

BSC ZOOLOGY I SEMESTER

CODE	DESCRIPTION	PD/W	EXAM	CIA	ESE	TOTAL
BSZO 111	TAXONOMY OF LOWER NON CHORDATE	3	3hrs	20	80	100
BSZO112	CYTOLOGY AND GENETICS I	3	3hrs	20	80	100
BSZO121	ZOOLOGY LAB I	6	3hrs	20	80	100
TOTAL				60	240	300

BSZO 111 TAXONOMY OF LOWER NON CHORDATE

UNIT- I

- Taxonomy
 - General principle
 - Need of classification
 - Basis of classification
 - System of classification
 - Binomial and trinomial nomenclature
 - Significance of classification
- Five kingdom concept
- Concept of Protozoa & Metazoa
- Basis of classification- Level of body organization, Coelom, Symmetry, Segmentation
- Embryogeny
 - Diploblastic & Triploblastic
 - Protostomia & Deuterostomia

UNIT-II

- General characters and classification upto orders with suitable examples and economic importance of each Phyla
 - Protozoa
 - Porifera
 - Coelenterata
 - Ctenophora
 - Platyhelminthes
 - Aschelminthes
 - Annelida
 - Arthropoda
 - Mollusca
 - Echinodermata

UNIT III

Paramecium

- Locomotion- Cilliary beat, Mode of swimming
- Nutrition- Food and feeding, Digestion, Egestion
- Reproduction- Transverse Binary Fission, Conjugation, Autogamy, Cytogamy, Endomixis, Cytoplasmic particles

Sycon

- Cellular Organization- Different types of cells
- Canal System -
 - **Types** of canal System in **sponges**
 - Significance
- Reproduction-
 - Asexual
 - Sexual
 - Spermatogenesis
 - Oogenesis
 - Fertilization
- Development -
 - Early Embryonic Period -Cleavage, Stomoblastula
 - Larval Period- Amphiblastula, Gastrula
 - Metamorphosis

UNIT IV

Obelia

- Sense Organs - Statocyst
- Reproductive System & Life Cycle

- Sexual Reproduction
- Fertilization
- Development - Cleavage
- Planula larva
- Alternation of Generation
- Polymorphism - Definition & Origin
 - Two Basic Forms-
 - Polyp
 - Medusa
 - Pattern-
 - Dimorphic
 - Trimorphic
 - Polymorphic
 - Significance
- Coral- Structure of Coral Polyp
- Coral Reef-
 - Kinds-
 - a) Fringing
 - b) Barrier
 - c) Atoll
 - Economic Importance

UNIT V

Taenia

- Reproductive System -Male Reproductive System, Female Reproductive System
- Development & Life Cycle-
 - Copulation & Fertilization
 - Capsule Formation
 - Formation of Onchosphere
 - Hexacanth
 - Cysticercus
 - Infection of Primary Host Man

Hirudinaria

- Digestive System-Alimentary Canal , Food and feeding, Digestion
- Haemocoelomic System-Haemocoelomic Channels, Course of Haemocoelomic Fluid Circulation
- Reproductive System-Male Reproductive System, Female Reproductive System
- Life History & Development
 - Copulation
 - Fertilization
 - Cocoon Formation and development

BSZO112 - CYTOLOGY AND GENETICS I

UNIT-I

- Cell and cell Theory
- Prokaryotic & eukaryotic cells
- Bacteria
 - i. Structure
 - ii. Types on the basis of shape and flagella
 - iii. Gram positive and Gram negative bacteria
 - iv. Reproduction in Bacteria
 - Asexual (Binary Fission, Budding, Conidia, Endospore, Antrospore)
 - Sexual reproduction (Transformation, Transduction, conjugation),
- General Structure and characteristics of Virus (TMV, Phage)
- Elementary study of Microscopy
 - i. Resolution and resolving power
 - ii. Principle and application of the light microscope
 - iii. Phase contrast microscope and interference microscope
 - iv. Fluorescence microscope
 - v. Electron microscope (Scanning electron microscope and transmission electron microscope)

UNIT-II

- Cell membrane
 - i. Characteristic of cell membrane
 - ii. Fluid mosaic model
 - iii. Concept of unit membrane
 - iv. Membrane molecules (lipids, carbohydrates and proteins)
- Transport across cell membrane
 - i. Passive

- ii. Facilitated
- iii. Active transport (Na⁺ and K⁺ pump)
- iv. Symport and Antiport transporter
- v. Pinocytosis
- vi. Phagocytosis
- vii. Exocytosis
- viii. Endocytosis
 - o Carrier mediated Endocytosis

UNIT-III

Cell Organelles- Structure, Composition and Functions of

- i. Endoplasmic reticulum (RER and SER)
- ii. Golgi complex
- iii. Lysosomes
- iv. Ribosomes
- v. Centrioles
- vi. Mitochondria

UNIT-IV

- Cell cycle
- Mitosis-
 - o Phase and steps in division
 - o Spindle fibers and their functions
- Meiosis-
 - o Phases and steps
 - o Synaptic membrane complex
 - o Chiasmata and crossing over

UNIT-V

- Brief History of Genetics
- Mendelism-Selection of pea plant, Mendelian laws and their significance
- Recombination
- Linkage
- ABO blood group and its genotype

BSZO121: ZOOLOGY LAB I

- A. Dissections - Earthworm – Nervous System, Nerve Ring, Spermatheca & Nephridia and **ovary**
- B. Microscopic Preparation - Sponge Spicules, Gemmules, *Obelia* Colony, *Neries* Parapodium
- C. Identification And Systematic Position upto order of Following Museum Specimens-
 Protozoa- *Paramecium*, *Trypanosoma*, *Noctiluca*, *Opalina*, *Balantidium*, *Nyctotherus*, *Entamoeba*.
 Porifera- *Sycon*, *Hyalonema*, *Euplectella*, *Euspongia*, *Spongila*
 Coelentrata- *Physalia*, *Porpita*, *Rhizostoma*, *Alcyonium*, *Corallium*, *Gorgonia*, *Pennatula*, ***Aurelia***, ***Madrepora***,
Metridium.
 Platyhelminthes- *Fasciola*, *Taenia*, *Dugesia*, *Schistosoma*
 Aschelminthes- *Ascaris*, *Trichinella*, *Dracunculus*, *Wuchereria*
- D. Study Of Prepared Slides- T.S *Sycon*, L.S *Sycon*, *Ephyra* Larva, Mature & Gravid Proglottid of *Taenia*, Hexacanth , cysticercus larva (bladder worm) T.S of *Taenia* .
- E. Experimental Zoology –
 1. **Test for Carbohydrate, Protein and Lipid**
 2. **Determination of quality of milk – MBRT test and phosphatase test**
 3. **Detection of presence of urea and starch in milk**
 4. **Detection of adulteration in ghee and oil**

Distribution of Marks	Marks Allotted	Time duration 3hrs
1. Dissection		18
2. Microscopic Preparation		12
3. Spots (6 x 4)		24
4. Experimental Zoology		16
5. Year Work/ Practical Record (CIA*)		10
6. Practical Class Test (2 x 5 Marks each) (CIA)		10
7. Viva Voice		10
Total		100

Suggested Readings

1. Principles Of Animal Taxonomy – G.G Simpson- Oxford and IBH Publication.
2. The Invertebrates – McNeill Alexander – Cambridge University Press
3. The Invertebrate Structure And Function – E.J.W Barrington- Thomas Nelson and Sons

4. Text Book Of Zoology By T. J Parker And W.A Haswell- Vol I – Mcmillan and Co, London
5. Invertebrates- Protozoa To Echinodermata Ashok Sharma – Narosa Publishing House
6. The Invertebrates- Vol I- VI –L.H Hyman – Mcgraw Hill Co.
7. A Text Book of Zoology – Invertebrates –Vishwanath – S Chand and Co, New Delhi
8. Invertebrate Zoology- E.L Jordan , P.S.Verma – S.Chand and Co, New Delhi
9. A textbook of Modern Zoology: Invertebrates- R.L. Kotpal – Rastogi Publication
10. Theory and Practices of Animal Taxonomy- VC Kapoor – Oxford and IBH Publication.
11. Genetics – P.K Gupta, Rastogi Publication
12. Molecular Cell Biology – Lodish, K. *Et. Al.* - Freeman Publication
- 13.** Cytology Genetics And Evolution - P.K.Gupta –Rastogi Publication
14. A Text Book Of Practical Zoology – Invertebrates – By S.S.Lal – Rastogi Publication, Merrut
15. A Manual Of Practical Zoology – P.S. Verma, Tyagi, Agarwal- S Chand Publication

BSC ZOOLOGY II SEMESTER

CODE	DESCRIPTION	PD/W	EXAM	CIA	ESE	TOTAL
BSZO 211	EVOLUTION AND BIOLOGY OF HIGHER NON CHORDATE	3	3hrs	20	80	100
BSZO212	MOLECULAR BIOLOGY AND GENETICS II	3	3hrs	20	80	100
BSZO221	ZOOLOGY LAB II	6	3hrs	20	80	100
TOTAL				60	240	300

BSZO 211 EVOLUTION AND BIOLOGY OF HIGHER NON CHORDATE

Unit I

- Origin of Life
- Natural Selection
- Genetic Basis of Evolution- Hardy-Weinberg Law
- Evidences of Organic Evolution

Unit II

- Variation
- Isolation
- Adaptation
- Geological Time Scale and Distribution of Animals in Different Era

Unit III

- Origin and Evolution of *Horse*
- Extinct Animals-
 - a) Dinosaurs
 - b) *Archaeopteryx*

Unit IV

- *Palaemon*
 - a) Appendages
 - b) Digestive System
 - c) Respiratory System
 - d) Blood Vascular System
 - e) Sense Organs
 - f) Reproductive System & Reproduction
 - g) Economic importance

Unit V

- *Pila*-
 - a) Digestive System
 - b) Respiratory System
 - c) Blood Vascular System
 - d) Reproductive System and Reproduction
- *Asterias*-
 - a) Water Vascular System
 - b) Reproductive System
 - c) Life History and Developmental Stages

BSZO212 MOLECULAR BIOLOGY AND GENETICS II

Unit I: Nuclear Organization:

- a) Structure and function of Nuclear Envelope,
- b) Nuclear matrix and Nucleolus
- c) Chromosome Morphology
 - Chromonema
 - Chromomeres
 - Telomere
 - Chromatids
 - Primary and Secondary constriction
- d) Chromosomes Types-
 - Polytene chromosomes
 - Lampbrush chromosomes

Unit II: DNA

- Structure
- DNA Replication
 - Semi conservative mechanism of replication
 - Enzymes involves in Replication-
 - Topoisomerase, Polymerase, Single Stabilizing Binding Protein (SSBP), RNA primase.
 - Okazaki fragments

- Replication Forks-Leading and Lagging Strands

Unit III: RNA-

- Structure
- Types
- Transcription of RNA in prokaryotes and eukaryotes
- Genetic Code
- Translation in prokaryotes and eukaryotes

Unit IV: Chromosomal Aberration:-

- Structural-
 - Translocation
 - Inversion
 - Deletion
 - Duplication
- Numerical-
 - Aneuploidy-
 - Hypo – Monosomy, Nullisomy, Double Monosomy
 - Hyper- Trisomy, Double Tetrasomy and Polysomy
 - Euploidy-
 - Monoploidy & Polyploidy.
- Gene mutation - **Spontaneous and induced**

Unit V: Gene expression – Lac operon

Gene Interactions-

- **Supplementary**
- **Complimentary**
- **Epistasis**
- **Lethal Genes**
- **Pliotrophic Genes and Multiple Gene**

BSZO221: ZOOLOGY LAB II

- Dissections - *Palaemon* – General Anatomy, Study of Appendages, Digestive System, Nervous System.
- Microscopic Preparation- *Palaemon*- Hastate Plate, Statocyst, Pollen basket of honey bee, Mosquito mouth parts, *Cyclops*, *Daphnia*
- Identification And Systematic Position up to order Of following Museum Specimens-
Annelida- *Neries* and *Heteroneries* Phase, *Aphrodite*, *Pheretima*, *Hirudinaria*
Onchyophora-*Peripatus*
Arthropoda- *Limulus*, *Aranea*, *Palaemon*, *Apus*, *Lepas*, *Balanus*, *Sacculina*, *Schistocerca*, *Pediculus*, *Lobster*, *Eupagurus*, *Cancer*, *Lepisma*, *Papilio*, *Bombyx*, *Apis*, *Julus*, *Scolopendra*, ***Termite*, *wasp*, *termite soldier***, ***Palameneous*, *life history of Periplaneta*, *Squilla***.
- Study of Prepared Slides-
Annelida- T.S *Nereis* and *Hirudinaria* from Various Regions, Trocophore Larva Parapodia of *Nereis* and *Heteronereis*
Arthropoda Larval Forms- Nauplius, Zoea, Megalopa, Mysis
Mollusca - Glochidium Larva
Echinodermata- Pedicellariae
- Experimental Zoology
 - Immunological detection of blood groups***
 - To calculate genetic variation in a population using Hardy – Weinberg’s law.***
 - Genetic exercise based on genetic interaction.***

Distribution of Marks

- Dissection
- Microscopic Preparation –
- Spots – (5 x 4)
- Experimental zoology
- Year Work/ Practical Record – (CIA)
- Practical Class Test - (2 x 5 Marks) (CIA)
- Viva Voice -
- Total

Marks Allotted Time duration 3hrs

- 22
- 12
- 20
- 16
- 10
- 10
- 10
- 100

Suggested Readings

1. The Invertebrates – M. Alexander – Cambridge University Press
2. The Invertebrate Structure And Function – E.J.W. Barrington- Thomas Nelson And Sons
3. Text Book Of Zoology By T.J. Parker And W.A. Haswell- Vol I – Mcmillan And Co, London
4. Invertebrates- R.L. Kotpal – Rastogi Publication
5. A Text Book of Zoology – Invertebrates –Vishwanath – S Chand And Co.
6. Invertebrate Zoology- E.L. Jordan , P.S.Verma – S.Chand And Co, New Delhi
7. Invertebrates- Protozoa To Echinodermata Ashok Sharma – Narosa Publishing House
8. The Invertebrates- Vol I- VI –L.H. Hyman – Mcgraw Hill Co
9. Genetics – P.K. Gupta , Rastogi Publication
10. Molecular Biology And Genetic Engineering (Paperback) - P.K. Gupta , Rastogi Publication
11. Genetics And Molecular Biology - By Hyde D R, Publisher: Tata Mcgraw Hill Education Private Limited
12. Molecular Cell Biology – Lodish, K et.al - Freeman Publication
13. Cytology Genetics And Evolution- P.K.Gupta –Rastogi Publication
14. A Text Book Of Practical Zoology – Invertebrates – By S.S.Lal – Rastogi Publication, Meerut
15. A Manual Of Practical Zoology – PS Verma, Tyagi, Agarwal- S Chand Publication

BSC ZOOLOGY III SEMESTER

CODE	DESCRIPTION	PD/W	EXAM	CIA	ESE	TOTAL
BSZO 311	BIOLOGY OF CHORDATES	3	3hrs	20	80	100
BSZO 312	IMMUNOLOGY & MICROBIOLOGY	3	3hrs	20	80	100
BSZO 321	ZOOLOGY LAB III	6	3hrs	20	80	100
TOTAL				60	240	300

BSZO 311 BIOLOGY OF CHORDATES

Unit I: Classification and characters of Phylum Chordata -excluding extinct forms (up to orders)

Affinities of Hemichordates, Urochordates, Cephalochordates

Unit II: *Amphioxus*-Digestive system, Circulatory system, Nervous system, Reproductive system **and** larval forms. *Petromyzon*- Buccal funnel, Digestive system, Respiratory system, Circulatory, Nervous and Sense organs, Reproductive **system** and Larval forms.

Unit III: Pisces- Types of fins, origin of fins, scales of fishes, accessory respiratory organs, parental care in fishes and migration. Amphibia- Neoteny and paedogenesis, parental care in amphibians.

Unit IV: Reptiles-Identification of poisonous and non poisonous snakes. Snakes of desert. Aves- Flight adaptation, types of feet, migration in birds

Unit V: Mammals- Egg laying mammals, marsupials, insectivorous, gnawing, toothless mammals and aquatic adaptation in mammals.

BSZO312 IMMUNOLOGY & MICROBIOLOGY

Unit I: Introduction, Types of Immunity- Innate and Acquired immunity, Humoral and Cell mediated immunity, Cell and molecules of immune system, MHC (Major Histocompatibility Complex) -Basic concepts.

Unit II: Antigen – Antigenicity of molecules. Antibody- Structure & function of each classes of immunoglobulin. Antigen and antibody reactions.

Unit III: Historical aspect of Microbiology, Patterns of arrangement & structural organization of Gram positive & Gram negative bacteria.

Unit IV: Bacteria -Genetic material of bacteria, Reproduction in bacteria, Medical importance of Gram negative and Gram positive bacteria, Preliminary idea about Role of microbes in pest control & Waste water treatment.

Unit V: Industrial microbiology – Fermented Food Production – Dairy products, Alcoholic beverages (**wine and beer**) and Vinegar. Methods of food preservation and Microbial spoilage.

BSZO321: ZOOLOGY LAB III

- A. Dissections -
Scoliodon – General Anatomy, Brain, Afferent and Efferent blood vessels, Cranial nerves V,VII,IX,X and Internal Ear.
- B. Microscopic Preparation-Placoid scales, Identification of Gram positive and Gram negative bacteria
- C. Osteology – Articulated and disarticulated bones of – *Rana*, *Varanus*
- D. Identification and Systematic Position up to order of following Museum Specimens-
Hemichordata- *Balanoglossus*
Urochordata- *Salpa*, *Doliolum*, *Herdmania*
Cephalochordata- *Amphioxus*
Cyclostomata- *Petromyzon*, *Myxine*
Pisces- *Scoliodon*, *Zygaena*, *Pristis*, *Torpedo*, *Trygon*, *Belone*
Amphibia- *Uraeotyphlus*, *Ambystoma*, Axolotol larva
Reptiles- *Trionyx*, *Chelone*, *Varanus*, *Uromastix*, *Ophiosaurus*,
Aves- *Pavo*, *Ardeotis*, *Francolinus*
Mammals- *Meriones*, *Funambulus*, *Rattus*, *Suncus*, *Hemiechinus*
- E. Study of Prepared Slides- Hemichordata- *Balanoglossus*- section through proboscis and Branchiogenital region
Cephalochordata- *Amphioxus*- T.S Oral Hood, Pharynx, Intestine, Gonads and Caudal Region
Amphibia- T.S through various organs- Stomach, Intestine, Lung, Liver, Kidney, Spleen,
Reptiles- V.S. skin
Aves- different types of feather
Mammals- T.S through various organs - Stomach, Intestine, Lung, Liver, Kidney, Spleen,
- F. Experimental Zoology
 1. **Immunoelectrophoresis**
 2. **Preparation of different types of culture media for bacterial growth.**
 3. **Preparation of bacterial colony by streak plate method**
 4. **Bacterial examination of water – multiple tube fermentation test - presumptive test**
 5. **Study of bacterial resistance against antibiotics.**

Distribution of Marks**Marks Allotted Time duration 3hrs**

1. Dissection - Major	22
Minor	
2. Microscopic Preparation -	12
3. Spots - (5 x 4)	20
4. Experimental zoology	16
5. Year Work/ Practical Record - (CIA)	10
6. Practical Class Test - (2 x 5 Marks) (CIA)	10
7. Viva Voice -	10
Total	100

Suggested Readings

1. Text book of Zoology Vol-1I Vertebrates - Parker & Haswell (Edited by Marshall &Williams) (ELBS & Macmillan)
2. Vertebrate life- Pough and McFerland
3. Life of Vertebrates . J. Z. Yong
4. The Vertebrate body- Romer & Parsons
5. Biology of Vertebrates- Walter & Sayles
6. Chordate Zoology and Animal Physiology - by E.L.Jordan, and P.S.Verma, S. Chand Publication
7. Chordate Zoology - R.L. Kotpal , Rastogi Publication, Meerut
8. Microbiology - An Introduction - Gerard Tortora- Pearson Education
9. A Text Book Of Microbiology - R. Ananthnaryan , C.K Jayaram Paniker
10. Text Book Of Microbiology - Naveen Kango- Ik Publishing House
11. Text Book Of Microbiology And Immunology - S.C Parija- Elsevier India
12. Food Microbiology - SK Sinha, Ashok Kumar Sharma-Hb- Oxford Book Co
13. Microbial Taxonomy And Culture Techniques- R P Singh- Kalyani Publisher
14. Introduction to immunology - Kuby

BSC ZOOLOGY IV SEMESTER

CODE	DESCRIPTION	PD/W	EXAM	CIA	ESE	TOTAL
BSZO 411	COMPARATIVE ANATOMY OF CHORDATES	3	3hrs	20	80	100
BSZO412	ANIMAL EMBRYOLOGY	3	3hrs	20	80	100
BSZO421	ZOOLOGY LAB IV	6	3hrs	20	80	100
TOTAL				60	240	300

BSZO411 COMPARATIVE ANATOMY OF CHORDATES

- Unit I:- Integument including structure & development of placoid scales, Feathers, & Hairs. Jaw suspensorium.
 Unit II: Comparative anatomy of Alimentary Canal, Respiratory System- Pisces, Amphibia, Reptiles, Aves & Mammals.
 Unit III: Heart and aortic arches, Urino genital system - Pisces, Amphibia, Reptiles, Aves & Mammals.
 Unit IV: Comparative anatomy of Brain & **Eye**- Pisces, Amphibia, Reptiles, Aves & Mammals.
 Unit V: Comparative anatomy of Endocrine systems - Pisces, Amphibia, Reptiles, Aves & Mammals.

BSZO412 ANIMAL EMBRYOLOGY

- Unit I: Gametogenesis, Vitellogenesis, Types of eggs & sperms, Parthenogenesis, Physiology of fertilization.
 Unit II: Cleavage - Planes & Patterns of cleavage & significance, Fate map. Blastulation, Gastrulation & its Significance.
 Unit III: Development of *Branchiostoma* up to gastrulation, **Hen** egg & its development up to formation of primitive streak. Extra embryonic membranes of chick.
 Unit IV Placenta - Types & function of Placenta in Mammals, Various types of stem cells & their applications
 Unit V: Cloning of Animals: Nuclear Embryonic Transfer technique, Nuclear transfer technique, Twins - Identical Siemans & Fraternal Twins, **test tube babies (IVF- In vitro fertilization)**, Artificial inseminations, Teratogenesis

BSZO421 ZOOLOGY LAB IV

- A. Dissections -
Labeo – General Anatomy, Brain, cranial nerves V,VII, IX, and X, Weberian ossicles
 B. Microscopic Preparation- Cycloid scales
 C. Osteology – Articulated and disarticulated bones of –*Gallus,Oryctolagus*
 D. Identification and Systematic Position up to order of following Museum Specimens Identification and Systematic Position up to order of following Museum Specimens-
 Pisces- *Protopterus, Labeo, Heteropneustes, Wallago, Clarias, Anabas, Exocoetus, Echeuis.*
 Amphibia- *Amphiuma, Necturus, Hyla, Bufo*
 Reptiles- *Naja, Bungarus, Echeis, Hydrophis, Eryx, Ptyas, Crocodilus, Gavialis*
 Aves- *Columba, Streptopelia, Passer*
 Mammals – *Pteropus, Presbytis, Maccaca*
 E. Study of Prepared Slides- *Scoliodon* – T.S gills, Scroll valve
 Amphibia - T.S and L.S of developmental stages
 Aves – V.S of skin
 Chick embryology – Whole Mount of developmental stages of chick of 18, 24, 36, 48, 72 hours
 Mammals – T.S through various organs- Thyroid, Testes, Ovary Adrenal Gland, Pancreas
 F. Experimental Zoology -
 1. **Detection of vitamin A in cod liver oil**
 2. **Detection of vitamin D in cod liver oil**
 3. **Preparation of different stages of chick embryological development.**
 4. **Study / collection of different types of feather (5)**
 5. **To study action of salivary amylase enzyme.**

Distribution of Marks	Marks Allotted	Time duration 3hrs
1. Dissection – Major	22	
Minor		
2. Microscopic Preparation –	12	
3. Spots – (5 x 4)	20	
4. Experimental zoology	16	
5. Year Work/ Practical Record – (CIA)	10	
6. Practical Class Test - (2 x 5 Marks) (CIA)	10	
7. Viva Voice -	10	
Total	100	

Suggested Readings-

1. Text book of Zoology Vol-11 Vertebrates – Parker & Haswell (Edited by Marshall &Williams) (ELBS & Macmillan)
2. Vertebrate life- Pough and McFerland
3. Life of Vertebrates. J. Z. Yong
4. The Vertebrate body- Romer & Parsons
5. Biology of Vertebrates- Walter & Sayles
6. Analysis of Vertebrate Structure- Hildebrand
7. Comparative Anatomy of Vertebrates- G.C. Kent & R. Carr
8. Chordate Zoology and Animal Physiology – by E.L.Jordan, and P.S.Verma, S. Chand Publication
9. Chordate Zoology – R.L. Kotpal , Rastogi Publication, Meerut
10. Developmental Biology – Scott Gilbert – PB- Palgrave Publication
11. Foundations Of Embryology – Bradley M Patten And Carlson
12. Introduction To Embryology – B.I Balinsky- Thomson Nelson Publication
13. Embryology – Rajendra Kausik – Oxford Book Co
14. Text Book Of Embryology - D.R. Khanna- Discovery Publishing House

BSC ZOOLOGY V SEMESTER

CODE	DESCRIPTION	PD/W	EXAM	CIA	ESE	TOTAL
BSZO 511	ANIMAL PHYSIOLOGY	3	3hrs	20	80	100
BSZO 512	ECOLOGY	3	3hrs	20	80	100
BSZO 521	ZOOLOGY LAB V	6	3hrs	20	80	100
TOTAL				60	240	300

BSZO511 ANIMAL PHYSIOLOGY

Unit I: Digestion – Structure of alimentary canal – salivary glands, stomach, intestine. Enzymes secreted in alimentary canal. Digestion of Carbohydrate, Protein & Fat. ***Omega 3 fatty acids and its importance.***

Unit II: Respiration- Respiratory Organs, Respiratory Pigments, Mechanism of Breathing, Regulation of Breathing

Unit III: Blood- Composition and function of Blood, Blood Clotting, elementary idea about - Blood Pressure, Anemia and its types, Hemophilia. ***Causes of heart attack***

Unit IV: Excretion – Structure of Kidney, Mechanism of Urine Formation and Elimination- Ultrafiltration, Selective reabsorption and Tubular Secretion, Urea Cycle. ***Factors affecting stone formation (in kidney and gall bladder)***

Co-ordination – Nerve impulse and its transmission – on neuron and between neuron (synaptic transmission), reflex action , types of reflexes.

Unit V: Muscles – Types, Ultra structure, Muscle Proteins, Physiology of Muscle Contraction. Endocrine gland – location, structure and function of various endocrine glands- pituitary, thyroid, parathyroid, pancreas and adrenal - their hormones and diseases caused by deficiency

BSZO512 ECOLOGY

UNIT-I :Ecosystem and its components, Energy flow, Food chain and Food Web, Biotic Community, Ecological Succession.

UNIT-II : Terrestrial Ecosystem- Forest Ecosystem, Grassland Ecosystem, Desert Ecosystem (Thar Desert), Aquatic Ecosystem - Fresh water ecosystem, Marine ecosystem.

UNIT-III : Laws of Limiting Factors, Physical Factors- Temperature, Light, Soil.

UNIT-IV : Biotic Factors- Competition, Predation, Parasitism, Commensalism, Mutualism, Population Ecology- Characteristics of population.

UNIT-V : Environmental Pollution-Causes, Effect and Control of- Soil Pollution, Air Pollution, Water Pollution, Noise Pollution, Radioactive Pollution.

**ZOOLOGY LAB V
PRACTICALS BSZO521**

1. Estimation of packed cell volume (P.C.V) with the help of centrifuge.
2. Preparation of haemin crystals.
3. Estimation of Water holding capacity of the given soil sample.
4. Estimation of soil moisture content of the given soil sample.
5. Osmotic effect on R.B.C.
6. Determination of blood sugar – fasting, pp, and random by glucometer.
7. Urine analysis for sugar, protein and pH.
8. Estimation of population density and frequency of animals in a community.
9. Demonstration of working of pH meter.
10. Analysis of pH of given water sample.
11. Demonstration of working of colorimeter.
12. Study of Pond ecosystem / Aquarium ecosystem.
13. Permanent preparation of different zooplanktons – *Daphnia, Cyclops, Cypris* .
14. **Permanent preparation of different ectoparasites – *Pediculus* .**
15. Demonstration of working of sphygmomanometer (B.P. measurement) with the help of stethoscope.
16. Dissection of nervous system of grasshopper .

Distribution of Marks

Marks Allotted Time duration 3hrs

1. Dissection –	18
2. Microscopic Preparation –	12
3. Spots – (5spots x 4)	20
4. Experimental zoology	20
5. Year Work/ Practical Record – (CIA)	10
6. Practical Class Test - (2 x 5 Marks) (CIA)	10
7. Viva Voice -	10
Total	100

Suggested Readings

1. Principals of animal physiology by Christopher Moyes, Patricia Schulte
2. Introduction to Animal physiology by Ian Kay
3. Basic Physiology by Shree kumar
4. Essentials of Animal Physiology by S C Rastogi
5. Animal Physiology, Mechanism and Adaptation by Eckert R
6. Animal Physiology, Adaptation and Environment by Schiemdt Nielsen
7. Endocrine Physiology by C R Martin
8. Environmental Law for the Built Environment by Jack Rostron
9. A Forest History of India by Richard P.Tucker.
10. Fundamental of Ecology by Odum
11. Environment Protection and the Law by Dr. R K Khitoliya
12. Environmental Studies by Singh, Thakur & chauhan
13. Concepts of Ecology by Edward J. Kormondy
14. Ecology, Environment & Pollution by P K Gupta
15. Ecology and Environment by P D Sharma
16. Modern Concept of Ecology by H D Kumar
17. Biodiversity: Science and Development by Castri, F D & Younes

BSC ZOOLOGY VI SEMESTER

CODE	DESCRIPTION	PD/W	EXAM	CIA	ESE	TOTAL
BSZO 611	BIODIVERSITY AND ETHOLOGY	3	3hrs	20	80	100
BSZO 612	APPLIED ZOOLOGY	3	3hrs	20	80	100
BSZO 621	ZOOLOGY LAB VI	6	3hrs	20	80	100
TOTAL				60	240	300

BSZO611 BIODIVERSITY AND ETHOLOGY

UNIT-I Biodiversity – Definition, Types- Genetic, species and ecosystem, Importance, Different values of biodiversity : social, ethical, aesthetic and option values, Diverse Fauna of India **with reference to Amphibia- Habit, habitat, general characters and economic importance of Frog, Tree frog, Toad and Salamander, Reptiles- Habit, habitat, general characters and economic importance of Varanus, crocodile, Gavalis, and Indian cobra, Birds- Habit, habitat, general characters and economic importance of Peacock, Vulture, Owl and Teetar and Mammals- Habit, habitat, general characters and economic importance of Elephant, Rhinoceros, Blue Bull, Hyena, Conservation of Biodiversity.**

UNIT-II - Biogeographical Regions of India, Hot spots, IUCN, RDB, Threats to biodiversity : habitat loss, poaching of wildlife, man-wildlife conflicts, , Endemic, Threatened species of Indian Fauna(Rare, Endangered, critically endangered, vulnerable) National Sanctuaries and zoological parks of Rajasthan- **Habit, habitat area and fauna of Keoladeo National park, Bharatpur, Ranthambore National park , Sawai Madhopur, Sariska National park, Alwar, and Machia Biological Park, Jodhpur.**

UNIT-III - Wildlife protection Act,1972,, Project Tiger , Project Gir Lion, Crocodile breeding project, Wildlife in Rajasthan with special references to Reptiles Birds and mammals, State bird – *Ardeotis nigriceps* (Godawan) and state animal *Gazelle gazelle* (Chinkara)

UNIT-IV Animal Behaviour – Introduction, Types- Innate, Learned. Methods of Studying Animal Behaviour – Studies in laboratory - Neuro anatomical Technique, Neuro physiological Technique, Neuro chemical Technique. Studies in Wild

UNIT-V Animal Behaviour - Role of Pheromones in behavior, Role of hormone in behavior, Communication- **Types**, Biological rhythms

BSZO612 APPLIED ZOOLOGY

UNIT-I Poultry Keeping: Types of Poultry Breeds, Poultry Farm and its management, Handling and Marketing of Eggs. Diseases – Disease causing Pathogens, Symptoms, and Control measures

UNIT-II Sericulture: Species of Silk Moth, Silkworms and their Host Plants, Mulberry Silk Worm culture, Life cycle. Natural enemies and Diseases of silkworm and their control.

UNIT-III Apiculture: Indian species of Honey bees, Life history of *Apis cerana indica*, Artificial Bee hives, Natural enemies and Diseases of Honey bee and their control, Bee products and their uses.

UNIT-IV Pest Management: Biology and control of pests: Paddy Pests (*Dicladestia*, *Spodoptera*), Cotton Pests (*Dysdercus*, *Pectinophora*), Sugarcane pests (*Scirpophaga*, *Pyrilla*), Stored grain pests (*Tribolium*, *Rhyzopertha*), Chemical, Biological and Mechanical pest control methods, Integrated Pest Management (IPM).

UNIT-V Aquaculture: Introduction to Aquaculture, General principles of Aquaculture, Fish farm and its management, Composite fish culture, By products of fishing industry. Prawn culture.

**ZOOLOGY LAB VI
PRACTICALS BSZO621**

1. Estimation of Haemoglobin by haemoglobinometer
2. Study of ECG of different age group persons and its analysis.
3. Blood smear and identification of different types of blood cells.
4. Estimation of bleeding time of your own blood.
5. Estimation of clotting time of your own blood.
6. Study of different types of bee castes and their identification.
7. Study of artificial bee hive.
8. Study of different types of insect traps.
9. Bioassay study on Pesticides
10. Study of different byproducts of fishing industry.
11. Study of different types of fishing nets.
12. Study of different types of edible fishes
13. Different types of spraying and dusting equipments.
14. Permanent preparation of store grain pest – *Tribolium*, *Rhyzopertha*, *Oryzaephilus*.
15. Honey bee- preparation of mouthparts, sting pollen basket.
16. Permanent preparation of different types of mouth parts- House Fly, Cockroach, Mosquito, Butterfly.
17. Dissection of Nervous system of Cockroach
18. Local fauna report

Distribution of Marks

Marks Allotted Time duration 3hrs

1. Dissection –	18
2. Microscopic Preparation –	12
3. Spots – (5 Spots x 4)	20
4. Experimental Zoology	20
5. Year Work/ Practical Record – (CIA)	10
6. Local fauna report (CIA)	10
7. Viva Voice -	10
Total	100

Suggested Readings

1. Diversity Management: Theoretical Perspectives and Practical Approaches by Dr. Sheying Chen
2. Biology of Biodiversity by M kato
3. Biodiversity by E O Wilson
4. Diversity of life by E O Wilson
5. Threatened Animals of India by B K Tikadar
6. Principal of Animal Behavior by Lee Alan Dugatkin
7. Animal Behavior by Reena Mathur
8. Animal Behavior Desk Reference by Edward M Barrows
9. Animal Behavior by John Alcock
10. Animal Behavior by Menning
11. Modeling in Behavioral Ecology by Lendren
12. Fish and Fisheries- Shukla, Pandey
13. A Text Book Of Fish Biology And Fisheries (Paperback)
by S S Khanna H R Singh
14. Applied Entomology- P. G. Fenemore, A Prakash
15. Freshwater Aquaculture- Santhanam *et al.*
16. Aquaculture- T. V. R. Pilley
17. Sericulture & Silk Industry- D. C. Sarkar
18. Bee keeping in India- ICAR
19. Economic Zoology- Shukla Upadhyay
20. Elements of Entomology- Rajendra Singh
21. Insect Pest of crop- S. Pradhan
22. Applied zoology- Ansari, Varma, Sharma