Crow, *Kingfisher*& Duck. (D)
4. Study of types of beaks &feets in birds – Any two each. (D)
5. Museum study of Class Mammalia: Rat, Shrew & Bat. (D)
6. Study of external characters & digestive system of Rat. (D)
7. Study of Heart of Rat. - (D) -Compulsory
8. Study of brain of Rat. (D)
9. Study of reptilian / avian diversity in and around the campus (**2 P**) - (E) -Compulsory
10. Compulsory visit to Zoo / Wildlife sanctuary / Bird sanctuary, report writing and submission. (**2 P**)

Apiculture –

1. Study of external morphology, life cycle and polymorphism in Honey Bee. (D)
2. Temporary mountingof mouth parts, legs, wings and sting apparatus of worker bee. (E)
3. Study of Bee keeping Equipment: Bee box, Honey extractor, Smoker**,** Bee-veil, queen excluder. (D)- Compulsory
4. Study of Bee products: Honey, Wax, Venom, Royal jelly, Pollen. (D)
5. Estimation of carbohydrates from Honey in different samples. (D)- Compulsory
6. Study of Bee enemies: Wax moth, Bee eater, ant. (D)

Fisheries –

1. Identification, Classification and study of habit, habitat and economic importance of
a) Rohu (*Labeo rohita*), **b)** Catla (*Catla catla*), **c)** Mrigal (*Cirrhinus mrigala*). (D)
2. Identification, Classification and study of habit, habitat and economic importance of
a) Prawn, **b)** Crab, **c)** Lobster, **d)** Pearl Oyster. (D)
3. Study and maintenance of Aquarium. (D) - Compulsory
4. Study of crafts: **a)** Catamaran, **b)** Machwa, **c)** Dinghi (Photographs/models/line drawings). (D)
5. Study of gears in fishing: **a)** Gill net, **b)** Dol net, **c)** Rampani net, **d)** Cast net. (Photographs/models/line drawings). (D)
6. Study of nutritional value of fish: Biochemical estimation of fish muscle proteins by using Biuret method. (E) - Compulsory
7. Compulsory study tour/field visit to Apiculture institute / Fish farm/ Aquarium. (E) **(2 P)**.