ST. XAVIER’S COLLEGE (AUTONOMOUS), AHMEDABAD

CHOICE BASED CREDIT SYSTEM

B. Sc. ZOOLOGY SYLLABUS
(SEMESTER - III)

B.Sc. ZOOLOGY

PROGRAMME SPECIFIC OUTCOMES

PSO1	Build a reliable foundation of all allied subjects of Zoology, besides classical Zoology itself.
PSO2	Link Zoology to various fields in real life, viz., Parasitology, Entomology, Fisheries, Poultry Science, etc.
PSO3	Student will be able to recognize and appreciate the plethora of fields into which he/she can progress onto, after graduation, viz., Biochemistry, Biotechnology, Bioinformatics, Toxicology, Food & Nutrition, Agriculture, Ethology, Parasitology, Environmental Science, Wildlife, Fisheries, Entomology, etc.
PSO4	With the fundamental knowledge of applied Zoology subjects like Poultry Science, Sericulture, Apiculture, Fishery Science, Wildlife, etc., a zoology student can develop a STARTUP of their own.
PSO5	Create employability, skill development and entrepreneurship.

B. Sc. ZOOLOGY SEMESTER- 3 SYLLABUS
(course effective from June - 2024)

1 credit in Theory equals to 1 hour of teaching per week in a semester.
1 credit in practical equals to 2 hours of teaching per week in a semester.

Course	Duration	External Marks	Internal Marks	Total Marks
Theory-Paper ZO- 3501 (Core_1) **[Animal diversity (Nonchordates) and Genetics]** **(Theory ; 4 credits)**	4 hours	50	50	100
Theory-Paper ZO- 3502 (Core_2) **[Animal diversity (Chordates) and Human Histology]** **(Theory ; 4 credits)**	4 hours	50	50	100
Practical-Paper ZO- 3503L (A) & (B) (Core_3) **(Basics of Zoology Practicals - III)** **[Based on Theory Papers ZO- 3501 & ZO- 3502]** **(Practicals ; 4 credits)**	8 hours	50	50	100
Theory-Paper ZO- 207 1C **Multidisciplinary Course (MDC)** **[Animal Diversity and its Conservation]** **(Theory ; 4 credits)**	4 hours	50	50	100
Theory-Paper ZO- 3650 **Skill Enhancement Course (SEC)** **[Poultry Science]** **(Theory ; 2 credits)**	2 hours	25	25	50

INSTRUCTIONS

1. The theory question paper comprises of FIVE / THREE questions.
2. In order to be qualified to appear in the Practical Examinations, the student must submit his / her duly certified journal during the examinations.
3. Minimum 75% attendance is required for every student to be qualified to appear in any examination.

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B.Sc. Semester-3 ZOOLOGY SYLLABUS

Choice based credit system (CBCS)

(course effective from June - 2024)

Discipline Specific Course [Core-1] : *(Theory)*

[**Animal diversity (Nonchordates) and Genetics**]

CREDIT DISTRIBUTION AND ELIGIBILITY OF THE COURSE

Number of Credits	Course Title and Code	Credit Distribution of Course			Learning hours in semester
		Lecture	Tutorial	Practical	
4	[Animal diversity (Nonchordates) and Genetics] (ZO-3501)	4 per Week	0	0	60

Course outcomes:

CO1 understand ancient as well as modern trends of Invertebrate classification by which they could distinguish and compare different characters across various Invertebrates taxa.

CO2 understand characteristics of invertebrate animals as well as their affinities with one another.

CO3 imbibe anatomy of earthworm and will have general idea of annelids

CO4 gain knowledge of extra nuclear inheritance

CO5 able to analyse human pedigree charts

PAPER – ZO-3501 (Theory)

Unit I ANIMAL *DIVERSITY* (Nonchordates):

A. Brief history and significance of classification

B. Five kingdom classification by R. H. Whittaker (1969)

C. Three-domain system by Carl Woese (1990)

D. Outline classification of Invertebrates

E. Salient features and Classification of Invertebrates, starting from Kingdom up to Classes, giving reasons & suitable examples (***as per practical syllabus***):

Phylum**:**

1) Protozoa
2) Porifera
3) Coelenterata
4) Platyhelminthes
5) Nematoda

Unit II *ANIMAL DIVERSITY* (Nonchordates):

Salient features and Classification of Invertebrates, starting from Kingdom up to Classes, giving reasons & suitable examples (***as per practical syllabus***):

Phylum**:**

1. Annelida
2. Arthropoda
3. Mollusca
4. Echinodermata
5. Hemichordata

(Classification of Nonchordate phyla, as per adapted in the book – TEXTBOOK OF INVERTEBRATES by R. L.Kotpal, Rastogi Publication, Meerut).

Unit III ANIMAL ***DIVERSITY*** **(Nonchordates) –** ***Type Study & General Topics*****:**

A. General structure & morphology with functional anatomy of the following animal:
   Annelida: Type – **Earthworm** (*Pheritima posthuma*) - Classification, Habits & Habitat, Ext. characters, Body wall, Digestive system, Circulatory system, Excretory system, Nervous system, and Reproductive systems & reproduction

B. General topics:
   1. Coelenterata: Kinds of coral reefs (Fringing, Barrier, Atoll)
   2. Types of Symmetry.
   3. Types and significance of Coelom.
   4. Types and significance of Metamerism.

Reference Books for Units I, II & III*:*

1. Textbook of Invertebrates, R. L. Kotpal, Rastogi Publishers, Meerut.
2. A Manual of Zoology, E. K. Ayyer, Vol. I & II.
3. Invertebrate Zoology, Jordan and Verma, S. Chand & Company Ltd., Delhi.
4. Invertebrate: Structure and Function, E. J. W. Barrington.

Unit IV ***GENETICS***:

(A) Genetics**:**
   1. Cytoplasmic inheritance in *Paramoecium* & *Limnea*.
   2. Chromosomal aberrations:
      a) Numerical/Ploidy (Down's Syndrome, Turner's Syndrome and Klinefelter's Syndrome)
      b) Structural (Deletion, Duplication, Inversion and Translocation)
   3. Human Genome Project
   4. Human pedigree analysis

Reference Books for Unit IV*:*

1. Textbook of Genetics, Veerbala Rastogi, Kedar Nath Ram Nath, Meerut.
2. Genetics, P.S.Verma & V.K.Agarwal, S. Chand & Company Ltd., Delhi.

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B.Sc. Semester-3 ZOOLOGY SYLLABUS

Choice based credit system (CBCS)

(course effective from June - 2024)

Discipline Specific Course [Core-2] *(Theory)*

[**Animal diversity (Chordates) and Human Histology**]

CREDIT DISTRIBUTION AND ELIGIBILITY OF THE COURSE

Number of Credits	Course Title and Code	Credit Distribution of Course			Learning hours in semester
		Lecture	Tutorial	Practical	
4	Animal diversity (Chordates) and Human Histology (ZO-3502)	4 per week	0	0	60

Course outcomes:

CO1 describe general taxonomic rules on animal classification.
CO2 classify phylum Protochordates to Mammalia
CO3 understand the distribution of fauna
CO4 differentiate between nonchordates and chordates
CO5 distinguish between venomous and nonvenomous snakes
CO6 understand anatomy of cartilagenous fishes (Shark)
CO7 study structure of human lung, bone and cartilage

PAPER ZO-3502 (Theory)

(ANIMAL DIVERSITY (Chordates), and HUMAN HISTOLOGY)

Unit I ***ANIMAL DIVERSITY*** **(Chordates) –** ***Systematics*****:**

A. Flow charts of classification of Chordates
B. Salient features & Classification, starting from Kingdom upto Orders, with reasons & suitable examples (***as per practical syllabus***) of Acrania, Cyclostomata, Pisces, Amphibia.

Unit II ***ANIMAL DIVERSITY*** **(Chordates) –** ***Systematics*****:**

Salient features & Classification, starting from Kingdom upto Orders, with reasons & suitable examples (***as per practical syllabus***) of Reptilia, Aves and Mammalia. (Classification as per adapted in the book – TEXTBOOK OF VERTEBRATES by R. L. Kotpal, Rastogi Publication, Meerut).

Unit III ***ANIMAL DIVERSITY*** **(Chordates) –** ***Type Study*** **&** ***General Topics:***

A. General structure & morphology with functional anatomy of the following animal: *Chondrichthyes*: Type – **Shark – (***Scoliodon sorrakowah***):** Ext. characters, Digestive system, Heart, Arterial system, Urinogenital systems, Brain and Placoid scales.

B. General topics:
   1. Comparison of chordates with non-chordates.
   2. Identification of venomous and non-venomous snakes of India.
      (*only external characters*):
      Venomous : Russel's viper, Krait, Cobra, King cobra, Marine snake.
      Non-venomous: Boa, Pythons, Rat snake.
   3. Beaks in Birds
   4. Feet in Birds

Reference Books for Units I, II & III*:*

1. Textbook of Vertebrates, R. L. Kotpal, Rastogi Publication, Meerut.
2. Chordate Zoology, P. S. Dhami, and J. K. Dhami, S. Chand & Co., Delhi.
3. Introduction to Chordates, T. C. Majupuria, Pradeep Publication, Jalandhar.

Unit IV ***HUMAN HISTOLOGY:***

1. Study of types of animal tissues
2. Histology of the following organs:

(A) Lung:
   1. Location and external characters
   2. T.S. of lung/Lung histology:
      a) Bronchial intercom
      b) Bronchi
      c) Bronchiole
      d) Respiratory bronchiole
      e) Alveolar duct
      f) Alveoli
   3. Kinds of cells
      Pneumocytes, Clara cells and Dust cells

(B) Bone:
   1. General organization from external to internal surface.
   2. Types of bones:
      Compact bone and Cancellous bone
   3. T.S. of compact bone/Histo-architecture of compact bone:
      a) Periosteum
      b) Bone cells (in brief)
      c) Haversian system
      d) Kinds of lamellae
      e) Endosteum
      f) Bone marrow
   4. Bone matrix/Chemical composition of bone
   5. Bone cells:
      a) Osteoblasts, Osteocytes, Osteoclasts and Osteoprogenitor cells

(C) Cartilage:

1. Introduction to general functions
2. Location of Hyaline cartilage, Elastic cartilage and Fibrocartilage
3. Cartilage matrix (Molecular organization)
   a) T.S. of Hyaline cartilage
   b) T.S. of Elastic cartilage
   c) T.S. of Fibrocartilage

Reference Books for Unit IV:

1. Principles of Anatomy and Physiology,
2. G. J. Tortora & S. R. Grabowski, HarperCollins College Publications.
3. diFiore's Atlas of Histology with Functional Correlation,
   Victor P.Eroschenko 10th Ed., Lipikott Williams & Wilkins Pub.
4. Basic Histology, Luiz Carlos junqueria, Jose Carenerio, Robert O. Kelley,
   9th Edi. Lang Med Book/McGraw-Hill Pub.
5. Basic Medical Histology; The Biology of Cells, Tissues and Organs,
   Richard Kessel: Oxford Univ. Press

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Discipline Specific Course [Core-3] : Basics of Zoology Practicals – III

CREDIT DISTRIBUTION AND ELIGIBILITY OF THE COURSE

Number of Credits	Course Title and Code	Credit Distribution of Course			Learning hours in semester
		Lecture	Tutorial	Practical	
4	Basics of Zoology Practicals - III [ZO-3503L (A) & B)]	0	0	8 Hours per week	120

PAPER ZO-3503L (A) (Practicals)
(***Based on Theory Paper ZO-3501*** **)**

1. ***ANIMAL DIVERSITY*** **(Nonchordates) –** ***Systematics:***
Identification & classification (*Kingdom to Class*) *giving reasons:*

1. Protozoa: *Amoeba*, *Euglena*, *Polystomella*, *Plasmodium*, *Paramoecium*.
2. Porifera: *Leucosolenia*, *Hyalonema*, *Euspongia*.
3. Coelenterata: *Hydra*,, *Physalia*, *Aurelia*, Coral, Sea anemone.
4. Platyhelminthes: *Planaria*, *Fasciola*, *Tapeworm*.
5. Nematoda: *Enterobius*, *Ascaris*, *Mermis*.
6. Annelida: *Nereis*, *Aphrodite*, *Amphitrite*, *Tubifex*, Leech.

7. Arthropoda: Apus, Balanus, Prawn, Crab, Centipede, Butterfly, Scorpion.
8. Mollusca: *Chiton, Dentalium, Pila, Unio, Octopus*.
9. Echinodermata: Sea star, Brittle star, Sea urchin, Sea cucumber, Feather star.
10. Hemichordata: *Balanoglossus, Saccoglossus, Rhabdopleura, Cephalodiscus*.

2. *ANIMAL DIVERSITY* (Nonchordates):

Study of Earthworm by charts/specimens:

1. Study of external characters.
2. Study of Digestive system, Circulatory system, Reproductive systems and Nervous system.
3. Study of Setae, Septal nephridia, Blood glands, Ovaries and Spermatheca.

Permanent slides of Earthworm:

T.S. passing through pharynx, T.S. passing through gizzard, T.S. passing through typhlosole, L.S. of earthworm

3. *ANIMAL DIVERSITY* (Nonchordates):

Study by charts/models/slides:

1. Coelenterata: Kinds of coral reefs (Fringing, Barrier, Atoll)
2. Types of symmetry (Radial, Biradial, Bilateral, Asymmetrical)
3. Coelom formation

4. *GENETICS*

Study of genetics through charts:

1. Cytoplasmic inheritance in *Paramoecium* and *Limnea*.
2. Chromosomal aberration:
   - Numerical (Down's Syndrome, Turner's Syndrome, Klinefelter's Syndrome)
   - Structural (Deletion, Duplication, Inversion, Translocation)
3. Pedigree analysis charts

PAPER ZO-3503L (B) (Practicals)

(*Based on Theory Paper ZO-3502*)

1. *ANIMAL DIVERSITY* (Chordates) – *Systematics*:

Classification of chordates, Kingdom to Orders, as per reasons taught in theory (alongwith scientific names) :

1. **Urochordata** : *Herdmania*, *Doliolum*
2. **Cephalochordata** : *Amphioxus* (Lancet)
3. **Cyclostomata :** *Petromyzon* (Lamprey), *Myxine* (Hagfish)
4. **Pisces-Chondrichthyes** : *Scoliodon* Dog fish), *Trygon* (Sting ray), *Hydrogalus* (Rat fish).
5. **Pisces-Osteichthyes** : *Muraena* (Moray eel), *Exocoetus* (Flying fish), *Hippocampus* (Sea horse), *Pleuronectus* (Flat fish), *Echeneis* (Sucker fish)
6. **Tetrapoda-Amphibia** : *Ichthyophis*, *Hyla* (Tree frog), Salamander
7. **Tetrapoda-Reptilia** : *Chelone* (Green turtle), *Geochelone* (Indian star tortoise), *Chamaeleo* (Chamaeleon), *Ptyas* (Rat snake), *Crocodylus* (Crocodile)
8. **Tetrapoda-Aves** : *Struthio* (Ostrich), *Aptenodytes* (Penguin), *Dendrocopos* (Woodpecker), *Psittacula* (Parakeet), *Pavo* (Peacock), *Anser* (Bar headed goose), *Pelecanus* (Pelican), *Phonicopterus* (Flamingo), *Milvus* (Common kite), *Bubo* (Horned owl).

9. Tetrapoda-Mammalia : *Ornithorhyncus* (Platypus), *Macropus* (Kangaroo), *Erinaceus* (Hedgehog), *Pteropus* (Flying fox), *Manis* (Pangolin/Scaly anteater), *Funambulus* (Squirrel), *Delphinus* (Dolphin), *Elephus* (Asiatic elephant), *Boselaphus* (Nilgai)

2. ***ANIMAL DIVERSITY*** **(Chordates)** ***:***

Study of Shark by charts/specimens:

1. Study of external characters.
2. Study of Digestive system, Arterial system, Urinogenital systems and Brain.
3. Temporary mountings of:

   Placoid scales, Striated muscle fibres, Medullated nerve fibres.

3. ***IDENTIFICATION OF SNAKES:***

Study by snakes by specimens/charts **(*only external characters*):**

1. Venomous : Russel's viper, Krait, Cobra, King cobra, Marine snake.
2. Non-venomous: Boa, Python, Rat snake.

4. ANATOMY OF BIRDS

Types of beaks, Types of feet

5. ***HUMAN HISTOLOGY***:

Study of types of animal tissues

Identification & histological study of the following organs by permanent slides of:

T.S. of Lung, Bone and Cartilage (Hyaline, Elastic, Fibrous)