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BENGALURU CITY UNIVERSITY
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# BENGALURU CITY UNIVERSITY

## Syllabus for

## B.Sc. Zoology (UG)

CHOICE BASED CREDIT SYSTEM (CBCS)

**Framed According to the State Educational Policy (SEP 2024)**

I and IV SEMESTERS

**[To be implemented from the academic year 2025-26]**

BENGALURU CITY UNIVERSITY, BENGALURU
Proceedings of the meeting of BOS (UG) in Zoology and Genetics

Ref: 1) BCU/BOS/SEP/376/2024-25 Dated, 29-01-2025
2) BCU/Syn/BOS/Zoology & Genetics (UG)/404/2024-25 Dated 03-03-2025

The Chairperson – BOS in Zoology / Genetics, Bengaluru City University, Bengaluru greeted the BOS Members before the commencement of the meeting

A meeting of Board of Studies in Zoology and Genetics of BCU was held on 11th and 12th March 2025 (during 10.30am to 4.30pm) at Department of Zoology, Bengaluru City University, Bengaluru to scrutinize the drafted syllabus pertaining to B.Sc. Zoology and Genetics, Bengaluru City University in accordance with SEP-2024

**Agenda 1: Approval of Syllabi for 3rd – 4th Semester B.Sc., Zoology and B.Sc., Genetics under SEP-2024**
**Resolution:** The proposed syllabus for 3rd – 4th Semester B.Sc., Zoology and B.Sc., Genetics (both theory and practical) and as well as the scheme of examination were scrutinized thoroughly, finalized with appropriate inclusion(s) deletion(s) of the contents and finally approved on 12th March 2025.

**Agenda 2: Approval of panel of examiners for B.Sc., Zoology and B.Sc., Genetics for the academic year 2025-2026**
**Resolution:** The given panel of examiners for UG Zoology and Genetics for the year 2025-2026 were scrutinized thoroughly, finalized with appropriate inclusion(s) deletion(s) of the contents and finally approved.
The meeting was concluded with the chairperson thanking all the members for rendering cooperation for the smooth conduct of the meeting.

**The following BOS members attended the meeting**

| Sl.No | Name of the Chairman / Member | Designation | Signature |
|---|---|---|---|
| 1. | Dr.B P Harini, Professor & Chairperson, Dept. of Zoology, Bangalore University, Bengaluru-560056 (Ph.No:9448939066) | Chairperson | |
| 2. | Dr. Ashalatha, Associate Professor, Vijaya College, R.V. Road, Bengaluru-560004 (Ph.No.9480019720) | Member | B. Ashalatha 11/3/25 |
| 3. | Dr. Rama Krishnaiah, Associate Professor, M.S Ramaiah College, Bengaluru (Ph.No.9611928200) | Member | |
| 4. | Gopala Krishna, Associate Professor, Dept. Genetics & Biotechnology, Vijaya College, R.V. Road, Bengaluru-560004 (Ph.No.7019272375) | Member | ABSENT |
| 5. | Dr. Salma Banu, Associate Professor, Seshadri Puram, First Grade College, Yelahanka (Ph.No. 9886703351) | Member | Salma B |
| 6. | Dr. Shubha M, Assistant Professor, Department of Zoology, BMS College for Women, Basavanagudi, Bengaluru – 560 004 (Ph.No. 9900782822) | Member | |
| 7. | Dr.C.E. Thriveni, Assistant Professor, V.V. Puram College of Science, Bengaluru-4. (Ph.No. 9902452934) | Member | Dr. C.E. Thriveni |
| 8. | Dr. Anil G.B. Assistant Professor, MES Degree College of Arts, Science & Commerce, Malleshwaram, Bengaluru (Ph.No.9611325048) | Member | |
| 9. | Dr. Abhinandini I, David, Associate Professor, Maharanis College for Womens, Mysore, (Ph.No. 9964123301) | Member | |
| 10. | Dr. J.S. Asha Devi, Professor, Dept. of Zoology, Yuvarajas College Mysore (Ph.No.9448258374 | Member | ABSENT |
| 11. | Dr. Rakesh H, Faculty, Dept. of Zoology, BUB | Co-opt Member | Rakesh. H |
| 12. | Dr. Shalini M, Faculty, Dept. of Genetics, BUB | Co-opt Member | M. Shalini |

Yours Sincerely,

(B.P.HARINI)
BOS Chairperson- BCU

PROFESSOR AND CHAIRPERSON
Department of Zoology
Bangalore University, Jnanabharathi
Bengaluru - 560 056

# F O R E W O R D

As per the recommendations made by State Education Policy (SEP) led by Prof. Sukhdeo Thorat commission, the Government of Karnataka has reinforced the three-year degree programme from the academic year 2024-25. The new changes come close on the heels of students and colleges who have expressed concerns over the lack of clarity in pursuing a four-year programme as per NEP. As per the recommendations, now colleges can offer degrees with three majors with a general degree in all six semesters; three majors up to fourth semester, and specialization in one subject in fifth and sixth semester or; a single subject specialization from first semester with minors. In addition to majors and specialization courses, the three subjects will be compulsory. First a course with practical (skill) orientation which is linked to the theoretical major course and is expected to improve employability. Students have to learn two languages: Kannada/ other Indian languages, and English. The third compulsory subject is value or moral education which will include teaching constitutional moral values/ principles of equality, liberty, fraternity, national unity, non-discrimination and similar values. Two electives that can be selected by the students based on the availability of courses may be discipline based or distinctly related to discipline-based majors. It is recommended that a tutorial or assignment with a project component based on the survey which will give or involve practical experience may be included. It is also suggested that skill enhancement course with a tutorial based on the survey/laboratory be introduced for single subject specialization and deep specialization in 5th and 6th semesters. The examination pattern will be 80:20-80 for the semester-end exam, and 20 for internal assessment. Likewise, for practical oriented science subjects, the examination pattern will be 40:10-40 for the semester-end practical exam, and 10 for internal assessment.

The prominent features of the new scheme framework are:

1. Colleges can offer degrees with three majors-three majors up to fourth semester, and specialization in one subject in fifth and sixth semester or; a single subject specialization from first semester with minors. In addition to majors and specialization courses, the three subjects will be compulsory.
2. Students have to learn two languages: Kannada/ other Indian languages, and English.
3. The third compulsory subject is value or moral education which will include teaching constitutional moral values/ principles of equality, liberty, fraternity, national unity, non- discrimination and similar values.
4. Two electives that can be selected by the students based on the availability of courses may be discipline based or distinctly related to discipline-based majors.

I am delighted to present curriculum structure pertaining to B.Sc., Degree in subject Zoology. I hope that the curriculum structure and syllabus will pave the way for overall development of the student community. I ensure that, student's community will procure the benefits at large in higher education.

**Dr. B. P. HARINI**
Chairperson - BOS (UG)
Zoology & Genetics
Bengaluru City
University

# BENGALURU CITY UNIVERSITY

# DEPARTMENT OF ZOOLOGY

## Credit framework for Science Stream (B. Sc.,) with 3-major subjects (3 + 2 C)

| Semester | CORE-1 (T + P) | CORE-2 (T + P) | CORE-3 (T + P) | Elective (E) | Languages (1 & 2) | Compulsory Skill | Total credits |
|---|---|---|---|---|---|---|---|
| I semester | 3 +2 = 5 | 3 +2 = 5 | 3 +2 = 5 | | L-1= 3<br>L-2= 3 | C-1 (Constitution Values) = 2 | 23 |
| II semester | 3 +2 = 5 | 3 +2 = 5 | 3 +2 = 5 | | L-1= 3<br>L-2= 3 | C-2 (Constitution Values + EVS) = 4 | 25 |
| III semester | 3 +2 = 5 | 3 +2 = 5 | 3 +2 = 5 | E-1= 2 | L-1= 3<br>L-2= 3 | | 23 |
| IV semester | 3 +2 = 5 | 3 +2 = 5 | 3 +2 = 5 | E-2= 2 | L-1= 3<br>L-2= 3 | Skill-1 = 2 (Pr.knowd.) | 25 |
| V semester (2 T^^ + 1 P) | 3 +2 = 5<br>3 +0 = 3 | 3 +2 = 5<br>3 +0 = 3 | 3 +2 = 5<br>3 +0 = 3 | | | Skill-2 = 2 (Pr.knowd.) | 26 |
| VI semester (2 T^^ + 1 P) | 3 +2 = 5<br>3 +0 = 3 | 3 +2 = 5<br>3 +0 = 3 | 3 +2 = 5<br>3 +0 = 3 | | | Skill-3 = 2 (Pr.knowd) | 26 |
| Total | 36 | 36 | 36 | 4 | 24 | 12 | 148 |

All numerical may read as credits

Note **- (Two theory): 2** T ^^ with approval from Academic bodies.

# BENGALURU CITY UNIVERSITY
## CREDIT DISTRIBUTION FOR THE COURSE
## CURRICULUM FOR B. Sc., ZOOLOGY (UG) 2025-26

| Title of the Paper | Total no. of hours | Contact hrs./week | Exam hrs. | I. A | End Sem Ex. Marks | Total marks | Credits |
|---|---|---|---|---|---|---|---|
| **1st and 2nd Semester (Revised as per SEP 2025-2026)** | | | | | | | |
| **FIRST SEMESTER** | | | | | | | |
| Zoology-I: DSCZOO-T1<br>**Systematics and Animal Diversity - 1**<br>(Protozoa To Hemichordata) | 56 hrs | 4 | 3 | 20 | 80 | 100 | 3 |
| Zoology Practical- I: DSCZOO-P1<br>**Systematics and Animal Diversity-1**<br>(Protozoa To Hemichordata) | 30 hrs | 3 | 3 | 10 | 40 | 50 | 2 |
| **SECOND SEMESTER** | | | | | | | |
| Zoology-II: DSCZOO-T2<br>**Animal Diversity -2**<br>(Protochordata To-Mammalia) | 56 hrs | 4 | 3 | 20 | 80 | 100 | 3 |
| Zoology Practical- II: DSCZOO-P2<br>**Animal Diversity -2**<br>(Protochordata To-Mammalia) | 30 hrs | 3 | 3 | 10 | 40 | 50 | 2 |
| **3rd and 4th (Framed as per SEP 2025-2026)** | | | | | | | |
| **THIRD SEMESTER** | | | | | | | |
| Zoology-III: DSCZOO-T3<br>**Anatomy and Histology.** | 56 hrs | 4 | 3 | 20 | 80 | 100 | 3 |
| Zoology Practical-III: DSCZOO-P3<br>**Anatomy and Histology** | 30 hrs | 3 | 3 | 10 | 40 | 50 | 2 |
| *Zoology Elective-1: DSEZOO-1**<br>**Biology of Parasites and Diseases** | 28 hrs | 2 | 1.5 | 10 | 40 | 50 | 2 |
| **FOURTH SEMESTER** | | | | | | | |
| Zoology-IV: DSCZOO-T4<br>**Cell Biology, Immunology and Genetics** | 56 hrs | 4 | 3 | 20 | 80 | 100 | 3 |
| Zoology Practical-IV: DSCZOO-P4<br>**Cell Biology, Immunology and Genetics** | 30 hrs | 3 | 3 | 10 | 40 | 50 | 2 |
| *Zoology Elective-2: DSEZOO-2**<br>**Food, Health and Nutrition** | 28 hrs | 2 | 1.5 | 10 | 40 | 50 | 2 |
| **SKILL-1**: COMPULSORY<br>**Applied Zoology-I (Economic Zoology)** | 30 hrs | 3 | 3 | 10 | 40 | 50 | 2 |
| | | | | | | | |
| **FIFTH SEMESTER** | | | | | | | |
| Zoology-V: ZOO-T5<br>**Animal Physiology and Endocrinology** | 56 hrs | 4 | 3 | 20 | 80 | 100 | 3 |
| Zoology Practical-V: DSCZOO-P5<br>**Animal Physiology and Endocrinology** | 30 hrs | 3 | 3 | 10 | 40 | 50 | 2 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Zoology-VI: DSCZOO-T6<br>**Biostatistics and Techniques in Biology** | 56 hrs | 4 | 3 | 20 | 80 | 100 | 3 |
| **SKILL-2**: COMPULSORY<br>**Applied Zoology-II**<br>**(Title to be confirmed)** | 30 hrs | 3 | 3 | 10 | 40 | 50 | 2 |
| **SIXTH SEMESTER** | | | | | | | |
| Zoology-VII: DSCZOO-T7<br>**Developmental Biology and Environmental Biology** | 56 hrs | 4 | 3 | 20 | 80 | 100 | 3 |
| Zoology Practical-VI: DSCZOO-P6<br>**Developmental Biology and Environmental Biology** | 30 hrs | 3 | 3 | 10 | 40 | 50 | 2 |
| Zoology-VIII: DSCZOO-T8<br>**Evolutionary Biology and Behavioural Biology** | 56 hrs | 4 | 3 | 20 | 80 | 100 | 3 |
| **SKILL-3**: **INTERNSHIP** | 90 hrs | 3 | 2 | 10 | 40 | 50 | 2 |

# Syllabus for B.Sc., in Zoology

## Introduction

The curriculum framework takes into account the need to maintain globally competitive standards of achievement in terms of the knowledge and skills in Zoology and allied courses, as well develop scientific orientation, spirit of enquiry problem solving skills and human and professional values which foster rational and critical thinking in the students. This course serves as plethora of opportunities in different fields right from classical to applied Zoology.

## PROGRAM OUTCOMES IN B. Sc Zoology (UG)

- **PO1** - Students gain knowledge and skill in the fundamentals of animal sciences, understands the complex interactions among various living organisms.
- **PO2** – Analyse complex interactions among the various animals of different phyla, their distribution and their relationship with the environment.
- **PO3** – Apply the knowledge of internal structure of cell, its functions in control of various metabolic functions of organisms.
- **PO4** – Understands the complex evolutionary processes and behaviour of animals.
- **PO5** – Correlating the physiological processes and relationship of organ systems.
- **PO6** – Understanding of environmental conservation processes and its importance, pollution control and biodiversity and protection of endangered species.
- **PO7** – Gain knowledge of Agro based Small Scale industries like sericulture, fish farming, butterfly farming and vermicomposting preparation.
- **PO8** – Understands about concepts of genetics and its importance in human health.
- **PO10** – Apply the knowledge and understanding of Zoology to one's own life and work
- **PO11** – Develops empathy and love towards the animals.
- **PO12**– To correlate the relationships among animals, plants and microbes.

## Program Specific Outcomes:

- **PSO1**. Understand the nature and basic concepts of cell biology, genetics, taxonomy, physiology, ecology and applied Zoology.
- **PSO2**. Analyse the relationships among animals, plants and microbes.
- **PSO3**. Perform procedures as per laboratory standards in the areas of Taxonomy, Physiology, Ecology, Cell biology, Genetics, Applied Zoology, tools and techniques of Zoology, Toxicology, Entomology, Nematology, Sericulture, Biochemistry, Fish biology, Animal biotechnology, Immunology and research methodology.
- **PSO4**. Understand the applications of biological sciences in Apiculture, Aquaculture, Agriculture and Medicine.
- **PSO5**. Gains knowledge about research methodologies, effective communication and skills of problem-solving methods.
- **PSO6**. Contributes the knowledge for Nation building.

**GRADUATE ATTRIBUTES IN B.Sc., Zoology**

Some of the characteristic attributes a graduate in Zoology should possess are:

- Develop the essential and fundamental skills required to enter the professional world of animal sciences.
- Tasks, including DNA analysis and trace evidence examination.
- Skilled communication and developing scientific knowledge.
- Critical thinking and problem-solving capacity:
- Ethical awareness / reasoning.

**Weightage for assessments**

| Type of Course | Formative Assessment / IA Marks | Summative Assessment Marks |
|---|---|---|
| **Theory** | **20** | **80** |
| **Practical** | **10** | **40** |

Outline of the blue-print of Question papers to be prepared. (% of share in each category)

## THEORY

- Part – A: Short answer questions: (Answer any 5 out of 8) 5x 2 = 10
- Part – B: Medium size questions: (Answer any 6 out of 8) (to test overall understanding of subject): - 6x 5 = 30
- Part – C: Essay type questions: (Answer any 4 out of 6) (to test overall understanding of subject): - 4 X 10 = 40

Total Marks: 80

IA marks: 20

**Total: 100**

## PRACTICALS

Total Practical exam Marks: 40

IA marks: 10

**Total: 50**

# I SEMESTER B.Sc., ZOOLOGY THEORY SYLLABUS

## THEORY PAPER: SYSTEMATICS AND ANIMAL DIVERSITY – I

(Protozoa to Hemichordata)

| Program Name | **B.Sc.** | **Semester:** | **I** |
|---|---|---|---|
| Course Title | **Systematics and Animal Diversity - I** (Protozoa to Hemichordata) | | |
| Course Code: | **DSCZOO-T1** | No. of Credits: | **3** |
| Contact hours: | **56 Hours** | Duration of SEA/Exam: | **3 hrs.** |
| Formative Assessment Marks: | **20** | Summative Assessment Marks: | **80** |

**Course Out comes (COs**): After the successful completion of the course, the student will be able to:

**CO1:** Group animals on the basis of their morphological characteristics/structures.
**CO2:** Demonstrate comprehensive identification abilities of Non-Chordate diversity.

**CO3:** Explain structural and functional diversity of Non-Chordates.

**CO4:** Develop understanding on the diversity of life with regard to Protists, non-chordates and chordates.

**CO5:** Examine the diversity and evolutionary history of a taxon through the construction of a basic phylogenetic/cladistics tree.

**Course Pre-requisite(s):** outcome

**Course Articulation Matrix: Mapping of Course Outcomes (COs) with Program Out comes (POs)**

| **Course Outcomes (COs)/(POs)** | DSCZOO-T1 |
|---|---|
| I Core competency | X |
| II Critical thinking | X |
| III Analytical reasoning | X |
| IV Research skills | X |
| V Team work | X |

Course Articulation Matrix relates course outcomes of course with the corresponding program out comes whose attainment is attempted in this course. Mark 'X' in the inter section cell if a course outcome addresses a particular program.

| Content | 56 hrs |
|---|---|
| **Unit - I** | **14 hrs** |
| **Chapter 1: Systematics.**<br>• Concept and significance of taxonomy.<br>• Zoological classification- Uses, kinds of classification and Linnean hierarchy.<br>• Rules and Codes of binomial nomenclature.<br>• ICZN – features, code and ICZN rules.<br>• Phylogenic tree- Features and types- Dendrogram, phenogram, cladogram, curvogram and phylogram. Significance of phylogram.<br>• Collection and preservation of natural history specimens: Formalin preservation, Alcohol Preservation. Stuffed animal preservation, Bone Preservation, Dry specimen preservation (Insects)<br><br>**Chapter 2: Introduction to Animal Architecture.**<br>• Outline classification of Kingdom Animalia up to the level of phyla.<br>• Body organization: Levels of organization- Protoplasmic, cellular, tissue, and organ with examples<br>• Body Symmetry - Definition and its types-asymmetry, spherical, radial, biradial and bi-lateral with examples.<br>• Germ layers – Definition and its types- Diploblastic and Triploblastic with examples<br>• Body Coelom – Definition, and its types- a coelom, pseudo coelom, eucoelom (Enterocoelome and schizocoelom) with examples<br>• Metamerism - Definition and its types with suitable examples- pseudometamerism, true metamerism- homonomous and heteronomous. | |
| **Unit - II** | **14 hrs** |
| **Chapter 3: Protozoans, Poriferans and Coelenterates**<br>**Phylum Protozoa:**<br>• General characteristics of the phylum; classification up to classes with suitable examples.<br>• Types of nutrition: Autotrophic, holozoic, saprozoic, holophytic and parasitic with an example for each.<br>• Locomotion: Amoeboid (Walking movement and Sol-Gel theory) - *Amoeba*, *Euglena,* Flagellar and euglenoid, ciliary movement – *Paramecium*.<br>• Reproduction: Binary fission and conjugation in *Paramecium caudatum*; significance of conjugation.<br>**Phylum Porifera:**<br>• General characteristics of the phylum; classification up to classes with suitable examples.<br>• *Sycon* - Morphology, T.S of body wall.<br>• Canal system and its evolution: Asconoid, Syconoid and Leuconoid types.<br><br>**Phylum Coelenterata:**<br>• General characteristics of the phylum; classification up to classes with suitable examples.<br>• Polymorphism with reference to *Halistemma*. | |

| | |
|---|---|
| • Coral reefs: Definition and its types.<br>Ctenophora – Salient features and its affinities. | |
| **Unit - III** | **14 hrs** |
| **Chapter 4: Helminthes**<br>**Phylum Platyhelminthes:**<br>• General characteristics of the phylum; classification up to classes with suitable examples.<br><br>**Phylum Nematoda:**<br>• General characteristics of the phylum; classification up to classes with suitable examples.<br><br>**Chapter 5: Annelids**<br>**Phylum Annelida:**<br>• General characteristics of the phylum; classification up to classes with suitable examples.<br>• Type study of Earthworm *(Pheretima posthuma)*- Morphology, digestive system, and excretory system.<br><br>**Chapter 6: Arthropods**<br>**Phylum Arthropoda:**<br>• General characteristics of the phylum; classification up to classes with suitable examples.<br>• Peripatus: Morphology, Affinities with Annelida and Arthropoda, Unique characteristics; systematic position.<br>• Respiratory organs: Gills, trachea and book lungs.<br>• Sense organs: Simple eye and compound eye.<br>• Metamorphosis in insects and its types.<br>• Neuro-endocrine regulation of metamorphosis in *Bombyx mori*. | |
| **Unit - IV** | **14 hrs** |
| **Chapter 7: Molluscs**<br>**Phylum Mollusca:**<br>• General characteristics of the phylum; classification up to classes with suitable examples.<br>• *Unio* - morphology, ultrastructure of the shell (External view, internal view and sectional view), respiratory system and life cycle.<br>• Modification of the foot: *Chiton, Dentalium, Pila, Aplysia, Mytilus, Sepia* and Octopus.<br>**Chapter 8: Echinoderms and Hemichordates**<br>**Phylum Echinodermata:**<br>• General characteristics of the phylum; classification up to classes with suitable examples.<br>• *Asterias* – morphology and Water vascular system.<br>• Structure and significance of Echinoderm larvae: Bipinnaria, Echinopluteus.<br><br>**Phylum Hemichordata**: | |

| | |
|---|---|
| • General characteristics of hemichordata.<br>• Balanoglossus: morphology and coelom.<br>Tornaria larva and its significance. | |

**Pedagogy:** Lectures, Presentations, Videos, Assignments and Weekly Formative Assessment Test

| **Formative Assessment for Theory** | |
|---|---|
| **Assessment Occasion / type** | **Marks** |
| House Examination/Test | 10 |
| Written Assessment/Presentation/Project/Term Papers/Seminars | 05 |
| Classroom Performance/Participation | 05 |
| **Total** | **20 Marks** |

## I SEMESTER B.Sc., ZOOLOGY PRACTICAL SYLLABUS

## PRACTICAL PAPER: SYSTEMATICS AND ANIMAL DIVERSITY - I

(Protozoa to Hemichordata)

| | | | |
|---|---|---|---|
| Course Title: | **Systematics and Animal Diversity - I** | Practical Credits: | **2** |
| Course Code: | **DSCZOO-P1** | Contact Hours: | **30 hrs** |
| | | Hours / Week: | **03 hrs** |
| Formative Assessment: | **10 Marks** | Summative Assessment: | **40 Marks** |

**Course Outcomes (COs**): After the completion of the course, the student will be able to:

**CO1:** Understand basics of classification of non-chordates.
**CO2:** Learn the diversity of habit and habitat of these species.
**CO3:** Develop the skills to identify different classes and species of animals.
**CO4:** Know uniqueness of a particular animal and its importance.
**CO5:** Enhancement of basic laboratory skill like keen observation and drawing.

**Course Pre-requisite(s):**

**Course Articulation Matrix: Mapping of Course Outcomes (COs) with Program Out comes (POs)**

| Course Outcomes (COs)/(POs) | DSCZOO-P1 |
|---|---|
| I Core competency | X |
| II Critical thinking | X |
| III Analytical reasoning | X |
| IV Research skills | X |
| V Team work | X |

Course Articulation Matrix relates course outcomes of course with the corresponding program out comes whose attainment is attempted in this course. Mark 'X' in the inter section cell if a course outcome addresses a particular program outcome.

| Practical Contents | 10 Units |
|---|---|
| Scientific microscopic drawing by using camera lucida.<br>**Protozoa**: Systematics of *Amoeba*, *Euglena*, *Noctiluca*, *Paramecium* and *Vorticella* (Permanent slides). (**Any Three**).<br>**Porifera:** Systematics of *Sycon, Euplectella, Hyalonema, Spongilla* and *Euspongia* (Specimens). Study of permanent slides of T.S of *Sycon*, spicules and gemmules. (**Two specimens + 1 slide)**<br>**Cnidaria:** Systematics of *Aurelia* and *Metridium* (Specimens). Slides of *Hydra*, *Obelia*-polyp and medusa, and *Ephyra* larva, T.S. of *Metridium* passing through mesenteries. (**Any Three**)<br>**Study of Corals** - *Astraea, Fungia, Meandrina, Corallium, Gorgonia, Millepora* and *Pennatula***. (Any Three***)*<br>**Helminthes:** Systematics of *Planaria*, *Fasciola hepatica* and *Taenia solium*, Ascaris-Male and female (Specimens). Slides of T.S. of *Planaria*, of male and female Ascaris. (**Any Three - Ascaris compulsory**).<br>**Annelida:** Systematics of *Nereis, Sabella, Aphrodite* and Leech (Specimens). Slide of T.S. of Earthworm through typhlosole. (**Any Three**)<br>**Arthropoda**: Systematics of *Panaeus, Palaemon, Astracus,* Scorpion, Spider, *Limulus, Peripatus, Millipede, Centipede,* Prayingmantis, Termite Queen, Moth, Butterfly, Dung beetle / Rhinocerous beetle. Slide of Larvae-Nauplius, Zoea and Mysis. **(Any Five specimens + 2 larva)**<br>**Mollusca:** Systematics of *Chiton, Mytilus, Aplysia, Pila, Octopus, Sepia* (Specimens) and Glochidium larva (Slide). (**Any Three)**<br>**Shell Pattern**-*Unio, Ostrea, Cypria, Murex, Nautilus, Patella, Dentalium,* Cuttlebone. (**Any Three**).<br>**Echinodermata**: Systematics of Seastar, Brittlestar, Sea Urchin, Sea cucumber, Sealilly (Specimens). Slides of Bipinnaria larva, Echinopluteus | |

| | |
|---|---|
| larva and Pedicellaria. (**Any Three + 1 larva**)<br>**Beneficial Non-chordates: Sericulture:** Lifecycle of *Bombyx mori*, Cocoon, Raw silk.<br>**Virtual Dissection/Cultured specimens:** Leech - Digestive system, **Earthworm** – Nervous system, Cockroach – salivary apparatus and Digestive system. | |

**Pedagogy:** Lectures, Presentations, Videos, Assignments and Weekly Formative Assessment Tests

Note: Field visit to nearby National Park/ Wildlife sanctuary/ any National laboratory at the end of semester is compulsory and the report of this is to be submitted along with practical record as a part of practical examination.

| **Formative Assessment for Practical** | |
|---|---|
| **Assessment Occasion/type** | **Marks** |
| House Examination/Test | 05 |
| Class room Performance/Participation | 05 |
| **Total** | **10 Marks** |

**References:**


1. Barnes, R.S.K.; Calow,P.; Olive,P.J.W.; Golding,D.W.; Spicer, J.I. (2002) The Invertebrates: Synthesis, Blackwell Publishing.
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3. Holland, P. (2011) The Animal Kingdom: A Very Short Introduction, Oxford University Press.
4. Kardong, K.V. (2006) Vertebrates: Comparative Anatomy, Function, Evolution (4thedition), McGraw-Hill.
5. Barrington, E.J.W. (1979) Invertebrate Structure and Functions. II Edition. E.L.B.S. and Nelson.
6. Boradale, L.A. and Potts, E.A. (1961) Invertebrates: A Manual for the use of Students. Asia Publishing Home.
7. Bushbaum, R. (1964) Animals without Back bones. University of Chicago Press.

# II SEMESTER B.SC., ZOOLOGY THEORY SYLLABUS

## THEORY PAPER: DIVERSITY OF LIFE-II

(Protochordata to Mammalia)

| | | | |
|---|---|---|---|
| Program Name: | **B.Sc., Zoology** | **Semester:** | **II** |
| Course Title: | **DIVERSITY OF LIFE - II** (Protochordata to Mammalia) | | |
| Course Code: | **DSCZOO-T2** | No. of Credits: | **3** |
| Contact hours: | **56 Hours** | Duration of SEA/Exam: | **3 hrs** |
| | | Hours / Week: | **4 hrs** |
| Formative Assessment Marks: | **20** | Summative Assessment Marks: | **80** |

**Course Pre-requisite(s):** Outcome

**Course Out comes (COs**): After the successful completion of the course, the student will be able to:

**CO1:** To demonstrate comprehensive identification abilities of chordate diversity.
**CO2.** Able to explain structural and functional diversity of chordate diversity.
**CO3**. To understand evolutionary relationship amongst chordates.
**CO4.** To take up research in biological sciences.
**CO5.** To realize that very similar physiological mechanisms are used in very diverse organisms.

**Course Articulation Matrix: Mapping of Course Outcomes (COs) with Program Out comes (POs)**

| **Course Outcomes (COs)/(POs)** | **DSCZOO-T2** |
|---|---|
| I Core competency | X |
| II Critical thinking | X |
| III Analytical reasoning | X |
| IV Research skills | X |
| V Team work | X |

Course Articulation Matrix relates course outcomes of course with the corresponding program out comes whose attainment is attempted in this course. Mark 'X' in the inter section cell if a course outcome addresses a particular program.

| Content | 56 Hrs |
|---|---|
| **Unit - I** | **14 hrs** |
| **Chapter: 1**<br>• General characters of chordates.<br>• Basic Chordate characters and outline classification up to classes.<br>**Protochordata**:<br>a. **Cephalochordata**: Type study of *Amphioxus* – Morphology, digestive system and feeding mechanism.<br>b. **Urochordata**: Type study of *Herdmania*- Morphology, tadpole of *Herdmania* and retrogressive metamorphosis.<br>**Chapter 2: Agnatha**<br>• General characters and classification up to classes.<br>• Salient features of Cyclostomata with examples.<br>• Differences between lampreys and hag fishes.<br>• Ammocoete larva and its significance. | |
| **Unit – II** | **14 hrs** |
| **Chapter 3: Super class: Pisces**<br>• Salient features and classification up to subclasses-<br>• Differences between Chondrichthyes and Osteichthyes.<br>• *Scoliodon*: Morphology, digestive system, circulatory system – afferent arterial system, neuromast organs (Lateral line sensory system and Ampullae of Lorenzini), male and female urinogenital system.<br>• Salient features of Placodermi and Ostracodermi with examples.<br>• Parental care in fishes – (*Hippocampus*, *Tilapia*, Betta and *Arius jella*)<br>• *Dipnoi*: Interesting features with examples.<br>**Chapter 4: Class Amphibia**<br>• General characters and classification of class Amphibia up to living orders, with suitable examples.<br>• Neoteny – Definition & types with examples and Paedogenesis - Definition with examples<br>• Parental care in Amphibia – (*Pipa*, *Ichthyophis, Alytes, Gastrothecus*) | |
| **Unit - III** | **14 hrs** |
| **Chapter 5: Class Reptilia**<br>• General characters and outline classification of modern reptiles with suitable examples.<br>• Adaptive radiation in extinct reptiles with suitable examples<br>• Temporal fossae in reptiles.<br>• Identification of Poisonous and non-poisonous snakes, Poison apparatus in snakes, venom- composition and its types. Anti-venom- production<br>• Interesting features of *Sphenodon*. | |

| | |
|---|---|
| **Chapter 6: Class Aves**<br>• General characters and classification up to orders with examples.<br>• Differences between Ratitae and Carinatae.<br>• Interesting features of *Archaeopteryx*.<br>• Flight adaptations in birds (Morphological, anatomical and physiological)<br>• Migration in Birds – Types and causes. | |
| **Unit - IV** | **14 hrs** |
| **Chapter 7: Class Mammalia**<br>• General characters and classification up to subclasses (Prototheria, Metatheria and Eutheria) with suitable examples.<br>• Interesting features of mammalian orders- Insectivora, Carnivora (Pinnipedia and Fissipedia), Chiroptera (Mega and Micro), Cetacea (Mystoceti and Odontoceti), Proboscidia (Indian Elephant and African Elephant),<br>Ungulata (Perissodactyla and Artiodactyla) and Primates (Platyrhini and Catarhini) with examples.<br><br>**Chapter 8: Dentition in mammals**<br>• Definition, structure of molar tooth.<br>• Types – Morphological, based on attachment, succession and kinds of teeth.<br>• Dental formula (Horse, Dog, Man, Cat, Rabbit and Elephant)<br>• Pattern of cheek teeth (Bunodont, Secodont, Selenodont and Lophodont). | |

**Pedagogy:** Lectures, Presentations, Videos, Assignments and Weekly Formative Assessment Tests

| **Formative Assessment for Theory** | |
|---|---|
| **Assessment Occasion / type** | **Marks** |
| House Examination/Test | 10 |
| Written Assessment/Presentation/Project/Term Papers/Seminars | 05 |
| Classroom Performance/Participation | 05 |
| **Total** | **20 Marks** |

# II SEMESTER B.Sc., ZOOLOGY PRACTICAL SYLLABUS

## PRACTICAL PAPER: ANIMAL DIVERSITY – II

**(Protochordata To Mammalia)**

| | | | |
|---|---|---|---|
| Program Name: | **B.Sc.** | **Semester:** | **IV** |
| Course Title: | **ANIMAL DIVERSITY - II (Protochordata To Mammalia)** | | |
| Course Code: | **DSCZOO-P2** | No. of Credits: | **2** |
| Contact hours: | **30 Hours** | Duration of SEA/Exam: | **3 hrs** |
| | | Hours / Week: | **3 hrs** |
| Formative Assessment Marks: | **10** | Summative Assessment Marks: | **40** |

**Course Pre-requisite(s): Course Out comes (COs)**: After the successful completion of the course, the student will be able to:

**CO1**: Identify major vertebrate groups from Protochordata to Mammalia.
**CO2**: Differentiate types of fishes and their adaptive features.
**CO3**: Recognize adaptations in reptiles, birds, and mammals.
**CO4**: Perform whole-mount preparation of fish scale.
**CO5**: Interpret organ systems using models or virtual dissections.

**Course Articulation Matrix: Mapping of Course Outcomes (COs) with Program Out comes (POs)**

| Course Outcomes (COs)/(POs) | DSCZOO-P2 |
|---|---|
| I Core competency | X |
| II Critical thinking | X |
| III Analytical reasoning | X |
| IV Research skills | X |
| V Team work | X |

Course Articulation Matrix relates course out comes of course with the corresponding program out comes whose attainment is attempted in this course. Mark 'X 'in the inter section cell if a course outcome addresses a particular program outcome.

| Practical Contents | 10 Units |
|---|---|
| a. **Protochordata**: *Herdmania* and *Amphioxus,* T.S. of *Amphioxus* through pharynx and intestine.<br>b. **Cyclostoma:** *Petromyzon*, *Ammocoete larva* and *Myxine*. (any **two each from a & b**) | |

| | |
|---|---|
| **Pisces**:<br>a. Cartilaginous Fishes: *Narcine, Trygon, Pristis*, *Mylobatis***.** ***(Any* Three***)***<br>b. Bony Fishes: Zebra fish, *Hippocampus, Muraena, Ostracion, Tetradon, Pleuronectus, Diodon and Echeneis* (**Any Three).**<br>c. Ornamental fishes: *Siamese*, *Koi*, *Oscar*, Betta Sp. *Neon tetra*, *Guppies*, Goldfish, Angel fish, Rainbow fish, *Molliesese*. (Any **Three)**<br>d. Accessory respiratory organs: *Saccobranchus, Clarias and Anabas***.** | |
| **Amphibia**:<br>1. *Rana, Bufo, Ambystoma, Axolotl larva, Necturus* and *Ichthyophis*. (**Each Order - one example**) | |
| **Reptilia**:<br>a. *Turtle, Tortoise, Mabuya, Calotes, Chameleon, Varanus. (Any* **Three)**<br>b. Snakes – *Dryophis*, Rat snake, *Brahmini*, *Cobra, Krait, Russell's viper* and *Hydrophis* (**Any Three).** | |
| **Aves**:<br>a. Beak and feet modification in Duck, Crow, Sparrow, Parrot, Kingfisher, Eagle or Hawk. (**Any Three).** | |
| **Mammalia**: *Mongoose, Squirrel, Pangolin, Hedge Hog, Rat, Loris* (**Any Three**). | |
| **Mounting:** Preparation of whole mount of fish scale. (Compulsory) | |
| **Virtual dissection/Cultured specimens**: (Use of Dissected Animal or Photograph or Model)<br>a. Shark/Bony fish: Afferent branchial system.<br>b. Rat: Dissection (only demonstration)- Urinogenital system of both male and female rat. | |

**Pedagogy:** Lectures, Presentations, Videos, Assignments and Weekly Formative Assessment, Test

**Note: Field visit to nearby National Park/ Wildlife sanctuary/ any National laboratory at the end of semester is compulsory and the report of this is to be submitted along with practical record as a part of practical examination.**

| **Formative Assessment for Practical** | |
|---|---|
| Assessment Occasion/type | **Marks** |
| House Examination/Test | 05 |
| Class Room Performance / Attendance | 05 |
| **Total** | **10 marks** |

**References:**


1. Colbert *et al*: Colbert's Evolution of the Vertebrates: A history of the back boned animals through time. (5th ed. 2002, Wiley–Liss).
2. Hildebrand: Analysis of vertebrate Structure (4thed 1995, John Wiley)
3. Kenneth V. Kardong (20015) Vertebrates: Comparative Anatomy, Function, Evolution McGraw Hill
4. McFarland *et al.*- Vertebrate Life (1979, Macmillan publishing)

5. Parker and Haswell: Text Book of Zoology, Vol. II(1978,ELBS)
6. Romerand Parsons: The Vertebrate Body (6thed1986, CBS Publishing Japan)
7. Young: The Life of vertebrates (3rded 2006,ELBS/Oxford
8. Weichert C. K. & William Presch (1970). Elements of Chordate Anatomy, Tata McGraw Hills
9. Dhami and Dhami: Vertebrate Zoology.

## SCHEME OF PRACTICAL EXAMINATION

### I Semester B.Sc., Zoology
### PRACTICAL – I: Systematics and Animal Diversity – I
### (Protozoa to Hemichordata)

**Course Code: DSCZOO – P1**

**Duration: 3 hrs**
**Max. Marks: 40**

| | | |
|---|---|---|
| 1 | Identify the system and describe with a neat labelled diagram. [Earthworm / Cockroach (Nervous system / Digestive system). | 07 marks |
| 2 | Mounting / camera lucida (Principle and Procedure, drawing) [Mouthparts of Cockroach/Honey bee/Housefly or setae of earthworm]. | 04 marks |
| 3 | Identify & comment on spotters A to F with labelled diagrams. | 24 marks (6 x 4 = 24) |
| 4 | **Class Records** | 05 marks |
| | **Total** | **40 marks** |

**Scheme of Valuation**

1. Dissection: Identification – **01M,** Diagram - **02M**, Description – **04M.**
2. Mounting: Performance – **02M**, comments – **04M** / Camera lucida: Principle – **01M**, Comments – **02M**; drawing – **01M**
3. Identification & classification – **01M**; Comments with diagram – **03M.**

### II Semester B.Sc., Zoology
### PRACTICAL – II: Animal Diversity - II
**(Protochordata to Mammalia)**

**Course Code: DSCZOO – P2**

**Duration: 3 hrs**
**Max. Marks: 40**

| | | |
|---|---|---|
| 1. | Identify the system and describe with a neat labelled diagram. [Shark – Afferent/Efferent/Cranial nerves] {Rat – Circulatory system / Male/Female Urinogenital system} | 07 marks |
| 2. | Mount the given scale and comment with labelled diagram. (Placoid / Ctenoid /Cycloid) | 04 marks |
| 3. | Identification and comment on spotters A to F with a neat labelled diagram. | 24 marks ( 6 x 4 = 24) |
| 7. | Class Records | 05 marks |
| | **Total** | **40 marks** |

**Scheme of Valuation**

1. Dissection: Identification – **01M,** Diagram - **02M**, Description – **04M.**
2. Mounting: Performance – **03M**, comment and diagram - **02M**
3. Identification & classification – **01M**; Comments with diagram – **03M.**

**BLUEPRINT FOR ZOOLOGY QUESTION PAPER**
**Paper I & II**
**Course Code – DSCZOO – T1 and T2**

| Unit | Teaching (hrs) | Number of Questions | | | Total Marks |
|---|---|---|---|---|---|
| | | 08 (2 Marks) | 08 (5 Marks) | 05 (10 Marks) | |
| Unit 1 | 14 | 2 | 2 | 1.5 | 29 |
| Unit 2 | 14 | 2 | 2 | 1.5 | 29 |
| Unit 3 | 14 | 2 | 2 | 1.5 | 29 |
| Unit 4 | 14 | 2 | 2 | 1.5 | 29 |
| **Total** | **56 hrs** | **8x2=16** | **8x5=40** | **6x10=60** | **116** |

## Scheme of Internal Assessment Marks:

**Theory:**

| Sl. No. | Particulars | IA Marks |
|---|---|---|
| 1 | Attendance | 05 |
| 2 | Internal Tests (Minimum of Two) | 10 |
| 3 | Assignments /Seminar / Case Study / Project work / Reports on - Field visits made for observation and collection of data etc., | 05 |
| **TOTAL Theory IA Marks** | | **20** |

**Practicals:**

| Sl. No. | Particulars | IA Marks |
|---|---|---|
| 1 | Practical Test | 05 |
| 2 | Active participation in practical classes (Attendance) | 05 |
| **TOTAL Theory IA Marks** | | **10** |

**I & II Semester B.Sc., Zoology Model Question Paper**
**Paper: 1 & 2**

**Time: 3 Hrs** **Max. Marks: 80**

**Instructions to Candidates:**
*1. All sections/parts are compulsory.*
*2. Draw neat labelled diagrams wherever necessary.*

## PART - A

**I. Answer any FIVE of the following: (5X2=10)**

1. .
2. .
3. .
4. .
5. .
6. .
7. .
8. .

## PART - B

**II. Answer any SIX of the following: (6X5=30)**

1. .
2. .
3. .
4. .
5. .
6. .
7. .
8. .

## PART - C

**III. Answer any FOUR of the following: (4X10=40)**

1. .
2. .
3. .
4. .
5. .
6. .

**********

# III SEMESTER B.Sc., ZOOLOGY THEORY SYLLABUS

## THEORY PAPER: ANATOMY AND HISTOLOGY

| | | | |
|---|---|---|---|
| Program Name | **B.Sc.** | **Semester:** | **III** |
| Course Title | **Anatomy and Histology** | | |
| Course Code: | **DSCZOO-T3** | No. of Credits: | **3** |
| Contact hours: | **56 Hours** | Duration of SEA/Exam: | **3 hrs.** |
| Formative Assessment Marks: | **20** | Summative Assessment Marks: | **80** |

**Course Out comes (COs**): After the successful completion of the course, the student will be able to:

**CO1:** Demonstrate a thorough understanding of the human body's anatomical structures including bones, muscles, organs and systems.

**CO2:** Study the comparative account of organs of vertebrates and their functions.

**CO3:** Acquire the knowledge of structure of brain, sense organs and excretory organs to a complex, highly evolved form in mammal.

**CO4:** Understand the microscopic organization of tissues and organs through histological studies.

**CO5:** To comprehend the fundamental principles of micro technique, identifying the role of various reagents in the preparation of tissue samples.

**Course Pre-requisite(s):** outcome

**Course Articulation Matrix: Mapping of Course Outcomes (COs) with Program Out comes (POs)**

| **Course Outcomes (COs)/(POs)** | **DSCZOO-T3** |
|---|---|
| I Core competency | X |
| II Critical thinking | X |
| III Analytical reasoning | X |
| IV Research skills | X |
| V Team work | X |

Course Articulation Matrix relates course outcomes of course with the corresponding program out comes whose attainment is attempted in this course. Mark 'X' in the inter section cell if a course outcome addresses a particular program.

| Content | 56 hrs |
|---|---|
| **Unit I** | **14 hrs** |
| **Human Anatomy - 1**<br>• Anatomy of Digestive system - Structure of alimentary canal and accessary glands (Liver and Pancreas).<br>• Anatomy of Respiratory system – conducting part and respiratory zone.<br>• Anatomy of Circulatory system - V.S of Heart, origin and conduction of heartbeat.<br>• Anatomy of Excretory system and structure of nephron.<br>• Anatomy of Nervous system – CNS, PNS and ANS, structure of multipolar neuron, anatomy of brain. | |
| **Unit II** | **14 hrs** |
| **Human Anatomy – 2 and Osteology**<br>• Anatomy of Reproductive system – structure of male and female reproductive systems.<br>• Sense organs - Eye and Ear.<br>• Skeletal system - functions, Types of bones, Axial and appendicular skeletal system (except bones of hand and foot).<br>• Joints and their types – Immovable joints, slightly movable joints and freely movable (synovial joints).<br>• Synovial joint – L.S of synovial joint, types – Ball & socket joint, hinge joint, saddle joint, plane joint, condyloid joint and pivot joint. | |
| **Unit III** | **14 hrs** |
| **Comparative Anatomy**<br>• Respiratory organs in Fishes (shark gills), respiratory organs in Amphibians (gills and lung), Reptiles, Birds and Mammals (rabbit lung).<br>• Comparative anatomy of heart in vertebrates.<br>• Evolution of kidney in vertebrates - Pronephros, Mesonephros and Metanephros of vertebrates.<br>• Comparative anatomy of brain in vertebrates. | |
| **Unit IV** | **14 hrs** |
| **Histology**<br>• Introduction, Tissues and its types - Epithelial tissues; connective tissue (loose and dense); skeletal tissue and muscular tissue.<br>• Micro-technique - Steps in histological techniques (fixation, dehydration, embedding, sectioning, mounting and differential staining); Common fixatives and stains; Uses of alcohol, xylene and DPX.<br>• Histological features of mammalian organs - Tongue, Stomach, Thyroid, Pancreas, Liver, Kidney, Adrenal, Testis and Ovary. | |

**Pedagogy:** Lectures, Presentations, Videos, Assignments and Weekly Formative Assessment Tests

| **Formative Assessment for Theory** | |
|---|---|
| **Assessment Occasion / type** | **Marks** |
| House Examination/Test | 10 |
| Written Assessment/Presentation/Project/Term Papers/Seminars | 05 |
| Classroom Performance/Participation | 05 |
| **Total** | **20 Marks** |

# III SEMESTER B.Sc., ZOOLOGY PRACTICAL SYLLABUS

## PRACTICAL PAPER: ANATOMY AND HISTOLOGY

| | | | |
|---|---|---|---|
| Course Title: | **Anatomy and Histology** | Practical Credits: | **2** |
| Course Code: | **DSCZOO-P3** | Contact Hours: | **30 hrs** |
| | | Hours / Week: | **03 hrs** |
| Formative Assessment: | **10 Marks** | Summative Assessment: | **40 Marks** |

**Course Outcomes (COs**): After the completion of the course, the student will be able to:
**CO1:** To understand the anatomical structure of organs of human body.
**CO2:** To comprehend the intricate structure of human skeletal system.
**CO3:** To appreciate the comparative account of different organs of vertebrates.
**CO4:** Develop proficiency in staining different histological tissues for proper viewing and understanding.

**Course Pre-requisite(s):**

**Course Articulation Matrix: Mapping of Course Outcomes (COs) with Program Out comes (POs)**

| Course Outcomes (COs)/(POs) | DSCZOO-P3 |
|---|---|
| I Core competency | X |
| II Critical thinking | X |
| III Analytical reasoning | X |
| IV Research skills | X |
| V Team work | X |

Course Articulation Matrix relates course outcomes of course with the corresponding program out comes whose attainment is attempted in this course. Mark 'X' in the inter section cell if a course outcome addresses a particular program

| Sl. no | Practical Contents | 10 Units |
|---|---|---|
| 1 | **Human Anatomy:** Virtual Display **/** Model / Photos: Structure of Lung, Heart and Brain | |
| 2 | **Human Osteology:** Skull, Lower jaw, vertebral column, sternum, ribs, pectoral and pelvic girdles, limb bones (except bones of hand and foot). | |
| 3 | Comparative anatomy of skin of Vertebrates – Fish, Frog and Rabbit. | |
| 4 | Comparative anatomy of heart of Vertebrates: Fish (Shark), Amphibian (Frog), Bird, (Pigeon) and Mammal (Rabbit). | |

| | | |
|---|---|---|
| 5 | Comparative anatomy of brain of Vertebrates: Fish (Shark), Amphibian (Frog), Bird (Pigeon) and Mammal (Rabbit). | |
| 6 | **Histology:** Permanent slides of sections of mammalian organs - Tongue, Stomach, Pancreas, Liver, Thyroid, Kidney, Adrenal, Ovary and Testis. | |
| 7 | Micro-technique: Preparation and Staining. | |

**Pedagogy:** Lectures, Presentations, Videos, Assignments and Weekly Formative Assessment Tests

| **Formative Assessment for Practical** | |
|---|---|
| **Assessment Occasion/type** | **Marks** |
| House Examination/Test | 05 |
| Class room Performance/Participation | 05 |
| **Total** | **10 Marks** |

**References:**


1. Gerard J Tortora and Nicholas P. Anagnostakos. 13th Ed. Principles of Anatomy and Physiology.
2. Clemente C D. 1981. Anatomy- A Regional Atlas of The Human Body, Urban and Schwarzenberg Publications 2nd Edition.
3. Chaurasia B D. 1986. Human Anatomy- Regional and Applied Upper Limb and Thorax, Cbs Publishers and Distributors.
4. Preves M, Lysenkov N, Bushkovich V. 1985.Human Anatomy, Mir Publications.
5. Vimala C.M, 2006. Introductory Zoology Vol. IV, Interline Publishing, Bangalore.
6. Grove & Newell, 1990. Animal Biology, Universal Book Stall, New Delhi, 9th Ed.
7. Hilderbrand. 1988 Analysis of Vertebrate Structure John Wiley and Sons, New York, 3rd Ed.
8. Kotpal R.L.1991.Vertebrates, Rastogi Publications, Meerut
9. Kotpal R.L.1993. Zoology Phylum Series, Rastogi Publications, Meerut
10. Kulshrestha S.K.1999.Comparative Anatomy of Vertebrates, Anmol Publications.
11. Vimala C.M, 2006. Introductory Zoology Vol. IV, Interline Publishing, Bangalore.
12. Frederick R. Bailey. Bailey's Textbook of Histology
13. Vimala C.M. 2006. Introductory Zoology Vol. V, Interline Publishing, Bangalore.
14. Brijesh kumar. 2013. Histology: Text & Atlas.

# III SEMESTER B.SC., ZOOLOGY ELECTIVE - 1 SYLLABUS

## THEORY PAPER: BIOLOGY OF PARASITES AND DISEASES

| | | | |
|---|---|---|---|
| Program Name: | **B.Sc.** | **Semester** | **III** |
| Course Title: | **Biology of Parasites and Diseases** | | |
| Course Code: | **DSEZOO-1** | No. of Credits | **2** |
| Contact hours: | **28 Hours** | Duration of SEA/Exam | **1.5 hrs** |
| | | Hours / Week | **2** |
| Formative Assessment Marks: | **10** | Summative Assessment Marks | **40** |

**Course Out comes (COs**): After the successful completion of the course, the student will be able to:

**CO1:** Describe the mechanisms for transmission, virulence and pathogenicity in pathogenic micro-organisms.

**CO2:** Know the stages of the life cycles of the parasites and infective stages.

**CO3:** Diagnose the causative agents, describe pathogenesis and treatment for important diseases like malaria, HPV, HIV, dengue, leishmaniasis, trypanosomiasis, schistosomiasis, cysticercosis, filariasis etc.

**CO4:** Carry out common procedures for culturing, purifying and diagnostics of micro-organisms Understand the disease-causing potential of bacteria and viruses, and the responses of the immune system.

**CO5:** Develop skills and realize significance of diagnosis of parasitic infection and treatment.

**Course Articulation Matrix: Mapping of Course Outcomes (COs) with Program Out comes (POs)**

| Course Outcomes (COs)/(POs) | DSEZOO-1 |
|---|---|
| I Core competency | X |
| II Critical thinking | X |
| III Analytical reasoning | X |
| IV Research skills | X |
| V Team work | X |

Course Articulation Matrix relates course outcomes of course with the corresponding program out comes whose attainment is attempted in this course. Mark 'X' in the inter section cell if a course outcome addresses a particular program

| Contents | 28 hrs |
|---|---|
| **Unit I** | **14 hrs** |
| **Parasites**<br>• Introduction to Parasites and its types, host and its types, parasitoids, zoonosis with examples.<br>• Occurrence, disease caused, mode of transmission and control measures of the following parasites: *Mycobacterium tuberculosis, Salmonella typhi*, Human papilloma virus (HPV), SARS Covid-2**.**<br>• Study of morphology, occurrence, disease caused, mode of transmission and control measures of *Leishmania donovani, Entamoeba histolytica and Plasmodium vivax.*<br>• Study of morphology, occurrence, disease caused, mode of transmission and control measures of *Taenia solium and Schistosoma haematobium.* | |
| **Unit - II** | **14 hrs** |
| **Parasitic Nematodes and Arthropods**<br>• Study of morphology, occurrence, disease caused, mode of transmission and control measures of *Ancylostoma duodenale*, *Ascaris lumbricoides* and *Wuchereria bancrofti.*<br>• **Parasitic Arthropods:** Biology, Importance and Control measures of Ticks (Soft tick-*Ornithodoros*, Hard tick- *Ixodes*), Mites (*Sarcoptes*), Lice (*Pediculus*), Flea (*Xenopsylla*), Bug (*Cimex*), Parasitoid (Wasps).<br>**Laboratory Diagnosis of Parasitic Diseases**<br>• Diagnostic methods of parasitology: Introduction, Examination of the human samples for parasitic isolation and identification: Blood, Stool and Sputum.<br>• Methods of Diagnosis: Immuno diagnosis, Skin Method, Culture methods of parasites.<br>• Diagnostic techniques for HPV (Pap Smear and RT – PCR) and SARS Covid (viral nucleic acid detection by RT-PCR) | |

**Pedagogy:** Lectures, Presentations, Videos, Assignments and Weekly Formative Assessment Tests

| Formative Assessment for Theory | |
|---|---|
| **Assessment Occasion/type** | **Marks** |
| House Examination/Test | 05 |
| Classroom Performance/Participation | 05 |
| **Total** | **10 Marks** |

**References:**


1. Essentials of Medical Parasitology: Apurba Sankar Sastry and Sandhya Bhat K, Jaypee Brothers Medical Publishers, 2014.
2. Paniker's Textbook of Medical Parasitology: CK Jayaram Paniker and Sougata Ghosh, 8th Edition, Jaypee Brothers Medical Publishers, 2018
3. Introduction to Animal Parasitology (2nd Edition.): Smith D G. John Willey Sons, NY. 1997
4. Parasitology: Sood R. C.B.S. publishers, New Delhi, 1995.
5. Foundations of Parasitology (2nd Edition): Roberts L S and Janovy J (Jr) McGraw Hill Publ. 2000.

# IV SEMESTER B.SC., ZOOLOGY THEORY SYLLABUS

## THEORY PAPER: CELL BIOLOGY, IMMUNOLOGY AND GENETICS

| | | | |
|---|---|---|---|
| Program Name: | **B.Sc., Zoology** | **Semester:** | **IV** |
| Course Title: | **Cell Biology, Immunology and Genetics** | | |
| Course Code: | **DSCZOOT4** | No. of Credits: | **3** |
| Contact hours: | **56 Hours** | Duration of SEA/Exam: | **3 hrs** |
| | | Hours / Week: | **4 hrs** |
| Formative Assessment Marks: | **20** | Summative Assessment Marks: | **80** |

**Course Pre-requisite(s):** Outcome

**Course Out comes (COs**): After the successful completion of the course, the student will be able to:

**CO1:** understanding of cellular architecture and diversity of prokaryotic and eukaryotic cells.

**CO2:** Acquire a deep insight on the concepts of cell biology and the ultrastructure of cells, structure and function of organelles.

**CO3:** Illustrate the phases of cell cycle, cell division, reductional division in germ cells.

**CO4:** To understand the fundamental concepts of immunology including cells and organs of immune system, immune responses, antibody structure, MHC complex and immunization programme.

**CO5:** Analyze the principles of genetic inheritance and chromosomal variations in organisms and also achieve competence in undergraduate level problem solving skills relevant to the genetics.

**Course Articulation Matrix: Mapping of Course Outcomes (COs) with Program Out comes (POs)**

| Course Outcomes (COs)/(POs) | DSCZOO-T4 |
|---|---|
| I Core competency | X |
| II Critical thinking | X |
| III Analytical reasoning | X |
| IV Research skills | X |
| V Team work | X |

Course Articulation Matrix relates course outcomes of course with the corresponding program out comes whose attainment is attempted in this course. Mark 'X' in the inter section cell if a course outcome addresses a particular program.

| Content | 56 Hrs |
|---|---|
| **Unit - I** | **14 hrs** |
| **Cell Biology – 1**<br>• Cell: Ultrastructure of Animal Cell. | |

| | |
|---|---|
| • Plasma membrane: Chemical composition, Structure (Fluid mosaic model).<br>• Transport across cell membrane: Passive transport (simple and facilitated diffusion; osmosis) and active transport ($Na^+$- $K^+$pump), bulk transport.<br>• Components of Cytoplasm, Ultra structure and functions of Mitochondrion, Golgi apparatus, Endoplasmic reticulum, Ribosomes and Lysosomes.<br>• Ultrastructure and functions of Nucleus.<br>• Structural organization of Chromosome.<br>• Chromatin Organization - Nucleosome model. | |
| **Unit – II** | **14 hrs** |
| **Cell Biology – 2**<br>• Base composition and structure of DNA and t-RNA.<br>• Types of DNA; RNA – types and functions.<br>• Cell cycle and its regulation and check points.<br>• Cell division: Meiosis and its significance.<br>• Apoptosis: Definition, pathway and significance.<br>• Cancer Biology: Definition, types with examples, Benign & Malignant, General properties of cancer cells, Carcinogens – Types (Environmental, chemical and biological). Cancer Diagnosis (Biopsy, imaging) and treatment. | |
| **Unit - III** | **14 hrs** |
| **Immunology**<br>• Definition, types of immunity, First, Second and third line (Role of B and T lymphocytes) of immunity.<br>• Role of APC cells.<br>• Primary and Secondary Immune response.<br>• Functional aspects of organs of the Immune system - Thymus and Bone marrow, Spleen, Lymph Node, Small intestine (Peyer's patches) and Liver (Von Kupffer cells).<br>• Immunoglobulins: Types and functions, Structure of IgG antibody.<br>• Vaccines: Types and Uses - Immunization (BCG, OPV, Hepatitis B, Tetanus, DPT).<br><br>**Genetics – 1**<br>• Genes and Environment: phenocopy, Norm of reactions (Fur colour in Himalayan Rabbit, human twins).<br>• Mendelian Genetics: Terminologies, Mendelian Laws of inheritance - monohybrid and dihybrid, test cross, back cross.<br>• Incomplete Dominance. | |
| **Unit - IV** | **14 hrs** |

| | |
|---|---|
| **Genetics – 2**<br>• Sex Determination:<br>a. Chromosomal basis of sex determination: Types with examples<br>b. Environmental sex determination<br>c. Free martins<br>• Patterns of inheritance: Autosomal Dominant (Eg. polydactyly), Autosomal recessive (Eg. Albinism), X-linked Dominant (Eg. Hypophosphatemia) and X-linked recessive (Eg. Duchene muscular dystrophy).<br>• Chromosomal aberrations: Aneuploidy - Autosomal (Down's syndrome and Cri-du-Chat syndrome) and Allosomal (Turner's syndrome and Klinefelter's syndrome).<br>• X – linked inheritance: Eye colour in Drosophila, Colour blindness and Haemophilia in Man. Y – linked inheritance: Hypertrichosis in man.<br>• Human karyotype and Pedigree analysis: Definition, Symbols used in pedigree studies, Pedigree construction and analysis (Problems on polydactyly, albinism, colour blindness and haemophilia in Man). | |

**Pedagogy:** Lectures, Presentations, Videos, Assignments and Weekly Formative Assessment Tests

| **Formative Assessment for Theory** | |
|---|---|
| **Assessment Occasion / type** | **Marks** |
| House Examination/Test | 10 |
| Written Assessment/Presentation/Project/Term Papers/Seminars | 05 |
| Classroom Performance/Participation | 05 |
| **Total** | **20 Marks** |

# IV SEMESTER B.Sc., ZOOLOGY PRACTICAL SYLLABUS

## PRACTICAL PAPER: CELL BIOLOGY, IMMUNOLOGY AND GENETICS

| | | | |
|---|---|---|---|
| Program Name: | **B.Sc.** | **Semester:** | **IV** |
| Course Title: | **Cell Biology, Immunology and Genetics** | | |
| Course Code: | **DSCZOO-P4** | No. of Credits: | **2** |
| Contact hours: | **30 Hours** | Duration of SEA/Exam: | **3 hrs** |
| | | Hours / Week: | **3 hrs** |
| Formative Assessment Marks: | **10** | Summative Assessment Marks: | **40** |

**Course Pre-requisite(s): Outcome**

**Course Outcomes:** After the successful completion of the course, the student will be able to:
**CO1:** To identify the liver parenchyma cells.
**CO2:** To prepare stained slides and to observe the different stages of Mitosis and Meiosis.
**CO3:** To study the chromosomal aberrations and understand the karyotyping analysis
**CO4:** How chromosomal aberrations are inherited in humans by pedigree analysis in families.
**CO5:** Solve various genetics problems.

**Course Articulation Matrix: Mapping of Course Outcomes (COs) with Program Out comes (POs)**

| Course Outcomes (COs)/(POs) | DSCZOO-P4 |
|---|---|
| I Core competency | X |
| II Critical thinking | X |
| III Analytical reasoning | X |
| IV Research skills | X |
| V Team work | X |

Course Articulation Matrix relates course out comes of course with the corresponding program out comes whose attainment is attempted in this course. Mark 'X 'in the inter section cell if a course outcome addresses a particular program outcome.

| Sl. No. | Practical Contents | 10 Units |
|---|---|---|
| 1. | Isolation and observation of buccal epithelial cells or Liver Parenchyma cells. | |
| 2. | Squash preparation to study the different stages of Mitosis in root tip of *Allium cepa.* | |

| | | |
|---|---|---|
| 3. | Squash preparation to study the different stages of Meiosis in grasshopper testis or flower buds of *Allium cepa* (virtual/ slides). | |
| 4. | Blood typing in humans. | |
| 5. | Study of human Karyotype: Normal and Abnormal – Down's syndrome, Klinefelter's syndrome, Turner's syndrome, cri-du-chat syndrome. | |
| 6. | Pedigree symbols, pedigree construction and analysis - polydactyly, albinism, colour blindness and haemophilia in Man. | |
| 7. | Genetic problems: Monohybrid cross, Dihybrid cross, multiple alleles, gene interaction. | |

**Pedagogy:** Lectures, Presentations, Videos, Assignments and Weekly Formative Assessment, Test

| **Formative Assessment for Practical** | |
|---|---|
| Assessment Occasion/type | **Marks** |
| House Examination/Test | 05 |
| Class Room Performance / Attendance | 05 |
| **Total** | **10 marks** |

**References:**


1. Lodish, H., Berk, A., Kaiser, C.A., Krieger, M., Bretscher, A., Ploegh, H., Amon, A. &
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# IV SEMESTER B.SC., ZOOLOGY ELECTIVE - 2 SYLLABUS

## THEORY PAPER: FOOD, NUTRITION AND HEALTH

| | | | |
|---|---|---|---|
| Program Name: | **B.Sc.** | **Semester:** | **IV** |
| Course Title: | **Food, Nutrition and Health** | | |
| Course Code: | **DSEZOO-2** | No. of Credits: | **2** |
| Contact hours: | **28 Hours** | Duration of SEA/Exam: | **1.5 hrs** |
| | | Hours / Week: | **2 hrs** |
| Formative Assessment Marks: | **10** | Summative Assessment Marks: | **40** |

**Course Out comes (COs**): After the successful completion of the course, the student will be able to:

**CO1:** Understand the fundamental concepts of food, nutrition, and their role in maintaining health and diseases.

**CO2:** Identify essential nutrients, their functions, and the effects of deficiencies.

**CO3:** Provide culturally competent nutrition services for diverse individuals.

**CO4:** Explain the digestion, absorption, and metabolism of macronutrients and micronutrients.

**CO4:** Assess dietary requirements for different age groups and physiological conditions.

**CO5:** Analyse the relationship between food choices and lifestyle diseases for better health.

**Course Articulation Matrix: Mapping of Course Outcomes (COs) with Program Out comes (POs)**

| Course Outcomes (COs)/(POs) | DSEZOO-2 |
|---|---|
| I Core competency | X |
| II Critical thinking | X |
| III Analytical reasoning | X |
| IV Research skills | X |
| V Team work | X |

Course Articulation Matrix relates course outcomes of course with the corresponding program out comes whose attainment is attempted in this course. Mark 'X' in the inter section cell if a course outcome addresses a particular program.

| Content | 28 hrs |
|---|---|
| **Unit - I** | **14 hrs** |
| **Nutrition and dietary nutrients**<br>• Basic concept of Food: Components and nutrients. Concept of balanced diet.<br>• Macronutrients: Carbohydrates, Lipids, Proteins - Definition, Classification, their dietary source and role.<br>• Micronutrients: Vitamins - Water-soluble and Fat-soluble vitamins - their sources and importance. Important minerals, sources and their biological functions - Iron, Calcium, Phosphorus, Iodine, Selenium and Zinc.<br>• Nutrient requirements and dietary pattern for different groups viz., infants, children, adolescents, adults, pregnant, nursing mothers, and elderly people. | |
| **Unit - II** | **14 hrs** |
| **Malnutrition and Deficiency diseases**<br>• Definition and concept of health: Common nutritional deficiency diseases- Protein Malnutrition (e.g., Kwashiorkor and Marasmus), Disorders due to deficiency of Vit A, Vit B complex, Vit D, Iron and Iodine - their symptoms, treatment, prevention and government initiatives.<br>• Life style disorders: Introduction, types - hypertension, Type II - Diabetes mellitus, sleep disorder, obesity, cancer - causes and prevention.<br>• Social health problems - Smoking, Alcoholism, Drug abuse, AIDS; Treatment and Rehabilitation. | |

**Pedagogy:** Lectures, Presentations, Videos, Assignments and Weekly Formative Assessment Tests

| Formative Assessment | |
|---|---|
| **Assessment Occasion / type** | **Marks** |
| House Examination / Test | 05 |
| Class room Performance / Participation | 05 |
| **Total** | **10 Marks** |

**References:**


1. Mudambi, S.R. and Rajagopal, M.V. (2007). Fundamentals of Foods, Nutrition and Diet Therapy; Fifth Ed; New Age International Publishers
2. Srilakshmi, B. (2002). Nutrition Science; New Age International (P) Ltd.
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4. Swaminathan, M. (1986). Handbook of Foods and Nutrition; Fifth Ed; BAPPCO.
5. Bamji, M.S.; Rao, N.P. and Reddy, V. (2009). Text Book of Human Nutrition; Oxford & IBH Publishing Co. Pvt Ltd.
6. Wardlaw, G.M. and Hampl, J.S. (2007). Perspectives in Nutrition; Seventh Ed; McGraw Hill.
7. Lakra, P. and Singh M.D. (2008). Textbook of Nutrition and Health; First Ed; Academic Excellence.
8. Manay, M.S. and Shadaksharaswamy, M. (1998). Food-Facts and Principles; New Age International (P) Ltd.
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# IV SEMESTER B.SC., ZOOLOGY SKILL ENHANCEMENT COURSE
# PRACTICAL SYLLABUS
# PRACTICAL PAPER: APPLIED ZOOLOGY - 1

| | | | |
|---|---|---|---|
| Program Name: | **B.Sc.** | **Semester:** | **IV** |
| Course Title: | **Applied Zoology - 1 (Economic Zoology)** | | |
| Course Code: | **DSE - 1** | No. of Credits: | **2** |
| Contact hours: | **30 Hours** | Duration of SEA/Exam: | **2 hrs** |
| | | Hours / Week: | **3 hrs** |
| Formative Assessment Marks: | **10** | Summative Assessment Marks: | **40** |

**Course Out comes (COs**): After the successful completion of the course, the student will be able to:

**CO1**: Develop hands-on skills in handling and identifying economically important insects, pests, and beneficial animals.

**CO2**: Develop practical skills in silkworm rearing, mulberry cultivation, cocoon processing and silk production techniques.

**CO3**: Develop practical skills in the analysis of milk quality and the processing techniques for the production of dairy products.

**CO4**: Gain practical knowledge of poultry farming, including breed identification, housing, feeding, disease management, and egg/meat production techniques.

**CO5**: Acquire hands-on skills in aquarium setup, maintenance, and water quality management for sustaining aquatic life.

**Course Articulation Matrix: Mapping of Course Outcomes (COs) with Program Out comes (POs)**

| Course Outcomes (COs)/(POs) | DSE-1 |
|---|---|
| I Core competency | X |
| II Critical thinking | X |
| III Analytical reasoning | X |
| IV Research skills | X |
| V Team work | X |

Course Articulation Matrix relates course outcomes of course with the corresponding program out comes whose attainment is attempted in this course. Mark 'X' in the inter section cell if a course outcome addresses a particular program.

| Sl. No. | Practical Contents | 10 Units |
|---|---|---|
| 1. | Sericulture: Introduction, Species of silkmoth, lifecycle of silkmoth, Moriculture, silkworm rearing, post-coocon processing, | |

| | | |
|---|---|---|
| | products and byproducts of sericulture – cocoon, silkfibre and types of silk. | |
| 2. | Apiculture: Introduction, Species of honeybees, caste system, lifecycle, products of apiculture – honey, propolis, beewax. | |
| 3. | Poultry: Introduction, Indigenous and exotic breeds of fowls, Broilers and layers, poultry feeding and nutrition, nutritive value of egg. | |
| 4. | Dairy Products Analysis:<br>a. Detection of density of milk by using lactometer.<br>b. Milk composition and qualitative test – Proteins, fats, lipids, lactose test, Urea test, formalin test, NaCl test.<br>c. Preparation of Curd, butter, buttermilk, ghee, paneer. | |
| 5. | Aquarium Management:<br>a. Freshwater Aquarium setup, aquarium fabrication, ornamental fishes (any 6 fishes to be explained) and aquarium plants (any 4 plants to be explained), fish food and aquarium maintenance.<br>b. Aquarium water Parameter Tests: Use of water testing kits (liquid test kits, test strips); pH levels, Ammonia ($NH_3$), Dissolved oxygen (DO), Carbon dioxide ($CO_2$), General hardness (GH). | |

**Pedagogy:** Lectures, Presentations, Videos, Assignments and Weekly Formative Assessment Tests

Note:

1. Maximum number of students in Skill Enhancement Courses (Practical Based) is 15 (Fifteen) and is considered as FULL BATCH with TWO TEACHERS.

2. Field visit / Industrial visit pertaining to the syllabus during the semester is compulsory and the report of this is to be submitted along with practical record as a part of practical examination.

| **Formative Assessment for Practical** | |
|---|---|
| **Assessment Occasion/type** | **Marks** |
| House Examination/Test | 05 |
| Class room Performance/Participation | 05 |
| **Total** | **10 Marks** |

**References:**


1. Sathe T.V. Vermiculture and Organic Farming
2. Jabde P.V. (2005) Textbook of Applied Zoology: Vermiculture, Apiculture, Sericulture, Lac culture.
3. Eikichi, H. (1999) Silkworm breeding, Oxford and IBH Publishing Co. Pvt Ltd., New

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## SCHEME OF PRACTICAL EXAMINATION

### III Semester B.Sc., Zoology
### PRACTICAL – III: ANATOMYAND HISTOLOGY
### Course Code: DSCZOO – P3

**Duration: 3 hrs**
**Max. Marks: 40**

| | | |
|---|---|---|
| 1. | **Human Anatomy:** Identify the given spotter / organ **A** and comment with labelled diagram. | 04 marks |
| 2. | **Human Osteology:** Identify the given spotter **B** and C comment with labelled diagram. | 08 marks |
| 3. | **Comparative Anatomy**: Identify **D** and **E** and comment on the evolutionary trends with labelled diagrams. | 08 marks |
| 4. | **Histology:** Identify and comment on the histological features of **F** and **G** with neat labelled diagrams. | 10 marks (2 x 5 = 10) |
| 5. | **Micro-technique:** Differential staining of the given slide. | 05 marks |
| 6. | **Class Records** | 05 marks |
| | **Total** | **40 marks** |

**Scheme of Valuation**

4. Human Anatomy: Identification – **01M**; Comments – **02M**; diagram – **01M**
5. Human Osteology: Identification – **01M**; Comments – **02M**; diagram – **01M**
6. Comparative Anatomy: Identification – **01M**; Comments with diagram – **03M**
7. Histology: Identification – **01M**; Comments – **03M**; diagram – **01M**
8. Micro-technique: Staining process Performance – **05M**

### IV Semester B.Sc., Zoology
### PRACTICAL – IV: CELL BIOLOGY, IMMUNOLOGY AND GENETICS
### Course Code: DSCZOO – P4

**Duration: 3 hrs**
**Max. Marks: 40**

| | | |
|---|---|---|
| 1. | Isolation of buccal smear. | 05 marks |
| 2. | Mitosis / Meiosis – Squash preparation, identification and comment on any one stage. | 06 marks |
| 3. | Blood typing. | 06 marks |
| 4. | Human karyotype: Identify and comment on A. | 05 marks |
| 5. | Genetic problems: (Any Two) | 08 marks (2x4=8) |
| 6. | Pedigree construction or analysis (One Problem) | 05 marks |
| 7. | Class Records | 05 marks |
| | **Total** | **40 marks** |

**Scheme of Valuation**

1. Q.1: Performance - **03M**; Principle and diagram – **02M**
2. Mitosis / Meiosis: Performance – **04M**; Comment on the stage – **01M**; diagram – **01M**
3. Q.3: Performance – **03M**; Procedure – **02M;** Result – **01M**

4. Identification – **01M**; Comments – **04M**
5. Genetic problems **–** 04M each (**2 x 4 = 8M**)
6. pedigree construction / analysis **– 05M**

**IV Semester B.Sc., Zoology**
**SKILL ENHANCEMENT COURSE PRACTICAL**
**APPLIED ZOOLOGY - 1**
**Course Code: DSE - 1**

**Duration: 3 hrs**
**Max. Marks: 40**

| | | |
|---|---|---|
| 1. | a. Qualitative analysis of Proteins, fats, lipids, lactose, urea, formalin, NaCl in the given milk sample. (Any three tests)<br>Or<br>b. Preparation of milk product. Comment on the results.<br>Paneer / Ghee / Buttermilk / Butter (Any one) | 09 marks (3x3=9)<br><br>09 marks |
| 2. | a. Qualitative analysis of Ammonia and pH present in the given aquarium water sample. Discuss the results.<br>Or<br>b. Estimation of Dissolved oxygen / carbondioxide / salinity / hardness in the aquarium water sample. Discuss the results. (Any one) | 09 marks |
| 3. | Identify and Comment on the spotters **A** to **C**.<br>(Sericulture / Apiculture / poultry / aquarium management) | 09 marks (3x3=09) |
| 4. | Viva - Voce | 05 marks |
| 5. | Class Records (04) + Field visit report (04) | 08 marks |
| | **Total** | **40 marks** |

**Scheme of Valuation**

1. A. Experiment performance – **01M,** procedure – **01M**, result – **01M** (for each test)
   B. Preparation – **05M**, Principle – **01M**, procedure – **02M**, result – **01M**
2. A. For Qualitative Analysis - Experiment performance – **01M,** principle – **01M**, procedure – **01M**, result and discussion – **1 1/2 M** (for each test)
   B. Titration Experiment – Principle and Procedure – **04M**; Calculations – **03M;** Results and Discussion – **02M**
3. Spotters: Identification – **01M**; Comments – **02M**
4. **Viva voce – Any 5 questions from the syllabus**

## BLUEPRINT FOR ZOOLOGY QUESTION PAPER
## Paper III & IV
## Course Code – DSCZOO – T3 & T4

| Unit | Teaching (hrs) | Number of Questions | | | Total Marks |
|---|---|---|---|---|---|
| | | 08 (2 Marks) | 08 (5 Marks) | 05 (10 Marks) | |
| Unit 1 | 14 | 2 | 2 | 1.5 | 29 |
| Unit 2 | 14 | 2 | 2 | 1.5 | 29 |
| Unit 3 | 14 | 2 | 2 | 1.5 | 29 |
| Unit 4 | 14 | 2 | 2 | 1.5 | 29 |
| **Total** | **56 hrs** | **8x2=16** | **8x5=40** | **6x10=60** | **116** |

## BLUEPRINT FOR ZOOLOGY ELECTIVE QUESTION PAPER
## Elective Paper 1 and 2
## Course Code – DSEZOO - 1 & 2

| Unit | Teaching (hrs) | Number of Questions | | | Total marks |
|---|---|---|---|---|---|
| | | 05 (1 marks) | 07 (3 marks) | 06 (5 marks) | |
| **I** | 14 | 03 | 03 | 03 | 27 |
| **II** | 14 | 02 | 04 | 03 | 29 |
| **Total** | **28 hrs** | **5x1=05** | **7x3=21** | **06x5=30** | **56** |

**III & IV Semester B.Sc., Zoology Elective Model Question Paper**
**Paper: Elective 1 & 2**

**Time: 1.5 Hrs** **Max. Marks: 40**

**Instructions to Candidates:**
*1. All sections/parts are compulsory.*
*2. Draw neat labelled diagrams wherever necessary.*

## PART - A

**IV. Answer the following:** **(5X1=5)**

9. .
10. .
11. .
12. .
13. .

## PART - B

**V. Answer any FIVE of the following:** **(5X3=15)**

9. .
10. .
11. .
12. .
13. .
14. .
15. .

## PART - C

**VI. Answer any FOUR of the following:** **(4X5=20)**

7. .
8. .
9. .
10. .
11. .
12. .

**********