

Progressive Education Society's
Modern College of Arts, Science and Commerce
Shivajinagar, Pune 5

(An Autonomous College Affiliated to Savitribai Phule Pune University)

Detailed Syllabus

For B.Sc. Zoology

(2019-20 Course)

(with effect from 2019-20)

Semester 1 (First Year)

Course Type	Course Code	Course / Paper Title	Hours / Week	Credit	CIA	End Sem	Total
CCT-1	19ScZooU101	Animal Biology and Diversity-I	3	2	40	60	100
CCT-2	19ScZooU102	Fundamentals of Genetics	3	2	40	60	100
CCP-1	19ScZooU103	Practicals in Zoology	4	2	40	60	100
Total				6	120	180	300

Semester II (First Year)

Course Type	Course Code	Course / Paper Title	Hours / Week	Credit	CIA	End Sem	Total
CCT-1	19ScZooU201	Animal Biology and Diversity-II	3	2	40	60	100
CCT-2	19ScZooU202	Fundamentals of Cell Biology	3	2	40	60	100
CCP-1	19ScZooU203	Practicals in Zoology	-	2	40	60	100
Total				6	120	180	300

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First Year of B.Sc. (2019 Course)

Course Code: 19ScZooU101

Course Name: Animal Biology and Diversity - I

Teaching Scheme: TH: 3 Lectures/Week

Credit: 02

Examination Scheme: CIA: 40 Marks

End-Sem: 60 Marks

Prerequisite :

Course in Basic Biology of Std XI and Std XII [Maharashtra Board/ CBSE Board/Any Govt. approved board]

Course Objectives:

- To study the basics of taxonomy and classification
- To know and understand the animal diversity
- To study the morphology and anatomy of selected invertebrates in detail

Course Outcomes:

- The student will be able to comprehend the diversity of animals
- The student will be able to understand the importance of classification
- It will enable the student to observe and study similarities and dissimilarities between varied groups of animals, as a basis of classification
- It will develop an insight in the student for studying type specimens from a particular group

Course Contents

Unit 1	Principles of classification	5 Lectures
1.1	Definition of Taxonomy	
1.2	Levels of taxonomy: Alpha, Beta and Gamma.	
1.3	Types of Taxonomy: Micro-taxonomy Macro taxonomy: Phenetics (numerical taxonomy),	
1.4	Cladistics (Phylogenetic systematics),	
1.5	Evolutionary taxonomy (evolutionary systematics)	
1.6	Role of Taxonomy	
1.7	Definition of Systematics	
1.8	Origin and development of systematics	
1.9	Linnaean hierarchy (Phylum, Class, Order, Family, Genus and Species)	
1.10	Binomial and Trinomial nomenclature and ICZN	
1.11	Seven kingdom classification system	
Unit 2	Basis of Animal Classification	2 Lectures

2.1	Grades of organization	
2.2	Symmetry	
2.3	Germ layers	
2.4	Protostome / Deuterostome concept.	
2.5	Coelom	
2.6	Metamerism	
2.7	Cephalization	
Unit 3	Kingdom Protista	5 Lectures
3.1	General characters and classification of Kingdom Protista up to classes	
3.2	Study of <i>Paramecium</i> : Habit, Habitat, Structure, Digestion, Excretion, Reproduction	
Unit 4	Kingdom Animalia	14 Lectures
4.1	Phylum Porifera General characters and classification up to classes	
4.2	Phylum Cnidaria General characters and classification up to classes	
4.3	Study of <i>Hydra</i> : Habit, Habitat, Structure -Cellular organization Digestive system, Excretion, Reproduction: Asexual – Regeneration and Budding and Sexual	
4.4	Phylum Platyhelminthes and Aschelminthes General characters and classification up to classes	
4.5	Phylum Annelida General characters and classification up to classes	
4.6	Study of Earthworm – <i>Pheretima posthuma</i> : Morphology, Digestive system, Excretory system, Nervous system, Reproductive system	
4.7	Economic importance of earthworm	
Unit 5	General Topics	9 Lectures
5.1	Nutrition and Locomotion in Protista	
5.2	Useful and Harmful Protista	
5.3	Spicules and Gemmules in Sponges	
5.4	Evolution of Canal system	
5.5	Corals and coral Reef	
5.6	Regeneration in <i>Planaria</i>	
Unit 6	Experiential learning	1 Lectures

References:

1. Text Books of Zoology. Vol.11, Invertebrates, 1982, A. J. Marshall and W. D. Williams, ELBS and Macmillan, Hongkong.
2. Life of Invertebrates, 1980, S. N. Prasad, Vikas Publishing Co. Sahlabad.
3. Invertebrate Zoology, 1982, R. D. Barnes, Saunders College, Philadelphia.
4. Text Books of Zoology, Invertebrates Vol- II, 1992, T.J.Parker and W.A. Haswel, Edited by Marshall and Williams, CBS publications and distribution, New Dehli.

5. Invertebrate Zoology, E.L. Jordon and P.S. Verma; S. Chand and Co. Ltd., New Dehli. 14th fully Revised Edition- 2007.
6. Invertebrate Zoology, 1991, Paul, A. Meglitch and Fedricks R. Schram, Oxford University Press, New York.
7. IGCSE Biology, D. G. Mackean, Published by John Murray, London. UK, 2002.
8. Invertebrate Zoology, Edited by D. T. Anderson, Oxford University Press, New York. Indian Edition by- A.P. Offset, Dehli, 2006.
9. Diversity of Organisms. Edited by Caroline M., Pond Biology- Form and Function. Published by Hodder and Stoughton, The Open University, London.
10. Modern Text Book of Zoology. Invertebrates. 6th Edition, 1992, R. L. Kotpal, Rastogi Publication, Meerut.
11. Principles of Animal Taxonomy, G. G. Simpson.

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First Year of B.SC. (2019 Course)

Course Code: 19ScZooU102

Course Name: Fundamentals of Genetics

Teaching Scheme: TH: 3 Lectures/Week

Credit: 02

Examination Scheme: CIA: 40 Marks

End-Sem: 60 Marks

Prerequisite

Course in Basic Biology of Std XI and Std XII [Maharashtra Board/ CBSE Board]

Course Objectives:

- To introduce the students to the different concepts of genetics
- To correlate this knowledge with human day to day life.

Course Outcomes:

- The learner will understand the significance of heredity and variation
- The learner will be able to appreciate the impact of genetics on animal diversity and their evolution.
- The student will be eligible to study further and understand concepts of advance genetics

Course Contents

Unit 1	Introduction to genetics	1 Lectures
	1. Recapitulation of Mendelian inheritance : Basic terminology, Monohybrid cross, Dihybrid cross, Test cross and Back cross	
Unit 2	Gene Interaction	6 Lectures
	2.1 Concept of gene interaction, co-dominance and incomplete dominance 2.2 Complementary factors (9:7) 2.3 Supplementary Factors (9: 3:4) 2.4 Inhibitory factors (13:3) 2.5 Duplicate factors (15:1) 2.6 Lethal genes in <i>Mus musculus</i>	
Unit 3	Multiple Alleles	4 Lectures
	3.1 Concept , characteristics and importance of multiples alleles Coat colour in rabbits, Eye colour in <i>Drosophila</i> , 3.2 ABO blood group in human beings and Rh-blood group system; 3.3 Medico-legal aspects of blood group	
Unit 4	Chromosomes	3 Lectures
	4.1 Introduction to morphology and composition 4.2 Classification based on the centromeric position 4.3 Types of chromosome (autosomes and sex chromosome) 4.4 Chromosomal aberrations: structural changes and numerical changes	

Unit 5	DNA , Gene expression and Gene regulation	7 Lectures
	5.1 DNA as the genetic material 5.2 Structure and packaging of eukaryotic DNA 5.3 Central dogma of molecular biology 5.4 Lac Operon	
Unit 6	Sex-determination	4 Lectures
	6.1 Introduction 6.2 Chromosomal mechanism of sex determination (XX-XY, ZZ-ZW, XX- 6.3 XO,Haploid-Diploid method, Genic balance theory) 6.4 Hormonally controlled sex determination (<i>Bonellia</i> , Crew's hen) 6.5 Parthenogenesis and Gynandromorphism	
Unit 7	Human genetics	6 Lectures
	7.1 Study of human karyotype , Amniocentesis 7.2 Syndromes:Autosomal-Down's (Mongolism), Patau's, Edward's and Cri-du-chat 7.3 Sex chromosomal abnormalities in man: Klinefelter's and Turner's syndrome 7.4 Inborn errors of metabolism: albinism, phenylketonuria and alkaptonuria	
Unit 8	Sex linked inheritance in human:	1 Lecture
	8.1 Colorblindness, haemophilia and hypertrichosis	
Unit 9	Application of genetics	3 Lectures
	9.1 Genetic counseling 9.2 Concept of Genetic Engineering, Eugenics, Euphenics, Euthenics	
Unit 10	Experiential learning	1 Lecture

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First Year of B.SC. (2019 Course)

**Course Code: 19ScZooU103
Course Name: Zoology Practical -I**

**Teaching Scheme: TH: 4 Lectures/Week
Examination Scheme: CIA: 40 Marks**

**Credit: 02
End-Sem: 60 Marks**

Practicals based on 19ScZooU101:

1. Classification of Protista and Porifera (One example from each class)
2. Classification of Cnidaria and Platyhelminthes (One example from each class)
3. Classification of Aschehelminthes and Annelida (One example from each class)
 - a. Temporary mounting of sponge spicules
 - b. Study of corals
4. Study of *Paramoecium*:
 - a. Sturucture, Binnary fission, Conjugation
 - b. Culture and cyclosis of *Paramoecium*
5. Study of *Hydra*
6. Study of Earthworm:
 - a. External morphology, digestive system, reproductive system.
 - b. Mounting: Seate, Septal nephredia and spermatheca

Practicals based on 19ScZooU102:

1. Study of monohybrid ratio and dihybrid ratio by providing hypothetical data and deducing applicability of Mendelian laws (three examples of each ratio) (E)
2. Preparation of culture media and maintenance of *Drosophila* culture (E)
3. a. Study of *Drosophila*: External characters and sexual dimorphism (D)
b. Study of *Drosophila* mutants (any two eye and any two wing mutants) (D)
4. Study of genetic traits in human beings (tongue rolling, widow's peak, ear lobes, color blindness and PTC tasters/ nontasters) (E)
5. Study of normal human karyotype from metaphase chromosomal spread picture (E)
6. Study of human karyotype with syndrome (Any one) from metaphase chromosomal spread picture (E)
7. Study of sex linked inheritance – Minimum Six Problems (E)
8. Study of blood groups in human (ABO and Rh) (E)

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First Year of B.SC. (2019 Course)

Course Code: 19ScZooU201

Course Name: Animal Biology and Diversity - II

Teaching Scheme: TH: 4 Lectures/Week

Credit: 02

Examination Scheme: CIA: 40 Marks

End-Sem: 60 Marks

Prerequisite Courses:

Course in Basic Biology of Std XI and Std XII [Maharashtra Board/ CBSE Board]

Course Objectives:

- To study the basics of taxonomy and classification
- To know and understand the animal diversity
- To study the morphology and anatomy of selected vertebrates in detail

Course Outcomes:

- The student will be able to comprehend the diversity of animals
- The student will be able to understand the importance of classification
- It will enable the student to observe and study similarities and dissimilarities between varied groups of animals, as a basis of classification
- It will develop an insight in the student for studying type specimens from a particular group

Course Contents

Chapter 1	Diversity and Classification of Chordates	8 Lectures
	1.1 Classification of Hemichordata, Urochordata and Cephalochordata 1.2 Classification of Agnatha: Cyclostomata 1.3 Classification of Pisces upto order 1.4 Classification of Amphibia upto order	
Chapter 2	General Topics	14 Lectures
	2.1 Mimicry in Animals 2.2 Migration in Fishes 2.3 Accessory Respiratory Organ in Fishes 2.4 Scales in Fishes 2.5 Swim bladder and Weberian apparatus	

	2.6 Neoteny and Paedogenesis 2.7 Parental Care in Amphibia 2.8 Bioluminescence	
Chapter 3	Study of Scoliodon	13 Lectures
	3.1 Systematic position, Habit and habitat 3.2 External characters 3.3 Digestive system, food, feeding and physiology of digestion 3.4 Respiratory system 3.5 Blood vascular system 3.6 Nervous system and sense organs 3.7 Male urinogenital system and female reproductive system	
Unit 4	Experiential learning	1 Lecture

References:

1. A Text Book of Zoology, Vertebrates, Vol-II, Jeffery Parker and W.A. Haswel, Edited by Marshall and Williams, CBS Publication, New Dehli.
2. Chordate Zoology, 1982, P.S Dhami and J.K.Dhami, R.Chand and Co., New Dehli.
3. A Text Book of Zoology, 1984, R.D. Vidyarthi, R. Chand and Co., Dehli.
4. Modern Text Book of Zoology, Vertibrates. R. L. Kotpal, 3rd edn. Rastogi Publications, Meerut.
5. Chordate Zoology, E.L. Jordon. S. Chand & Co., New Dehli.
6. Biology, Campbell nand Reece. 7th Edn. Pearson Education in South Asia,
7. Biology of Animals, Volume II, Snha, Adhikari, Ganguly and Bharati Goswami. (NCBA)

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First Year of B.SC. (2019 Course)

Course Code: 19ScZooU202

Course Name: Fundamentals of Cell Biology

Teaching Scheme: TH: 4 Lectures/Week

Credit: 02

Examination Scheme: CIA: 40 Marks

End-Sem: 60 Marks

Prerequisite Courses:

Course in Basic Biology of Std XI and Std XII [Maharashtra Board/ CBSE Board]

Course Objectives:

- To study the cell as a basic unit of life
- To study the techniques related to cell biology
- To study the different types of cells
- To understand the complex functions and processes of the cell

Course Outcomes:

- The students will understand the significance and importance of cell as a structural and functional unit of life.
- The students will know the logic of the techniques used in cell biology
- The students will appreciate the difference between the prokaryotic and eukaryotic cells
- The role of various cell organelles will be understood
- The students will learn the complex functions and processes of the cell

Course Contents

Unit 1	Introduction:	2 Lectures
	1.1 History of cell biology, cell as basic unit of life, cell theory, protoplasm theory and organismal theory, 1.2 Importance of Cell Biology and its applications in industry	
Unit 2	Overview of Cells	1 Lectures
	2.1 Definition, Prokaryotic (E. coli) and Eukaryotic cells (Animal and Plant Cell)	
Unit 3	Techniques in Cell Biology:	5 Lectures
	3.1 Microscopy: Basic Principle, Simple, Compound and Electron Microscope. 3.2 Stain and Staining: Types of Stain 3.3 Micrometry	
Unit 4	Plasma Membrane and Cytoplasm:	6 Lectures
	4.1 Structure of plasma membrane: Fluid mosaic model, functions of bio-membranes, 4.2 Transport across membranes: Active and Passive transport, Facilitated transport, exocytosis, endocytosis, phagocytosis – vesicles	

	and their importance in transport. 4.3 Cell communication – overview – types of cell signalling – signal molecules – signal amplification – receptor types – quorum sensing. 4.4 Cell junctions: Tight junctions, Desmosomes, Gap junction 4.5 Cytoplasm – Physical and chemical nature	
Unit 5	Nucleus : Structure and function	5 lectures
	Structure of Nucleus: Nuclear envelope, Nuclear pore complex, Nucleoplasm, Nucleolus Chromatin: Eu-chromatin and Hetro-chromatin, nature and differences. Functions of nucleus	
Unit 6	Endomembrane System	4 lectures
	6.1 Structure and Functions: Endoplasmic Reticulum, Golgi apparatus, Lysosomes and vacuoles.	
Unit 7	Mitochondria and Peroxisomes	4 lectures
	7.1 Mitochondria: Structure, Semi-autonomous nature, Endosymbiont hypothesis 7.2 Mitochondrial Respiratory Chain, Peroxisomes	
Unit 8	Cell Division	4 lectures
	8.1 Cell cycle (G1, S, G2, M phases), 8.2 Mitosis, Meiosis,	
Unit 9	Cell ageing and Cell death.	1 lectures
Unit 10	Cytoskeleton	3 lectures
	10.1 Structure,Function and Comparison of Microtubules, Microfilaments, Intermediate filaments	
Unit 11	Experiential learning	1 lectures

References:

Fundamentals of Cell Biology:

1. Cytology and Genetics By Dyanasagar VR., Tata McGraw Hill Pub. Co.Ltd.,New Delhi
2. Cell and Molecular Biology By De Robertis, EDP. And De Robertis EME, Molt Saunders Inc.
3. Cell Biology By Powar,CB, Himalaya Publication House
4. Cell and Molecular Biology By Dupraw I, Academic Press, New York
5. Cell Biology By avers,CJ.,Addison Wesley Pub. Co. New York and London
6. Cell and Molecular Biology By Carp,G.,John Waley, USA
7. Cell Biology By David,E.,Sadava Johnes and Bartlett Publication,London
8. Cell Structure and Function By Lowey,AG. and Siekevitz,JR.,Menninger and Gallew,JAN.,Saunder College Publication,Philadelphia

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First Year of B.SC. (2019 Course)

Course Code: 19ScZooU203

Course Name: Zoology Practical - II

Course Code: **19ScZooU203**

Practicals based on 19ScZooU201:

- 1 Classification Hemichordata, Cephalochordata, Urochordata and Cyclostomata (One example from each Class)
- 2 Classification of pisces and amphibia (One example from each order)
- 3 Accessory respiratory organs Anabas, Clarias, Labeo and mounting of scales in fishes
- 4 Study of *Scoliodon* external morphology, digestive system, brain
- 5 Eye ball muscles and cranial nerves of scoliodon
- 6 Compulsory tour to study Forest Biodiversity or Aquatic Biodiversity [*Report submission*]

Practicals based on 19ScZooU202:

- 1 Study of prokaryotic and eukaryotic cell with the help of suitable Material
- 2 Study of cell organelles from electron micrographs
- 3 Study of temporary preparation of different mitotic stages from onion root tip cells
- 4 Study of mitochondria using Janus Green B
- 5 Study of osmosis in RBCs [Membrane Fragility]