

“Dissemination of Education for Knowledge, Science and Culture”
-Shikshanmaharshi Dr. Bapuji Salunkhe



Shri Swami Vivekanand Shikshan Sanstha's
VIVEKANAND COLLEGE, KOLHAPUR
(EMPOWERED AUTONOMOUS)

DEPARTMENT OF ZOOLOGY
Three/Four- Years UG Programme
Department/Subject Specific Core or Major (DSC)

NEP- Phase-II

Curriculum, Teaching and Evaluation Structure

(as per NEP-2020 Guidelines)

for

B.Sc.-I Zoology

Semester-I & II

(Implemented from academic year 2024-25 onwards)

Department of Zoology

B.Sc.: Program Outcomes (POs):

PO 1: Disciplinary Knowledge: Graduates will gain in-depth understanding in their specific major or discipline, mastering the foundational principles and theories, as well as advanced concepts. Execute theoretical and practical knowledge developed from the specific curriculum.

PO 2: Problem-Solving Skills: Graduates will learn to use their knowledge to identify, analyze and solve problems related to their field of study.

PO 3: Analytical Skills: Graduates will gain the ability to collect, analyze, interpret, and apply data in a variety of contexts. They might also learn to use specialized software or equipment.

PO 4: Research Skills and Scientific Temper: Graduates might learn how to design and conduct experiments or studies, analyze results and draw conclusions. They might also learn to review and understand academic literature.

PO 5: Environment and Sustainability: Possess a sympathetic awareness of the environment while conducting research and scientific studies and focus on sustainable social development.

B.Sc. in Zoology: Program Specific Outcomes (PSOs):

PSO1: Understand the nature and basic concepts of Animal Diversity, Taxonomy, Comparative Anatomy Developmental Biology, Physiology, Biochemistry, Genetics and Evolutionary Biology

PSO2: Perform procedures as per laboratory standards in the areas of Animal Diversity, Taxonomy, Comparative Anatomy, Developmental Biology, Physiology, Biochemistry, Genetics and Evolutionary Biology, Entomology, Sericulture, Biochemistry, Animal biotechnology, Immunology and Research Methodology

PSO3: Understand the applications of Applied Zoology in Apiculture, Aquaculture, Agriculture and Medical zoology

PSO4: Acquired knowledge about Research Methodologies and Skills of problem solving methods

PSO5: Students will Contributes the knowledge for Nation building and Society welfare.

Vivekanand College, Kolhapur (Empowered Autonomous)

Department of Zoology

NEP-Phase-II

Departmental Teaching and Evaluation scheme

(2024-25 onwards)

Three/Four- Years UG Programme

Department/Subject Specific Core or Major (DSC)

(as per NEP-2020 Guidelines)

First Year Semester-I & II

Sr. No.	Course Abbr.	Course code	Course Name	Teaching Scheme Hours/week		Examination Scheme and Marks				Course Credits
				TH	PR	SEE	CIE	PR	Marks	
Semester-I										
1	DSC-I	2DSC03ZOO11	Animal Diversity I	2	-	40	10	-	50	2
2	DSC-II	2DSC03ZOO12	Cell Biology	2	-	40	10	-	50	2
3	DSC ZOO-PR-I	2DSC03ZOO19	DSC Zoology Lab-1	-	4	-	-	25	25	2
4	OEC LFS-PR-I	2OEC03LFS12	Life Science-I Dairy Production & Technology	-	4	-	-	25	25	2
Semester –I Total				4	8	80	20	50	150	8
Semester-II										
1	DSC -III	2DSC03ZOO21	Animal Diversity II	2	-	40	10	-	50	2
2	DSC -IV	2DSC03ZOO22	Genetics	2	-	40	10	-	50	2
3	DSC ZOO-PR-II	2DSC03ZOO29	DSC-Zoology Lab-2	-	4	-	-	25	25	2
4	OEC LFS-PR-II	2OEC03LFS22	Life Science-II Basics of Hematology	-	4	-	-	25	25	2
Semester –II Total				4	8	80	20	50	150	8

Abbreviations: TH-Theory, PR-Practical, PRO- Project, SEE- Semester End Examination, CIE-Continuous Internal Examination

Note: Minimum passing for 10 marks Internal evaluation = 04 marks

Minimum passing for 40 marks Theory paper = 16 marks

Minimum passing for 25 marks Practical = 10 marks

Passing percentage for Democracy, Election and Good Governance (DEGG) and Environmental Studies papers should be 40%

Separate passing for each Head - SEE, CIE and Practicals

Semester -I

B. Sc. Part – I Semester -I ZOOLOGY
DSC-I: 2DSC03ZOO11: ANIMAL DIVERSITY I

Credits: 02

Theory: 30hrs.

Marks-50

Course Outcomes: After the completion of the course the student will be able to -

CO1: Recall the systematic, classification and biology of animals

CO2: Compare the morphological peculiarities of animals

CO3: Classify the animals among invertebrates

CO4: Apply the knowledge for identification of animals

CO5: Evaluate the importance of diversity of animals

UNIT-1

(15 Hrs)

Importance and scope of animal diversity

Kingdom Protista- General characters and classification up to classes; locomotion in Protozoa

Phylum Porifera- General characters and classification up to classes; Canal System in Sycon

Phylum Cnidaria- General characters and classification up to classes; Polymorphism in Obelia

Phylum Platyhelminthes: General characters and classification up to classes; Life history of *Taenia solium* and its parasitic adaptations

UNIT-2

(15 Hrs)

Phylum Nematelminthes- General characters and classification up to classes; Life history of *Ascaris lumbricoides* and its parasitic adaptations

Phylum Annelida- General characters and classification up to classes; Metamerism in Annelida

Phylum Arthropoda- General characters and classification up to classes; Metamorphosis in insects

Phylum Mollusca- General characters and classification up to classes, Sense organ in Mollusca

Phylum Echinodermata- General characters and classification up to classes; Water-vascular system in star fish

Reference books:

- Ruppert and Barnes, R.D.(2006). Invertebrate Zoology, VIII Edition. Holt Saunders International Edition.
- Barnes, R.S.K., Calow, P., Olive, P.J.W., Golding, D.W. and Spicer, J. I. (2002). The Invertebrates: A New Synthesis, III Edition, Blackwell Science
- Young, J. Z. (2004). The Life of Vertebrates. III Edition. Oxford university press.
- Pough H. Vertebrate life, VIII Edition, Pearson International.
- Hall B.K. and Hallgrimsson B. (2008). Strickberger's Evolution. IV Edition. Jones and Bartlett Publishers Inc.

B. Sc. Part – I Semester -I ZOOLOGY
DSC-II: 2DSC03ZOO12: CELL BIOLOGY

Credits: 02

Theory: 30hrs.

Marks-50

Course Outcomes: After the completion of the course the student will be able to -

CO1: Define various terms in cell biology

CO2: Explain ultra-structure and functions of cell organelles

CO3: Apply knowledge of cell biology in research

CO4: Distinguish between various cell components

CO5: Design and implement experimental procedure using relevant techniques in cell biology

UNIT-1

(15 Hrs)

Introduction-Cell as basic unit of life, Importance of Cell Biology, Structure and function of Prokaryotic (*E. coli*) and Eukaryotic cell (Animal Cell)

Plasma Membrane: Structure, chemical composition and functions of plasma membrane, Fluid mosaic model.

Ultrastructure and Functions: Mitochondria, Endoplasmic Reticulum, Golgi apparatus, Ribosomes.

Nucleus: Structure and function of Nucleus, Chromatin: Euchromatin and Heterochromatin

UNIT-2

(15 Hrs)

Structure of Nucleic acid: DNA, RNA and its types

Chromosome: Morphology, types of chromosome, Giant chromosome-polytene chromosome & Lampbrush chromosome

Cell cycle and division: Overview of cell cycle, Phases and significance of mitosis and meiosis

Cytoskeleton: Structure and organization of microtubules, microfilaments and intermediate filaments

Reference books:

- Bruce Albert. Molecular biology of the Cell. Pub. By Garland Pub. Inc. New York & London.
- Lodish Berk, Matsudaira, Kaiser, Krleger (2004). Molecular Cell biology –pub. By W. H. Freeman & Company, New York.
- Gerald carp (2005). Molecular cell biology –pu. By John Wiley & Sons.
- Avers C.J. (1986)/ latest edition) Molecular Cell Biology, Addison- Westey, Reading in Massachusettes.
- Stearns, T. & Winey, M. (1997). The Cell Center at 100 Cell 91:303-309.

B. Sc. Part – I Semester -I ZOOLOGY

DSC- PR-I : 2DSC03ZOO19: DSC ZOOLOGY LAB-1

Credits: 02

Practical: 60hrs.

Marks-25

(Practical: Four lectures of 60 minutes per week per batch)

ANIMAL DIVERSITY I ZOOLOGY LAB (At least 7 experiments)

1. Study of the following specimens with respect to classification and morphological peculiarities
Amoeba, Paramecium, Sycon, Euplectella, Obelia, Physalia, *Taenia solium*, Male and female *Ascaris lumbricoides*, Aphrodite, *Hirudinaria*, Limulus, *Periplaneta*, Pila, Octopus, Star fish, Antedon
2. Study of the following permanent slides:
 - a. T.S. or L.S. of Sycon
 - b. T.S. of male and female *Ascaris lumbricoides*
3. Study of mouth part in cockroach/honey bee/ any insect
4. Temporary preparation of spicules and sponging fibres.
5. Study of life history stages of *Taenia solium*
6. Study of life cycle of *Ascaris lumbricoides*
7. Preparation of Paramecium culture
8. Temporary preparation of pedicellaria
9. Temporary preparation of tube feet

CELL BIOLOGY LAB (At least 7 experiments)

1. Study of Microscope: Simple and Compound
2. Temporary preparation of mitotic cell from onion roots
3. Temporary preparation of nucleus from W.B.Cs.
4. Extraction of DNA from given sample
5. Stained squash preparation of salivary gland chromosomes
6. Study of Cell organelles (any three) by using microphotographs
7. Stained preparation of mitochondria from oral mucosa/ onion peels
8. Effect of tonicity of solutions on plasma membrane of RBCs
9. Field visit-Museum, National park, Sea shore

B. Sc. Part – I Semester -I ZOOLOGY
OEC LFS-PR-I: 2OEC03LFS12: DAIRY PRODUCTION AND TECHNOLOGY

Credits: 02

Practical: 60hrs.

Marks-25

(Practical: Four lectures of 60 minutes per week per batch)

Dairy Production and Technology Lab

1. Study of nutrients of milk
2. Total fat analysis of milk
3. Testing of milk for adulteration
4. Preservation of milk samples for chemical analysis
5. Sampling of milk and milk products for microbiological and chemical analysis
6. Determination of specific gravity of milk by lactometer
7. Determination of titratable acidity of milk
8. Study of transport and chilling and storage of milk at farm level
9. Preparation of dahi
10. Preparation of Lassi
11. Preparation of Butter milk
12. Preparation of Butter
13. Preparation of Ghee
14. Preparation of peda
15. Preparation of kheer
16. Preparation of paneer
17. Determination of moisture content, acidity, fat content of paneer
18. Visit to nearby dairy or milk product industries

Semester -II

B. Sc. Part – I Semester -II ZOOLOGY

DSC-III: 2DSC03ZOO21: ANIMAL DIVERSITY II

Credits: 02

Theory: 30hrs.

Marks-50

Course Outcomes: After the completion of the course the student will be able to –

- CO1: Recall diversity in kingdom animalia
- CO2: Understand classification among chordates
- CO3: Identify and classify the chordates
- CO4: Analyze the various adaptations in vertebrates.
- CO5: Evaluate the significance of animal biodiversity

UNIT-1

(15 Hrs)

Protochordata: General characters and Classification of Protochordata

Agnatha: General characters of Agnatha and Classification of cyclostomes up to classes

Pisces: General characters of Pisces, General characters of Chondrichthyes and Osteichthyes with examples; aquatic adaptations of fishes

Amphibia: General features and Classification up to orders; Parental care in Amphibia

UNIT-2

(15 Hrs)

Reptiles: General characters and Classification up to orders, Venomous and non-venomous snakes, Biting mechanism in snake, Types of venom and anti-venom

Aves: General characters and Classification up to orders, Flight Adaptations in birds

Mammals: General characters and classification up to subclasses; Important characters of following Eutherian orders with examples, Primates, Chiroptera and Rodentia

Reference Books:

- Adam Sedgwick (1990). A Students Text Book of Zoology, Low Price Publications, Delhi, Vol. I, II & Vol. III
- Alfred Sherwood Romer. Thomas S. Pearson 'The Vertebrate Body, Sixth edition, CBS college Publishing, Saunders College Publishing
- Colbert E.H. (2011). Evolution of the Vertebrates, Wiley Student Edition,
- Dhami and Dhami (2014). Chordate Zoology, R. Chand & Co.
- Ekambaranatha Ayyar (1982). A Manual of Zoology Vol. II, S. Vishwanathan Pvt. Ltd.
- Jordan E. L. and Verma P. S. (2013). 'Chordate Zoology' -. S. Chand Publications. Kotpal R.L. (2016). Modern Text Book of Zoology – Vertebrates, Rastogi Publications

B. Sc. Part – I Semester -II ZOOLOGY

DSC-IV: 2DSC03ZOO22: GENETICS

Credits: 02

Theory: 30hrs.

Marks-50

Course Outcomes: After the completion of the course the student will be able to –

CO1: Describe the basic concept of genetics

CO2: Understanding the laws and concepts of Mendelian inheritance and its extension

CO3: Apply knowledge to solve the genetic examples

CO4: Distinguish between different genetic disorders

CO5: Explain basic human genetics and mechanism of inheritance

UNIT-1

(15 Hrs)

Introduction to Genetics: Definition, scope and importance of genetics, Classical and modern concept of gene (Cistron, Muton, Recon),

Brief explanation of following terms: Alleles, Wild type, Mutant allele, Locus, Dominant and recessive trait, Homozygous and heterozygous, Genotype and phenotype, Genome

Mendelian Genetics: Mendel's law of inheritance (Law of Dominance, Segregation and Independent assortment) Monohybrid cross, Dihybrid Cross, Test cross, Back cross.

Extension of Mendelian Genetics: Chromosomal theory of inheritance, Incomplete dominance and co-dominance, Multiple alleles with respect to ABO, RH blood group, Polygenic inheritance with reference to skin colour and eye colour in man, Lethal Alleles, Concept of Pleiotropy.

UNIT-2

(15 Hrs)

Mutations: Mutagenic agents (Physical and Chemical), Chromosomal Mutations: Deletion, Duplication, Inversion, Translocation, Aneuploidy and Polyploidy, Induced gene mutation

Basics of Human genetics: Autosomes and Sex chromosomes (Structure), Normal human Karyotype

Sex Determination: Sex determination in man, haploidy-diploidy mechanism in Honey bee, environmental sex determination (Bonelia)

Genetic Disorders: Causes and symptoms of genetic disorders, Sickle cell Anaemia, Phenylketonuria, Albinism, Down syndrome, Turner's Syndrome, Edward Syndrome, Klinefelter syndrome

Reference books:

- Gardner, E.J., Simmons, M.J., Snustad, D.P. (2008). Principles of Genetics. VIII Ed..Wiley India.
- Snustad, D.P., Simmons, M.J. (2009). Principles of Genetics. V Ed. John Wiley & Sons Inc.
- Klug, W.S., Cummings, M.R., Spencer, C.A. (2012). Concepts of Genetics. Edition. Benjamin Cummings.
- Russell, P. J. (2009). Genetics- A Molecular Approach. III Edition. Benjamin Cummings.
- Griffiths, A.J.F., Wessler, S.R., Lewontin, R.C. and Carroll, S.B. Introduction to Genetic Analysis. IX Edition. W. H. Freeman

B. Sc. Part – I Semester -II ZOOLOGY

DSC- PR-II : 2DSC03ZOO29: DSC ZOOLOGY LAB-2

Credits: 02

Practical: 60hrs.

Marks-25

(Practical: Four lectures of 60 minutes per week per batch)

ANIMAL DIVERSITY II LAB (At least 7 experiments)

1. Study of the following specimens with reference to morphological peculiarities and Classification up to orders:
Protochordata: Amphioxus
Cyclostomata: Petromyzon, Myxine
2. Study of the Pisces with reference to morphological peculiarities and Classification up to orders: Torpedo, Exocoetus, Labeo
3. Study of the Ambhibia with reference to morphological peculiarities and Classification up to orders: Ichthyophis, Bufo
4. Study of the Reptiles with reference to morphological peculiarities and Classification up to orders: Draco, Chamaeleon
5. Study of the Aves with reference to morphological peculiarities and Classification up to orders: Passer, Columba
6. Study of the Mammals with reference to morphological peculiarities and Classification up to orders: Funambulus, Loris
7. Characters identifying venomous and non-venomous snakes
8. Study of any six common birds from different orders with the help of photographs and keys.
9. Mounting of placoid/cycloid scale

GENETICS LAB (At least 7 experiments)

1. Demonstration of Barr bodies
2. Study of Mendelian Inheritance using suitable examples.
3. Study of gene interactions (Non-Mendelian Inheritance)
4. Study of Human Karyotypes (normal and abnormal)
5. Study of polytene chromosome
6. Study of Sex determination in *Drosophila*
7. Examples based on pedigree analysis
8. Study of genetic disorders (with images/photographs) Turner's syndrome, Patau's syndrome, Down syndrome
9. Field visit-Museum, National park, Sea shore

B. Sc. Part – I Semester -II ZOOLOGY

OEC LFS-PR-II: 2OEC03LFS22: BASICS OF HEMATOLOGY

Credits: 02

Practical: 60hrs.

Marks-25

(Practical: Four lectures of 60 minutes per week per batch)

Basics of Hematology Lab

1. Study of composition of blood
2. Separation of plasma/serum/ blood cells from given blood sample
3. Preparation of blood smear to study different types of blood cells
4. Total WBCs count from given blood sample
5. Total RBCs count from given blood sample
6. Detection of bleeding time of own blood
7. Detection of clotting time of own blood
8. Detection of blood groups (ABO Blood group system)
9. Estimation of haemoglobin by Sahli's haemometer
10. Study of Erythrocyte Sedimentary Rate (E.S.R)
11. Preparation of hemin crystals
12. Effect of tonicity of solutions on plasma membrane of RBCs
13. Submission of survey report- Blood group/Hb/Bleeding/Clotting time
14. Visit to the blood bank and submission of report

Question Paper Format:

Seat No.	
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Ques. paper code	
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**VIVEKANAND COLLEGE, KOLHAPUR
(EMPOWERED AUTONOMOUS)**

B.Sc. Part- I (Zoology) (Semester-I) Examination.....

Course Code and Name: 2DSC03ZOO11: Animal Diversity I

Day:

Time: 2 hours

Date: --/--/----

Marks : 40

Instructions:

- 1) All the questions are compulsory.
- 2) Figures to the right indicate full marks.
- 3) Draw neat labeled diagrams wherever necessary.
- 4) Use of log table/calculator is allowed.

Q. 1. Select correct alternative (One mark each):

[8]

- i) Xyzabcdefghijklmnop -----
a) ----- b) ----- c) ----- d) -----
- ii) Xyzabcdefghijklmnop -----
a) ----- b) ----- c) ----- d) -----
- iii) Xyzabcdefghijklmnop -----
a) ----- b) ----- c) ----- d) -----
- iv) Xyzabcdefghijklmnop -----
a) ----- b) ----- c) ----- d) -----
- v) Xyzabcdefghijklmnop -----
a) ----- b) ----- c) ----- d) -----
- vi) Xyzabcdefghijklmnop -----
a) ----- b) ----- c) ----- d) -----
- vii) Xyzabcdefghijklmnop -----
a) ----- b) ----- c) ----- d) -----
- viii) Xyzabcdefghijklmnop -----
a) ----- b) ----- c) ----- d) -----

Q.2. Attempt any TWO (Eight marks each):

[16]

- i) Xyzabcdefghijklmnop.
- ii) Xyzabcdefghijklmnop.
- iii) Xyzabcdefghijklmnop.

Q.3. Attempt any FOUR (Four marks each):

[16]

- i) Xyzabcdefghijklmnop.
- ii) Xyzabcdefghijklmnop.
- iii) Xyzabcdefghijklmnop.
- iv) Xyzabcdefghijklmnop.
- v) Xyzabcdefghijklmnop.
- vi) Xyzabcdefghijklmnop.

Evaluation Pattern for practical Course:

Course	Experimental work	Journal assessment	Seminar/ Mini Project	Total Marks
Major	20	05	-	25
OE	20	05	-	25

Equivalence of Courses:

B.Sc. Part I (Semester I and II)

Sem.	Old Course			Course in NEP Phase-II		
	Course code	Course Name	Credits	Course code	Course Name	Credits
I	DSC - 1008A1	Animal Diversity I	2	2DSC03ZOO11	Animal Diversity I	2
	DSC - 1008A2	Animal Diversity II	2	2DSC03ZOO12	Cell Biology	2
II	DSC-1008B1	Comparative Anatomy and Developmental Biology of Vertebrates I	2	2DSC03ZOO21	Animal Diversity II	2
	DSC-1008B2	Comparative Anatomy and Developmental Biology of Vertebrates II	2	2DSC03ZOO22	Genetics	2
	DSC-1008A & DSC-1008B	Zoology Lab(I)	4	2DSC03ZOO19	DSC Zoology Lab-1	2
				2DSC03ZOO29	DSC Zoology Lab-2	2