

Annexure – 7

B. Sc. ZOOLOGY Degree Course

UG – SCHEME OF EXAMINATIONS: CBCS PATTERN

(For students admitted during the academic year 2018-2019 and onwards)

Part	Sub Code	Title of the Paper	Hrs (work)	Internal (CA) Marks	External Marks	Total Marks	Ext. – Min.	Total Pass Mark	Credits
Semester I									
I	18TAM11L	Part I: Language: Tamil I	6	25	75	100	30	40	3
II	18ENG12L	Part II: English I	6	25	75	100	30	40	3
III	18BZO13C	Core Paper I: Non-Chordata	6	25	75	100	30	40	5
III	18BZO14A	Allied Paper I: Botany I	6	15	60	75	24	30	4
		Core Practical I: Includes Core Papers I & II	2						
		Allied Practical I: Botany	2						
IV	18ENV1GE	Environmental Studies	2	25	75	100	30	40	2
Semester II									
I	18TAM21L	Part I: Language: Tamil II	6	25	75	100	30	40	3
II	18ENG22L	Part II: English II	6	25	75	100	30	40	3
III	18BZO23C	Core Paper II: Chordata	6	25	75	100	30	40	5
III	18BZO24A	Allied Paper I: Botany II	6	15	60	75	24	30	4
III	18BZO25P	Core Practical I: Includes Core Papers I & II	2	40	60	100	24	40	3
III	18BZO26P	Allied Practical I: Botany	2	20	30	50	12	20	2
IV	18VAL2GE	Value Education: Gandhian Thoughts	2	25	75	100	30	40	2

Part	Sub Code	Title of the Paper	Hrs (work)	Internal (CA) Marks	External Marks	Total Marks	Ext. – Min.	Total Pass Mark	Credits
Semester III									
I	18TAM31L	Part I: Language: Tamil III	6	25	75	100	30	40	3
II	18ENG32L	Part II: English III	6	25	75	100	30	40	3
III	18BZO33C	Core Paper III: Cell Biology	4	25	75	100	30	40	5
III	18BZO34A	Allied Paper II: Chemistry I	6	15	60	75	24	30	4
		Core Practical II: Includes Core Papers III & IV	2						
		Allied Practical II: Chemistry	2						
IV	18BZO35S	Skilled Based Subject I: Vermitechnology	4	25	75	100	30	40	3
Semester IV									
I	18TAM41L	Part I: Language: Tamil IV	6	25	75	100	30	40	3
II	18ENG42L	Part II: English IV	6	25	75	100	30	40	3
III	18BZO43C	Core Paper IV: Animal Physiology	4	25	75	100	30	40	5
III	18BZO44A	Allied Paper II: Chemistry II	6	15	60	75	24	30	4
III	18BZO45P	Core Practical II: Includes Core Papers III & IV	2	40	60	100	24	40	3
III	18BZO46P	Allied Practical II: Chemistry	2	20	30	50	12	20	2
IV	18BZO45S	Skilled Based Subject II: Clinical Laboratory Techniques	4	25	75	100	30	40	3
V	18EXA4GE	Extension Activities							1

Part	Sub Code	Title of the Paper	Hrs (work)	Internal (CA) Marks	External Marks	Total Marks	Ext. – Min.	Total Pass Mark	Credits
Semester V									
III	18BZO51C	Core Paper V: Embryology	5	25	75	100	30	40	5
III	18BZO52C	Core Paper VI: Biochemistry & Biophysics	4	25	75	100	30	40	5
III	18BZO53C	Core Paper VII: Genetics	5	25	75	100	30	40	5
III	18BZO54C	Core Paper VIII: Evolution	4	25	75	100	30	40	5
IV	18BZO55S	Skill Based Subject III: Ornamental Fish Culture	3	25	75	100	30	40	3
IV	18BZO5EL	Non-Major Elective Paper I: Biofarming I	3	25	75	100	30	40	2
		Core Practical III: Includes Core Papers VIII, XI & XII	2						
		Core Practical IV: Includes Core Papers V, VI & VII	2						
		Core Practical V: Includes Core Papers IX & X	2						
Semester VI									
III	18BZO61C	Core Paper IX: Immunology & Microbiology	5	25	75	100	30	40	5
III	18BZO62C	Core Paper X: Biotechnology	5	25	75	100	30	40	5
III	18BZO63C	Core Paper XI: Ecology & Ethology	4	25	75	100	30	40	5
III	18BZO64C	Core Paper XII: Bioinformatics, Biostatistics & Computer Applications	4	25	75	100	30	40	5
IV	18BZO65S	Skill Based Subject IV: Sericulture & Apiculture	3	25	75	100	30	40	3
IV	18BZO6EL	Non-Major Elective Paper I: Biofarming I	3	25	75	100	30	40	2
III	18BZO67P	Core Practical III: Includes Core Papers VIII, XI & XII	2	40	60	100	24	40	3
III	18BZO68P	Core Practical IV: Includes Core Papers V, VI & VII	2	40	60	100	24	40	3
III	18BZO69P	Core Practical V: Includes Core Papers IX & X	2	40	60	100	24	40	3
		Total Marks & Credits				3700			140

Year	Paper Title	Sem.	Subject code
2018-19 onwards	CORE PAPER I: NON CHORDATA	I	18BZO13C

I B.Sc. ZOOLOGY

OBJECTIVES

- To appreciate the diversity of life on earth with respect to Non-Chordates.
- To understand the general characteristics of the different Phyla as exemplified in representative type studies.
- To study certain morphological attributes and physiological processes that are distinct and significant to each Phyla.

UNIT – I PHYLUM: PROTOZOA

Class: Sporozoa – *Plasmodium*.

Locomotion in Protozoa.

Reproduction in Protozoa.

PHYLUM: PORIFERA

Class: Calcarea – *Leucosolenia*.

Canal system in sponges.

Economic importance of sponges.

UNIT – II PHYLUM: COELENTERATA

Class: Hydrozoa – *Obelia*.

Coral reefs in Coelenterates.

PHYLUM: PLATYHELMINTHES

Class: Trematoda – *Fasciola hepatica*.

Parasitic adaptation in Platyhelminthes.

UNIT – III PHYLUM: ASCHELMINTHES

Class: Nematoda – *Ascaris lumbricoides*.

Nematode parasites of man and domestic animals- occurrence and mode of transmission in (excluding life history) *Enterobius*, *Wuchereria*, *Dracunculus*.

PHYLUM: ANNELIDA

Class: Hirudinea – *Leech*.

Excretion in Annelida.

Adaptive radiation in Polychaetes.

UNIT – IV PHYLUM: ARTHROPODA

Class: Insecta – **Cockroach.**

Crustacean larva.
Mouth parts in insects.
Economic importance of Arthropods.

UNIT – V PHYLUM: MOLLUSCA

Class: Gastropoda – *Pila*.
Foot in Mollusca.
Economic importance of Mollusca.

PHYLUM: ECHINODERMATA

Class: Asteroidea – **Starfish**.
Echinoderm larvae.

TEXT BOOK

Ayyar, M. Ekambaranatha. 1973. A Manual of Zoology, Part I. Invertebrata.
S. Viswanathan Pvt. Ltd.

REFERENCE BOOKS

Jordan, E.L. and Verma, P.S. 2000. Invertebrate Zoology. S. Chand & Co. **Kotpal,**
R.L. 2000. Modern Textbook of Zoology – Invertebrates. Rastogi Publications.
Barnes, Robert D. 1981. Invertebrate Zoology. Saunders College Publications.

I B.Sc. ZOOLOGY

Year	Paper Title	Sem.	Subject code
2018-19 onwards	CORE PAPER II: CHORDATA	II	18BZO23C

OBJECTIVES

- To understand the diversity of Chordates and its outline systematics.
- To study the general characteristics of the different Classes and the organization of the representative types.
- To understand the features that are unique to the different Chordate Classes.

UNIT – I PHYLUM CHORDATA AND CLASS PISCES

Outline classification of Phylum Chordata.

General organization of *Amphioxus* (excluding endoskeleton) and its affinities.

General characters of Class Pisces.

General organization of **Shark** (excluding endoskeleton).

Accessory respiratory organs in fishes.

UNIT – II CLASS AMPHIBIA

General characters of Class Amphibia.

General organization of **Frog** (excluding endoskeleton).

Parental care in Amphibians.

UNIT – III CLASS REPTILIA

General characters of Class Reptilia.

General organization of *Calotes* (excluding endoskeleton).

South Indian Poisonous and Nonpoisonous snakes.

An account of Dinosaurs.

UNIT – IV CLASS AVES

General characters of Class Aves.

General organization of **Pigeon** (excluding endoskeleton).

Flight adaptation in birds.

Migration in birds.

UNIT – V CLASS MAMMALIA

General characters of Class Mammalia.

General organization of **Rabbit** (excluding endoskeleton).

An account of aquatic mammals and their adaptation.

Dentition in mammals.

TEXT BOOK

M. Ekambaranatha Ayyar, 1973. A Manual of Zoology. Part II. S. Viswanathan Pvt. Ltd., Madras.

REFERENCE BOOKS

J.Z. Young, 2006. The Life of Vertebrates. The Oxford University Press, New Delhi.

R.L.Kotpal, 2000. Modern Textbook of Zoology, Vertebrates. (Rastogi Publ., Meerut). 632 pages.

E.L. Jordan & P.S. Verma, 2010. Chordate Zoology. S. Chand & Co.. 1092 pages.

I B.Sc. ZOOLOGY

Year	Paper Title	Sem.	Subject code
2018-19 onwards	CORE PRACTICAL I	I & II	18BZO25P

(Includes Paper I: Non – Chordata and Paper II: Chordata)

SPOTTERS

CLASSIFY GIVING REASONS

1. *Paramecium* - Entire.
2. Ascon sponge - Entire
3. *Gorgonia* - Entire.
4. Liver fluke - Entire.
5. *Ascaris* - Entire.
6. *Panaeus indicus* - Entire.
7. *Loligo* - Entire.
8. Star Fish - Entire
9. Amphioxus – Entire.
10. Shark - Entire.

DRAW LABELLED SKETCH

1. Obelia – Colony, Medusa.
2. T.S. of Leech.
3. Carapace and Plastron.
4. Pigeon – Quill feather.

BIOLOGICAL SIGNIFICANCE

1. Sponge – Gemmule.
2. Nauplius Larva.
3. Nautilus.
4. Chamaeleon.
5. Bat.

DESCRIPTIVE NOTES

1. Starfish.
2. Exocoetus.
3. Draco.
4. Cobra.
5. Owl.

RELATE STRUCTURE AND FUNCTION

1. Nereis – Parapodium.
2. Scorpion – Book Lungs.

3. Rabbit – Dentition.
4. Dog – Dentition.
5. Duck – Palate.

DISSECTIONS

1. Cockroach - Digestive system, Nervous system and Reproductive system.
2. Fish – Digestive system.

MOUNTINGS

1. Cockroach – Mouth parts.
2. Honey bee - Mouth parts and sting apparatus.
3. Types of scales.
4. Earthworm – Body setae.

I B.Sc. ALLIED ZOOLOGY

Year	Paper Title	Sem.	Subject code
2018-19 onwards	PAPER I: NON – CHORDATA AND CHORDATA	I	18BBO14A

OBJECTIVES

- To appreciate the diversity of the animal kingdom.
- To understand characteristics of the non-chordate phyla and the chordate classes.
- To study the organization and life cycle of certain economically significant organisms.

UNIT – I

General characters of the Phylum Protozoa.

General organization and life cycle of *Plasmodium*.

General characters of the Phylum Porifera

General characters of the Phylum Coelenterata.

UNIT – II

General characters of the Phylum Platyhelminthes.

General organization and life history of *Fasciola hepatica*.

General characters of the Phylum Nematelminthes.

Nematode parasites of man.

General characters of the Phylum Annelida.

UNIT – III

General characters of the phylum Arthropoda.

General organization and reproduction in *Periplanata americana*.

General characters of the Phylum Mollusca.

General characters of the Phylum Echinodermata.

UNIT – IV

General characters of the Phylum chordate and outline classification up to class level.

General characters of the class: Pisces.

General organization of all systems except endoskeletal system of Shark.

General characters of the class: Amphibia.

UNIT – V

General characters of the class: Reptilia.

General characters of the class: Aves.

General characters of the class: Mammalia.

General organization of all systems of Rabbit except endoskeleton.

TEXT BOOKS

M. Ekambaranatha Ayyar & T. N. Ananthakrishnan. Outlines of Zoology.

M Ekambaranatha Ayyar & T. N. Ananthakrishnan. Manual of Zoology, VOlI & II.

REFERENCE BOOKS

R. L. Kotpal. Modern Textbook of Zoology: Invertebrates.

R. L. Kotpal. Modern Textbook of Zoology: Vertebrates.

I B.Sc. ALLIED ZOOLOGY

Year	Paper Title	Sem.	Subject code
2018-19 onwards	PAPER II: GENERAL PRINCIPLES OF ZOOLOGY	II	18BBO24A

OBJECTIVES

- *To understand the scope and branches of zoology.*
- *To introduce certain aspects of Genetics, Cell biology, Developmental biology, and Economic zoology.*

UNIT – I CELL BIOLOGY & GENETICS

Structure of animal cell.

An account of Cancer.

Genetic disorders in Man – Haemophilia, Phenylketonuria and Down's syndrome.

Blood groups – A, B, O and Rh factor.

UNIT – II DEVELOPMENTAL BIOLOGY

Structure of egg and sperm of Rabbit.

Fertilization, Cleavage, Blastulation and Gastrulation in Rabbit.

Fetal membranes (yolk, sac, amnion, chorion and allantois) and Placenta in Rabbit.

Human infertility and *in vitro* fertilization.

UNIT – III PHYSIOLOGY

Respiration – transport of gases CO_2 and O_2 .

Excretion – Nephron – structure and urine formation.

Structure of Neuron – Nerve impulse conduction – synaptic transmission.

UNIT – IV ANIMAL ADAPTATIONS

Parental care.

Migration in Birds.

Natatorial adaptations.

Volant adaptations.

Desert adaptations.

UNIT – V – ECONOMIC ZOOLOGY

Life cycle and Economic importance of silkworm .

Life cycle and Economic importance of honeybee.

Economic importance of fishes.

TEXT BOOK

N. Arumugam 2016.A Text Book of Embryology. Saras Publications.

P.S. Verma & Agarwal.2009.Animal Physiology. S. Chand & Co.

REFERENCES

P.S. Verma & Agarwal. 2001. Concepts of Cell Biology. S. Chand & Co.

I B.Sc. ALLIED ZOOLOGY PRACTICALS

Year	Paper Title	Sem.	Subject code
2018-19 onwards	CORE PAPER - I: NON CHORDATA	I & II	18BBO26P

(Papers covering: Non – Chordata, Chordata and General Principles of Zoology)

DISSECTIONS

1. Fish – Alimentary canal.
2. Cockroach – Alimentary canal.

MOUNTINGS

1. Cockroach – Mouth parts.
2. Honey bee - Mouth parts.
3. Types of scales in Fish.

SPOTTERS – IDENTIFICATION

Identify, draw and write notes:

1. *Paramecium*: Entire.
2. Ascon: Entire.
3. *Obelia*: Colony, Medusa.
4. *Fasciola hepatica*: Entire.
5. *Ascaris*: Entire.
6. *Penaeus*: Entire.
7. Pila: Entire.
8. Starfish: Entire – Oral and Aboral view.
9. Shark: Entire.
10. *Calotes*: Entire.

EMBRYOLOGY

1. Structure of egg and sperm of frog.
2. Blastula of Frog.
3. Gastrula of Frog.

ADAPTATIONAL SIGNIFICANCE

1. Desert – Scorpion.
Volant – Draco and Bat.

ANIMAL BEHAVIOUR

1. Parental care – Arius, Hippocampus.

ECONOMIC ZOOLOGY

1. Honey bee – Queen, worker drone..
2. Silkworm – Adult, egg, Caterpillar, Pupa and Cocoon.
3. Edible fishes – Catla, Sardine .

II B.Sc. ZOOLOGY

Year	Paper Title	Sem.	Subject code
2018-19 onwards	CORE PAPER III: CELL BIOLOGY	III	18BZO33C

OBJECTIVES

- *To underline the central role played by Cell Biology in current biological science.*
- *To understand the organization and functions of the different cell organelles.*
- *To understand cell cycle, cell division, cell differentiation (stem cells) and cell aging.*
- *To study the nature, expression and regulation of the genetic materials at the molecular level.*

UNIT – I STRUCTURAL ORGANIZATION AND FUNCTION OF INTRACELLULAR ORGANELLES

Ultra structure of animal cell – Plasma membrane (fluid mosaic model only) – Endoplasmic reticulum – Ribosomes – Golgi complex, Lysosomes, Centrioles and Mitochondria, Nucleus and Nucleolus.

UNIT – II ORGANIZATION OF GENES AND CHROMOSOMES

Operon Concept – Chromatin and Chromosomes – Polytene and Lampbrush Chromosomes, Giant Chromosomes.

UNIT – III FUNDAMENTAL PROCESS

DNA – semi conservative replication, Mechanism and Enzymology of DNA replication, Structure and Functions of DNA.

RNA – Structure, Types (mRNA, tRNA, rRNA), Functions – Protein Synthesis.

UNIT – IV CELL DIVISION, CELL CYCLE AND CANCER

Mitosis - Meiosis - cell cycle and its regulation.

Cancer cells – Distinction between normal cells and cancer cells – Cytological changes in cancer cells – Therapeutic interventions of uncontrolled cell growth.

UNIT – V STEM CELLS AND AGEING

Stem Cells – Embryonic and Adult stem cells – Characteristics of stem cell – Applications of Stem cells.

Senescence (Aging) – Apoptosis in *C. elegans*.

TEXT BOOK

P.S. Verma & Agarwal. 2001. Concepts of Cell Biology. S. Chand & Co.

REFERENCE BOOKS

Ajay Paul., 2011. Cell and Molecular Biology. Books and Allied Pvt, Kolkata.

Powar, C.B., 2002. Cell Biology. Himalaya Publishing House.

Cohn, N.S., 1979, Elements of Cytology, Freeman Book Co., New Delhi.

II B.Sc. ZOOLOGY

Year	Paper Title	Sem.	Subject code
2018-19 onwards	SKILL BASED SUBJECT I: VERMITECHNOLOGY	III	18BZO35S

OBJECTIVES

- To appreciate the role of Earthworms and the concept of Vermitechnology.
- To understand the Earthworm- types, classification, organization and lifecycle.
- To study all aspects related to Vermicomposting and the economics of Vermiculture.

UNIT - I

Vermitechnology – Definition – History.

Earthworms – Systematic Classification.

Morphological and Anatomical Characteristics of Earthworms.

Lifecycle of *Eudrilus eugeniae* and *Lampito mauritii*.

UNIT - II

Earthworm – Ecological Types.

Earthworms for Vermiculture.

Sampling of Earthworms.

Earthworm – Collection – Transport – Storage.

UNIT - III

Composting and Vermicomposting.

Vermicomposting Materials.

Types of Vermicomposting.

Factors affecting Vermicomposting.

UNIT - IV

Vermicompost – Harvesting and Storage.

Vermicast and Vermiwash.

Vermiprotein and Earthworm paste.

Earthworm parasites and predators.

UNIT - V

Role of Earthworms in Agriculture.

Uses of Earthworms in Medicine.

Earthworm and Pollution Control.

Investment – Cost Marketing Awareness – NABARD – KVIC.

TEXT BOOKS

Sultan Ismail, 1997. Vermicology – The Biology of Earthworm, Orient Longman Limited, Chennai.

R. Ramalingam. 2007. Mann Puzhu Valarpu

REFERENCE BOOKS

U.S. Bhawalkar and V.U. Bhawalkar. 1992. Vermi Biotechnology, Bhawalkar Earthworms Research Institute, Pune, India.

L.S. Ranganathan. 2006. Vermitechnology from soil Health to Human Health, Agrobios (India), Agro House, Chopasani Road, Jodhpur, 342002.

P.K. Gupta. 2005. Vermicomposting for Sustainable Agriculture, Second Revised Edition . Publisher- Dr.Updesh Purohit for Agrobios (India), Jodhpur.

Year	Paper Title	Sem.	Subject code
2018-19 onwards	CORE PAPER IV: ANIMAL PHYSIOLOGY	IV	18BZO43C

OBJECTIVES

- *To understand the structure of the different organ systems in man/mammals.*
- *To understand the mechanisms involved in the functioning of the different systems.*
- *To study certain disorders that arise as a consequence of physiological malfunction.*

UNIT – I NUTRITION, DIGESTION AND ABSORPTION

Nutrition – Food requirements – Balanced Diet.

Role of enzymes in carbohydrate, protein and lipid digestion.

Absorption of carbohydrates, proteins and lipids.

UNIT – II RESPIRATION AND CIRCULATION

Respiration – Respiratory pigments and functions, Respiratory quotient, transport of gases.

Blood – Composition, Properties and Functions.

Structure of heart – Origin, conduction and Regulation of Heart Beat – ECG – BP – Heart Problems and coronary circulation.

UNIT – III EXCRETION, OSMOREGULATION AND MYOLOGY

Excretion – Kidney – Structure and Function, Mechanism of Urine formation, Kidney Failure.

Osmoregulation in mammals.

Types of muscles, mechanism of muscle contraction.

UNIT – IV NERVOUS SYSTEM AND RECEPTORS

Nervous tissue – Neuron – Structure, types of neurons, Nerve impulse.

Synapse – Synaptic transmission, Neurotransmitters.

Receptors – Photoreceptor – Mammalian Eye – Physiology of vision.

Phonoreceptors – Mammalian Ear and Phonoreception in bat.

UNIT – V ENDOCRINE GLANDS

Endocrine glands – Structure, secretions and functions of endocrine glands of vertebrates – pituitary, thyroid, islets of Langerhans.

TEXT BOOK

- **Verma, Tyagi and Agarwal.** 1986. Animal Physiology . Chand & Co., New Delhi.

REFERENCE BOOKS

William. S. Hoar. 1976. General and Comparative Physiology, Prentice Hall of India Pvt. Ltd., New Delhi-110 001.

Wood. D. W. 1983. Principles of Animal Physiology. 3rd edition.

Prosser and Brown. 1985. Comparative Animal Physiology. Satish Book Enterprise, Agra-282 003.

II B.Sc. ZOOLOGY

Year	Paper Title	Sem.	Subject code
2018-19 onwards	CORE PRACTICAL - II	III & IV	18BZO45P

(Includes Paper III: CELL BIOLOGY and Paper IV: ANIMAL PHYSIOLOGY)

CELL BIOLOGY

Preparation of blood smear and observation of cell types.

Morphology of chromosomes from a study of the squash preparation of Onion root tip.

ANIMAL PHYSIOLOGY

Estimation of oxygen consumption in freshwater fish and calculation of unit metabolism.

Qualitative detection of excretory products.

Preparation of haemin crystals.

Enumeration of red blood corpuscles using haemocytometer.

Estimation of bleeding time and clotting time of blood.

SPOTTERS - CELL BIOLOGY

Study of the histology of various tissues – epithelial, muscle, bone, nervous and fluid tissues.

Stages of Mitosis and Meiosis.

Microscope – Compound and Binocular.

Centrifuge.

SPOTTERS -PHYSIOLOGY

Haemocytometer.

Haemoglobinometer.

II B.Sc. ZOOLOGY

Year	Paper Title	Sem.	Subject code
2018-19 onwards	SKILL BASED SUBJECT II: CLINICAL LABORATORY TECHNIQUES	IV	18BZO45S

OBJECTIVES

- *To appreciate the immense practical scope of the subject.*
- *To understand the laboratory practices and laboratory requirements.*
- *To study the procedures involved in Haematology, Bacteriology and Parasitology.*
- *To understand the significance of the examination of body fluids and exudates.*

UNIT – I INTRODUCTION

Scope of Clinical Laboratory Techniques.

Laboratory instruments – Haemocytometer, Haemoglobinometer, and Urinometer.

Cleaning, Sterilization and Disposal of infected materials.

First – aid in laboratories.

Microscopes – Dissection microscope, Compound microscope.

UNIT – II HAEMATOLOGY

Collection of Blood Sample, Isolation of plasma and serum.

Enumeration of Total RBC and Estimation of Haemoglobin.

Enumeration of Total WBC and Differential Leucocyte Count.

Anticoagulants, BT, CT and ESR.

ABO Blood grouping, Rh typing, Cross matching.

UNIT – III BACTERIOLOGY

Morphology of Bacteria

Culture preparation and staining of microorganisms.

Typhoid, Cholera and Meningitis.

Motility test for bacteria – Hanging drop method.

UNIT – IV EXAMINATION OF STOOL, URINE AND OTHER FLUIDS

Gastric juice analysis.

Liver function Test.

Examination of stool specimen

Examination of urine.

Examination of seminal fluid.

Examination of pus and sputum.

UNIT – V HUMAN PARASITES – DISEASES, SYMPTOMS, DIAGNOSIS AND TREATMENT

Malarial parasite, Leishmania and Trypanosoma.

Intestinal Round worm and Tissue Round worm.

Flukes and Tape worm.

TEXTBOOK

Kani, L. Mukerjee. Medical Laboratory Technology, Tata McGraw Hill Publishing Co., Ltd., New Delhi.

REFERENCE BOOKS

Samuel, K.M. Notes on Clinical Lab Techniques. Pub. M.K. Gopalan, Chrompet, Chennai.

Ramnik Sood, M.D. Medical Laboratory Technology – Jaypee Brothers, Medical Publishers (p) Ltd., New Delhi.

Arumugam, N. Microbiology (General and Applied). Saras Publications.

III B.Sc. ZOOLOGY

Year	Paper Title	Sem.	Subject code
2018-19 onwards	CORE PAPER V - EMBRYOLOGY	V	18BZO51C

OBJECTIVES

- *To understand the process of gametogenesis and fertilization.*
- *To undertake a comparative study of cleavage and gastrulation in frog, chick and pig.*
- *To understand certain phenomena integral to developmental biology.*

UNIT-I GAMETOGENESIS AND FERTILIZATION

Spermatogenesis and types of sperms.

Oogenesis, types and classification of eggs.

Types, Process and physiological events of fertilization.

Theories of fertilization.

UNIT-II CLEAVAGE

Planes of cleavage.

Patterns of cleavage.

Cleavage in Frog.

Cleavage in Chick.

Cleavage in Pig.

UNIT-III GASTRULATION

Morphogenetic movements in gastrulation.

Gastrulation in Frog.

Gastrulation in Chick.

Gastrulation in Pig.

UNIT-IV EMBRYONIC AND POST-EMBRYONIC DEVELOPMENT

Organizer - Types, nature of inductors, mechanism of induction.

Organogenesis – Development of Brain.

Regeneration – Types of regeneration, Origin of blastema cells, Events in regeneration.

UNIT-V EMBRYONIC DEVELOPMENT AND FERTILITY CONCEPTS

Extra-embryonic membranes in Chick.

Placentation in mammals.

Infertility and Birth control.

TEXT BOOKS

Verma P. S. and Agarwal V. K. (2014). Chordate Embryology, S. Chand and Company Ltd., New Delhi.

Arumugam N. (2014). A Text Book of Embryology, Saras Publication, Kanyakumari, Tamil Nadu.

REFERENCE BOOKS

Balinsky B. I. and Fabian B.C. (2012). An Introduction to Embryology, 5th Edition, Cengage Learning.

Scott F. Gilbert (2013). Developmental Biology, Sinauer Associates.

III - B.Sc. ZOOLOGY

Year	Paper Title	Sem.	Subject code
2018-19 onwards	CORE PAPER VI: BIOCHEMISTRY & BIOPHYSICS	V	18BZO52C

OBJECTIVES

- *To understand the structure and metabolism of biologically significant molecules.*
- *To appreciate the contribution of enzymes and vitamins to life processes.*
- *To introduce the tools and techniques available for the study of the biochemical and biophysical attributes of life.*

BIOCHEMISTRY

UNIT – I CARBOHYDRATES AND ITS METABOLISM

Carbohydrates – Classification and Structure (Glucose).

Metabolism of Glucose – Glycolysis, Oxidative decarboxylation, Krebs's cycle, Production of ATP.

Glycogenesis, Glycogenolysis, Gluconeogenesis.

UNIT – II PROTEINS, LIPIDS AND THEIR METABOLISM

Protein – Structure, Amino acids – Properties, Peptide bond formation.

Protein metabolism – Transamination & Deamination.

Lipid – Classification, Structure and properties of triglycerides, β -oxidation of fatty acids and Intermediary metabolism.

UNIT – III ENZYMES AND VITAMINS

Enzymes – Classification, Mechanism of enzyme action, Inhibition, Factors affecting enzyme action, Co-enzymes.

Vitamins – Types, Sources, Functions and Deficiency diseases.

BIOPHYSICS

UNIT – IV PHYSICAL PRINCIPLES AND BIOINSTRUMENTS

Microscopy – Principle, Structure and application of Compound microscope, Transmission Electron Microscope and Scanning Electron Microscope.

Centrifugation.

Cell fractionation methods.

UNIT – V PHYSICAL PRINCIPLES AND BIOINSTRUMENTS

Radio isotope Tracer techniques and Autoradiography.

Chromatography – Principles and applications of Paper Chromatography.

Electrophoresis – Principles and applications of PAGE Electrophoresis.

TEXT BOOKS

Satyanarayana U. and Chakrapani U. (2014). Biochemistry, 4th Edition, Books and Allied (P) Ltd., Kolkata.

Palanichamy S. and Shunmugavelu M. (1996). Principles of Biophysics, 2nd Edition, Palani Paramount Publications.

REFERENCE BOOKS

Ambika Shanmugam (2016). Fundamentals of Biochemistry for Medical Students, 8th Edition, Wolters Kluwer India Private Limited.

Lehninger A.L. (2013). Principles of Biochemistry, W. H. Freeman Publishers.

Arumugam N. and Kumaresan V. (2014). Biophysics, Saras Publication, Kanyakumari, Tamil Nadu.

Narayanan P. (2007). Essentials of Biophysics, New Age International Publishers.

III - B.Sc. ZOOLOGY

Year	Paper Title	Sem.	Subject code
2018-19 onwards	CORE PAPER VII - GENETICS	V	18BZO53C

OBJECTIVES

- *To appreciate the relevance of classical genetics.*
- *To gain a molecular level understanding of genetics.*
- *To understand certain genetic disorders and diagnostic methods.*

UNIT – I CLASSICAL GENETICS AND IMMUNOGENETICS

Mendelian laws – Monohybrid and Dihybrid experiments.

Genic interactions – Complementary genes – Supplementary genes (Coat color in mice) – Epistasis (Dominant & Recessive) – Complete dominance – Incomplete dominance – Codominance (Coat colour in cattle).

Multiple alleles – definition – ABO blood groups – Rh factor.

UNIT – II LINKAGE, CROSSING OVER AND POPULATION GENETICS

Linkage – Coupling and repulsion – Types of linkage – Linkage in *Drosophila*.

Crossing over – Mechanism – Tetrads – Theories – Significance of crossing over.

Population genetics – Hardy Weinberg law – Explanation, Significance and Applications.

UNIT – III SEX DETERMINATION AND SEX-LINKED INHERITANCE

Sex determination – Theories – Chromosomal theory – Theory of heterogametes

Genic balance theory – Barr body - Male haploidy – Gynandromorphs – Cytological basis of sex determination – Environmental sex determination – Hormonal theory – Free martins.

Sex-linked inheritance in man – Haemophilia and colour blindness.

UNIT – IV MOLECULAR GENETICS

DNA as genetic material – Griffith's experiment only.

Genetic code.

Gene concept – Cistron, Muton, Recon.

Chromosomal aberrations – Gene mutation – Mutagens.

UNIT – V HUMAN GENETICS

Non-disjunction – Klinefelter's syndrome – Turner's syndrome – Down's syndrome.

Inborn errors of metabolism – Phenylketonuria - Sickle cell anemia.

Eugenics – Euthenics – Euphenics.

Karyotype and Idiogram – Amniocentesis.

TEXT BOOKS

Verma P.S. and Agarwal V.K. (2010). Genetics, 9th Edition, S. Chand Publishing, New Delhi.

Meyyan R. P. (2014). Genetics, Saras Publication, Kanyakumari, Tamil Nadu.

REFERENCE BOOKS

William S. Klug, Michael R. Cummings, Charlotte A. Spencer, Michael A. Palladino (2014). Concepts of genetics. 11th edition. Pearson Education India.

Eldon J. Gardner, Michael J. Simmons and Peter D. Snustad (2006). Principles of Genetics. 8th edition. Wiley India Pvt. Ltd.

Gupta P. K. (2010). Genetics. Rastogi Publication. 4th edition, New Delhi, India.

III B.Sc. ZOOLOGY

Year	Paper Title	Sem.	Subject code
2018-19 onwards	CORE PAPER VIII: EVOLUTION	V	18BZO54C

OBJECTIVES

- *To introduce the concept of origin of life.*
- *To critically evaluate the theories of evolution in the light of available evidences.*
- *To study human evolution from the biological and cultural perspectives.*
- *To understand the laws and concepts associated with evolution.*

UNIT – I ORIGIN AND EVOLUTION OF LIFE

Theories of Origin of life.

Biochemical origin.

Geological time scale.

Zoogeographic realms.

UNIT - II: EVIDENCES OF EVOLUTION

Morphological evidences.

Embryological evidences.

Physiological evidences.

Paleontological evidences.

UNIT – III: THEORIES OF EVOLUTION

Lamarckism.

Darwinism.

Neo Darwinism.

Mutationism.

UNIT - IV: HUMAN EVOLUTION

Biological evolution.

Fossil record of human evolution.

Cultural evolution.

Future evolution.

UNIT - V: CONCEPTS OF EVOLUTION

Hardy - Weinberg law.

Speciation.

Isolation.

Ariyalur fossil system.

TEXT BOOKS

Arumugam N. (2014). Organic Evolution, Saras Publication, Kanyakumari, Tamil Nadu.

Veer Bala Rastogi (2016). Organic Evolution, Medtech Publications, New Delhi.

REFERENCE BOOKS

Pat Willmer (1990). Invertebrate Relationships, 1st Edition, Cambridge University Press.

Edwin H. Colbert, Michael Morales, Eli C. Minkoff (2011). Evolution of the Vertebrates, 5th Edition, Wiley India, New Delhi.

Alfred Sherwood Romer (1966), Vertebrate Paleontology, 2nd Edition, University of Chicago Press.

Abraham J.C.B.(1987). Evolution: A laboratory Manual. Macmillan India Ltd., Madras.

III B.Sc. ZOOLOGY

Year	Paper Title	Sem.	Subject code
2018-19 onwards	SKILL BASED SUBJECT III: ORNAMENTAL FISH CULTURE	V	18BZO55S

OBJECTIVES

- *To introduce the aquarium fishes*
- *To study the steps involved and the equipment required in the establishment of an aquarium.*
- *To understand the breeding, feeding and diseases that affect aquarium fishes.*
- *To understand the economics of ornamental fish culture.*

UNIT – I: ORNAMENTAL FISHES AND THEIR BIOLOGY

Introduction and scope of Ornamental fish culture.

Taxonomy of aquarium fishes – marine – fresh water.

Water tolerance in fishes.

UNIT – II: CONSTRUCTION OF AN ORNAMENTAL FISH TANK

Design and construction of ornamental fish tank.

Aquarium setting. Aquarium accessories – natural and artificial aquatic plants, insects, aerators and heaters.

Water quality management in aquarium fishes.

UNIT – III: BREEDING OF ORNAMENTAL FISHES

Commercially important ornamental fishes.

Selection of species.

Breeding of live bearers.

Breeding of egg layers.

UNIT – IV: FISH FEED AND FISH DISEASES

Culture of live feeds.

Methods of preparation of artificial feeds.

Common diseases and their control.

Viral – Carp pox, Spring Viraemia of carp (SCV)

Bacterial – Fin rot and Fish Dropsy

Fungal – *Saprolegnia* and *Ichthyophonus hoferi*

Protozoan – White spot disease (Ich) and Velvet disease.

UNIT - V: COMMERCIAL ASPECTS OF ORNAMENTAL FISH CULTURE

Transportation of Ornamental fishes.

Economics of ornamental fish culture – setting up of an export oriented unit – financial viability - financial assistance – NABARD.

TEXT BOOKS

Thara Devi C. S., Jayashree K. V., Arumugam N.(2015). Home Aquarium and Ornamental Fish Culture, Saras Publication, Kanyakumari, Tamil Nadu.

Arumugam N(2014). Aquaculture. Saras Publication, Kanyakumari, Tamil Nadu.

REFERENCE BOOKS

Saroj K. Swain Sarangi N. and Ayyappan S. (2010). Ornamental Fish Farming, Indian Council of Agricultural Research, New Delhi.

Ahilan B., Felix N. and Santhanam R. (2008). Textbook of Aquariculture, Daya Publishing House, New Delhi.

Venugopal S. (2006). Aquaculture, Pointer Publishers, Jaipur.

Gupta S. K. and Gupta P. C. (2006). General and Applied Ichthyology, S. Chand Publishing, New Delhi.

III YEAR

Year	Paper Title	Sem.	Subject code
2018-19 onwards	NON-MAJOR ELECTIVE PAPER I: BIOFARMING-I	V	18BZO5EL

(For Non-Zoology students only)

OBJECTIVES

- To introduce the potential avenues for the commercial application of Zoology.
- To understand the basics of Apiculture, Sericulture, Vermiculture, Mushroom culture and Biofertilizer production.

UNIT-I: APICULTURE

Honeybee species in Apiculture, Social organization and Life history of Bees.
Requirements and Hiving of bees.
Honey, bee wax-uses.

UNIT- II: SERICULTURE

Silkworm varieties (Eri, Muga, etc..)
Life cycle of *Bombyx mori*.
Rearing of Silkworm.
Silk – properties and uses.

UNIT- III: VERMICULTURE

Types of earthworms employed in vermicomposting.
Methods of vermicomposting.
Role of earthworm in waste management.

UNIT- IV: MUSHROOM CULTURE

Cultivable edible mushrooms.
Cultivation of oyster mushroom and white button mushroom.
Storage of mushrooms.
Economic importance –Nutritive and medicinal value and other uses of mushrooms.

UNIT- V: BIOFERTILIZERS

Production and application of Bacteria-Rhizobium,
Production and application of Azolla.

TEXT BOOKS

Arumugam N., Murugan T. , Johnson Rajeswar J., Ram Prabhu R. (2014).
Applied Zoology, Saras Publication, Kanyakumari, Tamil Nadu.

Kumaresan V. (2009). Biotechnology, Saras Publication, Kanyakumari, Tamil Nadu.

REFERENCE BOOKS

Dubey R.C. (2014). A Textbook of Biotechnology, S. Chand Publishing, New Delhi.

Upadhyay V. B. and Shukla G. S. (2014). Applied and Economic Zoology, 5th Edition, Rastogi Publications, Meerut.

Seetha Lekshmy M. and Santhi R. (2012). Vermitechnology, Saras Publication, Kanyakumari, Tamil Nadu.

Sultan A. Ismail. (1997). Vermicology – The Biology of Earthworms, Orient Longman, Hyderabad.

III B.Sc. ZOOLOGY

Year	Paper Title	Sem.	Subject code
2018-19 onwards	CORE PAPER IX: IMMUNOLOGY AND MICROBIOLOGY	VI	18BZO61C

OBJECTIVES

- *To understand the concept of immunity and its constituent types.*
- *To study the lymphoid organs, the cells of the immune system and the effector molecules namely, antigens and antibodies.*
- *To study the clinical manifestations of immunological disorders.*
- *To appreciate the diversity of microbes and the significance of certain microbes associated with man.*

UNIT – I TYPES OF IMMUNITY

Immunity- Innate immunity – Physical, Mechanical and Biochemical factors – Cellular factors – Genetic factors.
Acquired immunity – Natural – Artificial –Active – Passive.
Cell mediated immunity.

UNIT – II LYMPHOID ORGANS AND CONSTITUENT CELL TYPES

Lymphoid organs – Primary Lymphoid organs – Thymus – Bursa of Fabricius –Bone marrow.
Secondary Lymphoid organs – Lymph node – Spleen – MALT – Peyer’s patches— Tonsils.
Cells of the immune system – Lymphoid lineage –Myeloid lineage.

UNIT- III EFFECTOR MOLECULES OF THE IMMUNE SYSTEM, VACCINES

AND IMMUNE DISORDERS

Antigens –haptens - chemical nature of antigens – Antigenic determinants – factors of antigenicity.
Antibody – Immunoglobulin – Types and functions of Immunoglobulins – Structure and biological properties of Immunoglobulin G.
Immunizing agents – Vaccines – Types of Vaccines-Common Vaccines.
Auto immune disorders – Definition, Characteristics –Systemic Lupus erythematosus, Rheumatoid arthritis.

UNIT – IV BACTERIA, VIRUS AND ASSOCIATED DISEASES

Classification – Whittaker’s five kingdom concept.
Structure and Reproduction of Bacteria.
Bacterial diseases in Man –Typhoid , Cholera, Tuberculosis.
Structure and Reproduction of T₄ Phage.
Viral diseases in Man – AIDS, Polio, Rabies.

UNIT – V YEAST

Structure and economic importance of yeast.
Sterilization.
Culture media and culture techniques.
Microbiology of food poisoning.

TEXT BOOKS

Dulsy Fatima and Arumugam N. (2014). Immunology, Saras Publication, Kanyakumari, Tamil Nadu.

Arumugam N., Mani A., Selvaraj A.M. and Narayanan L.M. (2014). Microbiology, Saras Publication, Kanyakumari, Tamil Nadu.

REFERENCE BOOKS

Fahim Halim Khan (2009). The Elements of Immunology, Pearson Education, New Delhi, India.

Judith A. Owen, Jenni Punt, Sharon A. Stranford and Patricia P. Jones (2013). Kuby Immunology, 7th Edition, W. H. Freeman Publishers, New York.

Ananthanarayanan K. and Jayaram Panicker C.K. (2017). Text book of Microbiology, 10th Edition, Universities Press, Hyderabad.

Michael J. Pelczar, Chan E.C.S. and Noel R. Krieg (2001). Microbiology, McGraw Hill, New York.

III B.Sc. ZOOLOGY

Year	Paper Title	Sem.	Subject code
2018-19 onwards	CORE PAPER X: BIOTECHNOLOGY	VI	18BZO62C

OBJECTIVES

- To introduce the tools and techniques employed in genetic engineering.
- To understand gene cloning procedures in prokaryotes and eukaryotes.
- To study the techniques of animal cell culture, organ culture, animal cloning and assisted reproduction.
- To appreciate the contribution of biotechnology in medicine, agriculture, industry, food science and environmental protection.

UNIT – I MOLECULAR TOOLS OF GENETIC ENGINEERING

Scope of Biotechnology – Biotechnology tree.

Enzymes - Restriction endonuclease, Reverse transcriptase, Ligase, Alkaline phosphatase, Polymerase – Klenow fragment.

Cloning Vectors – Bacterial vectors – Plasmid (pBR322), Bacteriophage (λ phage), Cosmid (pJB8); Animal viral vector – SV40; Yeast vector – Yac vector.

UNIT—II TECHNIQUES IN GENETIC ENGINEERING

Probes – Construction and Labelling (Radioactive – Random primed method).

Blotting Technique – Southern Blotting.

DNA Sequencing Technique – Sangar and Coulson method.

DNA Amplification Technique – PCR - Technique and Application.

UNIT – III GENE CLONING

In Prokaryotes

Preparation of desired DNA (Restriction digestion, c DNA synthesis, Chemical synthesis-Phosphoramidite method).

Insertion of r DNA (Linkers, Adaptors, Homopolymer tailing).

Introduction of recombinant DNA (Transformation, Transduction, Electroporation).

Selection of rDNA (Direct selection, Colony hybridization).

In Eukaryotes

Introduction of rDNA (Transfection, Liposome mediated gene transfer, Particle bombardment, Virus vector method and Microinjection).

UNIT—IV Animal Cell Culture and ART

Cell culture – Steps involved in the cell culture technique.

Organ culture – Methods and Application.

Assisted Reproductive Technology in man – Artificial insemination (AI), *In vitro* fertilization (IVF), Embryo transfer (ET), Gamete intra – fallopian transfer (GIFT),

Zygote intra – fallopian transfer (ZIFT) and Intra-cytoplasmic sperm injection (ICSI).
Animal Cloning – Nuclear Transfer Method – Cloning in Sheep (DOLLY).

UNIT – V Applied Biotechnology

Medical Biotechnology – Production of Hepatitis B Vaccine, Monoclonal Antibodies and Human insulin.

Agricultural Biotechnology – Production of Bio-fertilizer (*Rhizobium*) and Bio-insecticide (*Bacillus thuringiensis*).

Industrial Biotechnology – Production of Antibiotic (Pencillin) and Alcohol (Ethanol).

Food Biotechnology – Production of SCP (*Spirulina*) and Mushroom (White Button).

Environmental Biotechnology – Biodegradation – Super Bug.

TEXTBOOKS

Kumaresan V. (2009). Biotechnology, Saras Publication, Kanyakumari, Tamil Nadu.

Satyanarayana U. (2005). Biotechnology, 1st Edition, Books and Allied (P) Ltd., Kolkata.

REFERENCE BOOKS

Dubey R.C. (2014). A Textbook of Biotechnology, S. Chand Publishing, New Delhi.

Das H.K. (2017). Textbook of Biotechnology, 5th Edition, Wiley India Pvt. Ltd., New Delhi.

III - B.Sc. ZOOLOGY

Year	Paper Title	Sem.	Subject code
2018-19 onwards	CORE PAPER XI: ECOLOGY AND ETHOLOGY	VI	18BZO63C

OBJECTIVES

- *To understand the inter relationship of various organisms with the ecosystem.*
- *To understand the concept of ecosystem, community, diverse habitats and biological rhythms.*
- *To study the learning process of animals and their behavioural changes.*

UNIT I

Environment – Abiotic factors – atmosphere and temperature.

Limiting factors –Leibig's law and Shelford's law.

Biotic factors – inter specific animal relationship.

Biogeochemical cycle – oxygen, carbon, nitrogen, phosphorus.

UNIT II

Ecosystem – structure and functions – food chain – food web – ecological pyramids.

Community – definition, types, characteristics, stratification, niche, ecotone and edge effect.

Ecological succession – types, pattern, significance.

UNIT III

Habitat – Lentic.

Marine – stratification, intertidal shores, deep sea.

Terrestrial – desert.

Ecological pollution – air, water.

UNIT IV

Ethology – definition, history, scope.

Learning behaviour –types, neural mechanism.

Chronobiology – biological clock, circadian rhythm.

Visual communication – postures and gestures of humans.

UNIT V

Pheromones and behaviour.

Echolocation in bats.

Territorial behaviour of animals.

Speech, language development in bonobo chimpanzees.

TEXT BOOKS

Rastogi V.B. and Jayaraj M. S.(1998). Animal Ecology and Distribution of Animals, Kedar Nath Ram Nath Publishers, Meerut.

Gundevia, H.S. and Hare Govind Singh (2013). A Textbook of Animal Behavior, 7th Edition, S. Chand Publishing, New Delhi.

REFERENCE BOOKS

Eugene P. Odum and Gary W. Barrett (2005). Fundamentals of Ecology, 5th Edition, Cengage Learning Publishers.

Sanjib Chattopadhyay (2012). Life Evolution, Adaptation and Ethology, 3rd Edition, Books and Allied Pvt. Ltd., Kolkata.

III B.Sc. ZOOLOGY

Year	Paper Title	Sem.	Subject code
2018-19 onwards	CORE PAPER XII: BIOINFORMATICS, BIOSTATISTICS & COMPUTER APPLICATIONS	VI	18BZO64C

OBJECTIVES

- *To introduce the basics of bioinformatics- biological databases, retrieval tools and applications.*
- *To understand data collection, data handling and data analysis.*
- *To understand computer components, certain MS Office applications, internet search engines and computer viruses.*

BIO INFORMATICS

UNIT – I: Databases, Proteomics and Genomics

Definition, history, biological databases.

Nomenclature of DNA sequence, protein sequence.

Proteomics – Protein structure, PIR, entry of a SWISSPROT account.

Genomics – Divisions, entry of Gen Bank account.

UNIT – II: Data Retrieval and Applications

Data retrieval tools- Entrez, BLAST.

Bioinformatics in drug design.

Phylogeny analysis in bioinformatics.

Human genome project.

BIOSTATISTICS

UNIT – III: Data and its Representation

Data - types of data, collection of data, methods of collecting primary data, sources of secondary data.

Classification and tabulation of data.

Diagrammatic representation of data- line diagram, bar diagram (simple, component and percentage), pie diagram and pictogram.

Graphic representation of data – histogram, frequency polygon, frequency curve and Ogive.

UNIT – IV: Measures of Central Tendency, Dispersion and Distribution

Measures of central tendency - Arithmetic mean.

Measures of dispersion – Standard deviation and Standard error.

Student's 't' test and Chi-square test.

COMPUTER APPLICATIONS

UNIT - V

Components of computer.

MS Word, Excel, Power point.

Internet – Search engines (Google, Yahoo), Applications.

Computer virus.

TEXT BOOKS

Palanichamy and Manohar S.(2014). Statistics for Biologists, Paramount Publications, Palani.

Ignacimuthu S. (2013). Basic Bioinformatics, 2nd Edition, Alpha Science International Ltd., Narosa Publishing House, New Delhi.

REFERENCE BOOKS

Gupta S.P. (2014). Statistical Methods, 44th Edition, Sultan Chand and Sons Pvt. Ltd., New Delhi.

Rastogi S.C., Mendiratta, N. and Rastogi P. (2013). Bioinformatics – Methods and Applications, 4th Edition, PHI Learning Press, New Delhi.

III B. Sc. ZOOLOGY

Year	Paper Title	Sem.	Subject code
2018-19 onwards	SKILL BASED SUBJECT IV: SERICULTURE AND APICULTURE	VI	18BZO65S

OBJECTIVES

- *To appreciate the scope and economics of sericulture and apiculture.*
- *To study the essentials of sericulture-silkworm rearing, mulberry cultivation, silk production.*
- *To study the essentials of apiculture- beekeeping, honey and other byproduct production.*

SERICULTURE

UNIT – I The Silkworm

History of Sericulture.

Types of Silkworm- Tasar, Muga and Eri.

Races of mulberry silkworm.

Morphology and Life cycle of *Bombyx mori*.

Diseases of Silkworm - Pebrine, Flacherie, Grasserie

UNIT – II Mulberry Cultivation and Rearing of Silkworm

Mulberry cultivation - Preparation of land, Propagation of mulberry plants, Irrigation and Pruning.

Harvesting and Storage of mulberry leaves.

Pests of mulberry plants.

Rearing of Silkworm - Rearing room, Incubation of eggs, Rearing of worms.

Rearing appliances, Feeding, Cleaning, Spacing, Mounting and Harvesting of Cocoon.

UNIT – III Silk and Silk Reeling

Silk Reeling and Appliances.

By products - Commercial value.

Silk properties and uses.

Organic Silk, Dyeing of silk.

Future of Sericulture in India.

APICULTURE

UNIT – IV The Honey Bee

Scope of Apiculture.

Types of Honey Bees- Life Cycle (*Apis indica*).

Bee Keeping and Bee Keeping Equipment. Appliances of apiculture.

Social Organization of Honey Bee.

Bee Language and Communication.

UNIT – V: Products of Apiculture

Products of Apiculture -Honey-Chemical composition-Nutritional value and medicinal value.

Extraction and uses of Bee wax and Bee venom.

Production of Bee wax and Uses.

Bee venom and Uses.

Bee enemies and Diseases - Nosima, Acarine, Septecaemia.

TEXT BOOKS

Ganga G. and Sulochana Chetty J. (2010). An Introduction to Sericulture, 2nd Edition, Oxford and IBH Publishing House Co. Pvt. Ltd., New Delhi.

Jayashree K. V., Thara Devi C. S. and Arumugam N. (2015). Apiculture, Saras Publication, Kanyakumari, Tamil Nadu.

REFERENCE BOOKS

Venkatanarasaiah P. (2002). Sericulture, Daya Publishing House, New Delhi.

Kumar A. and Nigam P. M. (2008). Economic and Applied Entomology, Emkay Publications.

Upadhyay V. B. and Shukla G. S. (2014). Applied and Economic Zoology, 5th Edition, Rastogi Publications, Meerut.

III – YEAR

Year	Paper Title	Sem.	Subject code
2018-19 onwards	NON – MAJOR ELECTIVE II : BIOFARMING –II	VI	18BZO6EL

(For Non - Zoology students only)

UNIT- I: Ornamental Fish Culture

Aquarium – aims of aquarium.

Requirements in setting of an aquarium.

Aquarium fishes.

UNIT - II: Poultry Keeping

Fowl breeds – Indigenous and Exotic.

Rearing of chicken- fowl house, food and feeding of fowl.

Poultry products-eggs, by-products.

UNIT – III: Cattle Farming

Breeds of dairy animals - cow and goat.

Rearing, food and feeding.

Products-milk and milk products (curd, butter, ghee).

UNIT - IV: Rabbit Farming

Breeds of rabbits.

Care and management of rabbit farms.

Products-meat, fur and wool.

UNIT – V: Pig Farming

Breeds of pig.

Products of piggery.

TEXT BOOKS

Upadhyay V. B. and Shukla G. S. (2014). Applied and Economic Zoology, 5th Edition, Rastogi Publications, Meerut.

Narahari D.(2010). Commercial Broiler Production, Emkay Publications.

REFERENCE BOOKS

Kumar A. and Nigam P. M. (2008). Economic and Applied Entomology, Emkay Publications.

III B.Sc. ZOOLOGY

Year	Paper Title	Sem.	Subject code
2018-19 onwards	CORE PRACATICAL III	V & VI	18BZO67P

(Includes Paper VIII: Evolution, Paper XI: Ecology & Ethology and Paper XII: Bio informatics, Biostatistics and Computer applications)

EVOLUTION

- Homologous organs.
- Analogous organs.
- Study of fossils – Living fossils.

ECOLOGY and ETHOLOGY

- Measurement of pH of water samples.
- Estimation of salinity of water samples.
- Estimation of dissolved oxygen in water samples.
- Study of planktons- Marine and Freshwater.
- Animal associations.
- Study of fauna
 - a. Intertidal rocky shore
 - b. Sandy shore
 - c. Muddy shore

BIOSTATISTICS

- Collection of Biological data.
- Frequency distribution.
- Representation of data – Histogram, Frequency polygon.

BIOINFORMATICS

- Browsing of different sites related to bioinformatics.
- Collection of data from different sources.
- Entry page of SWISS PROT and BLAST.

COMPUTER APPLICATIONS

- MS – Word.
- MS – Excel.
- MS – Power point.

III B.Sc. ZOOLOGY

Year	Paper Title	Sem.	Subject code
2018-19 onwards	CORE PRACTICAL IV	V & VI	18BZO68P

(Includes Paper V: Embryology; Paper VI: Biochemistry and Biophysics and Paper VII: Genetics)

BIO CHEMISTRY

Qualitative determination of Biomolecules in biological substances by the following tests

A. Determination of Carbohydrate

- (i) Iodine test
- (ii) Benedicts test
- (iii) Fehling's test

B Determination of Protein

- (i) Biuret test
- (ii) Ninhydrin test
- (iii) Millons test

C Determination of Lipids

- (i) Dichromate test
- (ii) Emulsification test
- (iii) Test for free fatty acid - Saponification

BIOPHYSICS

Compound microscope

Electrophoretic apparatus

Centrifuge

EMBRYOLOGY

Observation of prepared slides

- a. Different Developmental stages of Chick
- b. Cleavages in frog cell

Foetal Membranes and Placenta

- a. Pig
- b. Sheep
- c. Rabbit

GENETICS

Identification of male and female Drosophila.

Study of the culture of Drosophila.

Blood Grouping in man.

Identification of Finger prints (Whorl, Arch, Loop)

III – B.Sc. ZOOLOGY

Year	Paper Title	Sem.	Subject code
2018-19 onwards	CORE PRACTICAL V	V & VI	18BZO69P

(Includes Paper IX: Immunology and Microbiology and Paper X: Biotechnology)

IMMUNOLOGY

Observation of slides of primary and secondary Lymphoid organs

- a. Thymus
- b. Bone marrow
- c. Spleen
- d. Lymph node

Study of immunological tests

- a. WIDAL
- b. VDRL
- c. ELISA

MICROBIOLOGY AND BIOTECHNOLOGY

Calibration of the ocular micrometer.

Measurement of the diameter of yeast.

Measurement of the diameter of Paramecium.

Preparation of microbial culture media

- a. Slab b. Slant c. Agar plate

Staining techniques

- a. Simple staining b. Negative staining c. Differential staining

Methylene blue reduction test – MBR.

Study of bread mould.

Isolation of DNA from squamous epithelial cells.

Immobilization of yeast cells.

SPOTTERS

Inoculation loop

Inoculation needle

Autoclave

Hot air oven

Laminar Air flow

Southern blotting

Polymerase Chain Reaction - PCR

SDS-PAGE