Savitribai Phule Pune University

(Formerly University of Pune)

Three Year B.Sc. Degree Program in Zoology

(Faculty of Science & Technology)

F.Y.B.Sc. Zoology

Choice Based Credit System Syllabus

to be implemented from

Academic Year 2019-2020

Preamble:

Zoology is one of the major subjects of Basic Sciences and deals with all aspects of animal biology. It includes an interesting range of highly diverse topics. A zoology student needs to gain understanding of many areas of the subject to keep pace with advancements in Life Sciences.

This under-graduate degree program has been designed by the Board of Studies in Zoology of Savitribai Phule Pune University with a substantial component of what is needed from zoologists as a skilled career and what zoologists need to pursue for post-graduation and further academic studies. It follows the guidelines laid down by the University Grants Commission, New Delhi. This newly designed curriculum is a perfect blend of the classical aspects in Zoology and the advanced and more specialized areas.

This degree offers Discipline Specific Core Courses **[CC]** in Animal Systematics, Animal Ecology, Animal Cell biology, Applied Zoology, Pest Management, Histology, Biological Chemistry, Genetics, Developmental Biology, Parasitology, Medical & Forensic Zoology, Animal Physiology, Molecular Biology, Entomology, Techniques in Biology and Evolutionary Biology.

In addition to the Core Courses, Ability Enhancement Compulsory Courses **[AECC]** have been added in the second year i.e. Semester III and Semester IV of the undergraduate course. In the third year i.e. Semester V and Semester VI, Discipline specific Elective Courses **[DSEC]** and Skill Enhancement Courses **[SEC**] have been offered. The students, therefore, have an opportunity to take courses in Environment Awareness, Language communication: English/Marathi, Aquarium Management, Poultry Management and Environmental Impact Assessment. In Semester VI the students also have a course dedicated to Project work.

The syllabus has been framed in such a way that the student gains each year, a broader perspective of the subject as he progresses towards completion of the degree program. Field trips, Educational visits and the Project work have been included for the student to experience the applications of the theory learnt in the classroom.

After completion of the program, it is expected that students will understand and appreciate: animal diversity, few applications of Zoology, the structure, functions and life processes at cellular, tissue, organ and system level, significance of evolution, and basic concepts of human health. The students would also gain an insight into laboratory and field work through the practical course, field work and the project.

While presenting this new syllabus to the teachers and students of F.Y.B.Sc. Zoology, I am extremely happy to state that efforts have been made to seek inputs of all the stake holders to make it more relevant.

The new course that will be effective from the academic year 2019- 2020 and will follow the Choice Based Credit System in a Semester mode. It has been primed keeping in view the distinctive requirements of B.Sc. Zoology students. The contents have been drawn-up to accommodate the widening prospects of the discipline of Life Sciences. They reflect the changing prerequisites of the students. This program has been introduced with 132 credits for the subject group while 08 credits to earn from any of the 08 groups offering a range of curricular, cocuricular and extracurricular activities. This pattern has been specially aimed be as per the guidelines of the University. The B.Sc. Zoology program provides an appropriate blend of classical and applied aspects of the subject. This newly designed curriculum will allow students to acquire the skill in handling scientific instruments planning and performing in the laboratory and exercising critical judgement, independent thinking and problem solving skills. The Syllabus has been revised with the following aims

To foster curiosity in the students for Zoology
To create awareness amongst students for the basic and applied areas of Zoology
To orient students about the importance of abiotic and biotic factors of environment and their conservation.
To provide an insight to the aspects of animal diversity.
To inculcate good laboratory practices in students and to train them about proper handling of lab instruments.

1. Course Structure:

Course Structure with Credit Distribution of the Undergraduate Science Program in Zoology

Course	Course Code and Name of the Course		Credits
F.Y.B.Sc.	**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.	**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
T.Y.B.Sc.	**SEMESTER V**	**SEMESTER VI**	
DSEC	ZO-351 Pest Management	ZO-361 Medical & Forensic Zoology	2+2
DSEC	ZO-352 Histology	ZO-362 Animal Physiology	2+2
DSEC	ZO-353 Biological Chemistry	ZO-363 Molecular Biology	2+2
DSEC	ZO-354 Genetics	ZO-364 Entomology	2+2
DSEC	ZO-355 Developmental Biology	ZO-365 Techniques in Biology	2+2
DSEC	ZO-356 Parasitology	ZO-366 Evolutionary Biology	2+2
DSEC	ZO-357 Zoology Practical Paper 1	ZO-367 Zoology Practical Paper 1	2+2

1.3 Linnaean system of classification (Six level classification: Phylum, class, order, family, genus, species)

1.4 Concept of Species: Biological & Evolutionary

1.5 Introduction to Binomial Nomenclature.

1.6 Introduction to Five kingdom system.

2. **General Features of kingdom Animalia** **(02)**

2.1 General characters of Kingdom Animalia, Grades of organization

2.2 Symmetry.

3. **Kingdom Protista (Phylum: Protozoa)** **(07)**

3.1 Introduction to Phylum Protozoa

3.2 Salient features of Phylum Protozoa

3.3 Classification of Phylum Protozoa up to classes with two examples of each class (names only).

Class Rhizopoda (e.g :*Entamoeba histolytica*, *Arcella*),

Class Mastigophora (e.g: *Euglena viridis*, *Trypanosoma gambiense*),

Class Ciliata (e.g *Paramoecium caudatum*, *Opalina ranarum*),

Class Sporozoa (e.g *Plasmodium vivax*, *Toxoplasma gondii*)

3.4 Locomotion in Protozoa: Amoeboid, Ciliary and Flagellar with suitable examples

3.5 Type Study: ***Paramecium caudatum***: Classification, Habit and Habitat, External morphology, Feeding and digestion, Excretion, Reproduction (binary fission and conjugation)

3.6. Economic importance of Protozoa (three harmful and one useful protozoan)

3.6.1-**Harmful Protozoa**:

Plasmodium vivax (malarial parasite),

Entamoeba histolytica (Amoebic dysentery),

Trypanosoma gambiense (Gambian sleeping sickness).

3.6.2- **Useful Protozoa**:

Trichonympha

4. **Origin of Metazoa** **(01)**

4.1 Introduction Origin and importance of Metazoa

5. **Phylum Porifera** **(06)**

5.1. Introduction to Phylum Porifera

5.2 Classification of Phylum Porifera up to classes with two examples of each class (names only, no description of specimens).

Class Calcarea (e.g.: *Leucosolenia, Sycon (Scypha)*

Class Hexactinellida (e.g: *Euplectella* (venus flower basket), *Hyalonema* (glass sponge))

Class Demospongiae (e.g: *Chalina* *Spongilla* (fresh water sponge))

5.3 Canal system in sponges: Ascon, Leucon and Rhagon type.

5.4 Skeleton in sponges: Spicules, its types:

Microscleres & Megascleres,

Monoaxon monactinal, diactinal, Amphidiscs, Triaxon, Polyaxon,

Spongin fibres.

5.5 Regeneration in sponges.

5.6 Economic importance of Phylum Porifera.

6. **Phylum: Cnidaria** **(05)**

6.1 Introduction to Phylum Cnidaria

6.2 Salient features of Phylum Cnidaria

6.3 Classification of Phylum Cnidaria up to class level with given examples each class (names of examples only)

Class Hydrozoa e.g.: Hydra, *Physalia* (Portuguese man of war)

Class Scyphozoa e.g: *Aurelia* (Jelly fish), *Leucernaria* (trumpet shaped Jellyfish)

Class Anthozoa: e.g; Metridium (Common sea anemone0

6.4 Polymorphism in Hydrozoa: Polyps & Medusa (polyp types: gastrozooids, dactylozooids, gonozooids) and functions

6.5 Economic importance of Cnidarians with reference to Corals and Coral reefs.

7. **Phylum Platyhelminthes** **(04)**

7.1 Introduction to Phylum Platyhelminthes

7.2 Salient features of Phylum Platyhelminthes

7.3 Classification of Phylum Platyhelminthes up to classes with two examples each class (names of examples only).

Class: Turbellaria (e.g: *Dugesia, Bipallium*)

Class: Trematoda (e.g*: Fasciola hepatica, Schistosoma haematobium*)

Class Cestoda: (*Taenia solium* (pork tape worm),*Echinococcus granulosus* (dog tapeworm)

7.4 Parasitic adaptations in Platyhelminthes: structural and physiological.

7.5 Economic importance of Platyhelminthes

Course Title: Animal Ecology

Course Code: ZO 112

Semester I **(2 Credits-30 Lectures)**

Learning outcomes for the course:

The learners will be able to 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.

To understand anticipate, analyse and evaluate natural resource issues and act on a lifestyle that conserves nature.

The Learner understands and appreciates the diversity of ecosystems and applies beyond the syllabi to understand the local lifestyle and problems of the community.

The learner will be able to 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.

The working in nature to save environment will help development of leadership skills to promote betterment of environment.

ZO 112: Animal Ecology **(2 Credits-30 Lectures)**

No.	Topic & Content	Number of lectures
1.	**Introduction to Ecology**	**(02)**
	1.1 Concepts of Ecology, Environment, Population, Community, Ecosystem, Biosphere, Autecology and synecology.	
2.	**Ecosystem**	**(08)**
	2.1 Types of ecosystems: Aquatic (Freshwater, estuarine, Marine and terrestrial (Forest, Grassland and Desert)	
	2.2 Structure and Composition of Ecosystem (Abiotic components and biotic components.	
	2.3 Food chain: Detritus and grazing food chains, Food web, Energy flow through the ecosystem, Ecological pyramids: Number, Biomass, and Energy.	
	2.4 concept of Eutrophication in lakes and rivers.	
3	**Population**	**(08)**
	3.1Characteristic of population: Density, Natality, Mortality, Fecundity tables, survivorship curves, age ratio, sex ratio, dispersal and dispersion.	
	3.2Exponential and logistic growth,	
	3.3 Population regulation density-dependent and independent factors.	
	Population interactions, Gause Principle with laboratory and field interactions,	
	3.4 Quadrate, line and belt transect methods.	
4.	**Community**	**(07)**
	4.1Community characteristics: species richness, dominance, diversity, abundance, vertical stratification, Eco tone and edge effect; Ecological succession with one example.	
5.	**Animal interactions**	**(05)**
	5.1Introduction to Animal interactions	
	5.2 Types of Animal interactions with at least to suitable examples of each	
	5.2.1-Competition: Interspecific and intraspecific	

5.2.2- Beneficial Associations:

Commensalism (remora fish on shark, Cattle egrets on livestock),

Mutualism (Termite and *Trichonympha*, bees and flowers, cleaning symbiosis in fish by prawns.

5.3 Antagonistic associations: Parasitism (*Ascaris* and man, lice and humans), Prey predation (Lion and deer).

Course Title: Zoology Practical Paper

Course Code: ZO113

Semester I (1.5 Credits-45 Hours)

Animal Diversity ïI

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: Animal Diversity ïII

Course Code: ZO-121:

Semester II **(2 credits-30 lectures)**

No.	Title & Contents	Number of lectures
1.	**Phylum Aschelminthes**	**(04)**
	1.1 Introduction to phylum Aschelminthes 1.2 Salient features of Phylum Aschelminthes 1.3 Classification of Phylum Aschelminthes (Class Nematoda only with two examples *Ascaris lumbricoides* (common round worm), *Wuchereria bancrofti* (Elephantiasis)). 1.4 Economic importance of class Nematoda.	
2.	**Phylum Annelida**	**(06)**
	2.1 Introduction to Phylum Annelida 2.2 Salient features of Phylum Annelida. 2.3 Classification of Phylum Annelida up to classes with examples of following classes (names of examples only). Class Polychaeta (e.g: *Nereis pelagica (neries/* sand worm, *Aphrodita aculeata* (=Aphrodite/ seamouse) Class Oligochaeta (e.g.: *Pheritima posthuma* (earthworm), Class Hirudinea (e.g: *Hirudinaria granulosa* common cattle leech) 2.4 Economic importance of Annelida with reference to earthworms as friends of farmers and in their role in vermicomposting.	
3.	**Phylum Arthropoda**	**(06)**
	3.1 Introduction to Phylum Arthropoda 3.2 Salient features of Phylum Arthropoda 3.3 Classification of Phylum Arthropoda with specific classes and mentioned examples (names only) Class:Crustacea:*Palaemon palaemon* (Prawn) *Brachyura* spp. crabs) Class: Chilopoda: *Scolopendra* sp. (centipede) Class: Diplopoda: *Julus* sp. (millipede)	

Class Insecta*: Periplaneta americana* (American Cockroach),

Anopheles stephensii (mosquito).

Class: Arachnida- Spiders, *Buthus sp (*scorpion)

3.4 mouth parts in insects: Mandibulate (cockroach), Piercing and sucking (female Anopheles mosquito), chewing and lapping type (honey bee)

3.5 Economic importance of Arthropoda

Useful Insects: Honey bee, Lac insect, Silkworm.

Harmful insects: Female Anopheles mosquito, Red cotton bug, Rice weevil

4. **Phylum Mollusca** **(06)**

4.1 Introduction to Phylum Mollusca

4.2 Salient features of Phylum Mollusca

4.3 Classification of Phylum Mollusca with specific classes and mentioned examples (names only)

Class Gastropoda e.g *Pila globosa* (apple snail)

Class Pelecypoda e.g *Lamellidens marginalis*(Bivalve)

Class Polyplacophora e.g *Chiton*

Class: Cephalopodae.g: *Octopus vulgaris* (common octopus), *Sepia officinalis* (common Cuttle fish)

4.4 Economic importance of Mollusca.

5. **Study of Phylum Echinodermata** **(08)**

5.1 Introduction to Phylum Echinodermata

5.2 Salient features of Phylum Echinodermata.

5.3 Classification of Phylum Echinodermata with specific classes and mentioned examples (names only)

Class Asteroidea (*Asterias rubens* sea stars or starfish)

Class: Holothuroidea. *Holothuria sp*. sea cucumbers)

Class: Echinoidea *(Echinus esculentis* common sea urchins)

Class: Crinoidea (sea lilies or feather stars)

5.4 **Type study: *Asteriasrubens* (Sea Star):** Classification, Habit

Habitat, External Morphology, Digestive system, Water vascular

System and autotomy and regeneration

5.5 Pedicillaria in Echinodermata: straight, crossed, valvate, tridactylous, globigerous.

5.6 Economic importance of Echinidermata.

Course Title: Cell biology

Course Code: ZO122:

Semester II **(2 credits-30 lectures)**

Learning outcomes for Cell Biology

The learner will understand the importance of cell as a structural and functional unit of life.

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