# Course Structure BSc Zoology

## Course Structure

## B.Sc. Sem 1 Zoology

| Sr No. | Course Type | Course Code | Corse Name | Lecture (hrs.) | Practical (hrs.) | Credits | Examination | | Total Marks |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | Internal | External | |
| 1 | Foundation Compulsory | B101FC | Foundation Compulsory-English | 2 | 0 | 2 | 30 | 70 | 100 |
| 2 | DISCIPLINE SPECIFIC COURSE (DSC) | BBOT101UDSC | Microbiology & Phycology | 4 | 0 | 4 | 30 | 70 | 100 |
| 3 | DISCIPLINE SPECIFIC COURSE (DSC) | BZOO101UDSC | Non-chordates I: Protista to Pseudocoelomates | 4 | 0 | 4 | 30 | 70 | 100 |
| 4 | DISCIPLINE SPECIFIC COURSE (DSC) | BCHE101UDSC | Inorganic, Organic, Physical & Volumetric | 4 | 0 | 4 | 30 | 70 | 100 |
| 5 | PRACTICAL COURSE (PRA) | BBOT101UPRA | Botany practical | 0 | 4 | 2 | 0 | 50 | 50 |
| 6 | PRACTICAL COURSE (PRA) | BZOO101UPRA | Zoology practical | 0 | 4 | 2 | 0 | 50 | 50 |
| 7 | PRACTICAL COURSE (PRA) | BCHE101UPRA | Chemistry Practical | 0 | 4 | 2 | 0 | 50 | 50 |
| 8 | Subject Elective | BZOO101USE/ BZOO102USE | Subject Elective: Wetland Ecology **OR**Human Disease and Control | 2 | 0 | 2 | 15 | 35 | 50 |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 9 | Elective Generic | B101EG | Elective Generic: Communication Skills | 2 | 0 | 2 | 0 | 50 | 50 |
| | | Total credit | | 18 | 12 | 24 | 120 | 530 | 650 |

# Course Structure

## B.Sc. Sem 2 Zoology

| Sr No. | Course Type | Course Code | Corse Name | Lecture (hrs.) | Practical (hrs.) | Credits | Examination | | Total Marks |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | Internal | External | |
| 1 | Foundation Compulsory | B201FC | Foundation Compulsory-English | 2 | 0 | 2 | 30 | 70 | 100 |
| 2 | DISCIPLINE SPECIFIC COURSE (DSC) | BBOT201UDSC | Biomolecules and Cell Biology | 4 | 0 | 4 | 30 | 70 | 100 |
| 3 | DISCIPLINE SPECIFIC COURSE (DSC) | BZOO201UDSC | Non-chordates II: Coelomates | 4 | 0 | 4 | 30 | 70 | 100 |
| 4 | DISCIPLINE SPECIFIC COURSE (DSC) | BCHE201UDSC | Inorganic, Organic, Physical Chemistry | 4 | 0 | 4 | 30 | 70 | 100 |
| 5 | PRACTICAL COURSE (PRA) | BBOT201UPRA | Botany practical | 0 | 4 | 2 | 0 | 50 | 50 |
| 6 | PRACTICAL COURSE (PRA) | BZOO201UPRA | Zoology practical | 0 | 4 | 2 | 0 | 50 | 50 |
| 7 | PRACTICAL COURSE (PRA) | BCHE201UPRA | Chemistry Practical | 0 | 4 | 2 | 0 | 50 | 50 |
| 8 | Subject Elective | BZOO201USE/ BZOO202USE | Subject Elective: Environmental Pollution And Climate Change **OR** Pest Control Technology | 2 | 0 | 2 | 15 | 35 | 50 |
| 9 | Elective Generic | B201UEG | Elective Generic: Elective Generic: Disaster Management | 2 | 0 | 2 | 0 | 50 | 50 |
| | | Total credit | | 18 | 12 | 24 | 120 | 530 | 650 |

# Course Structure

## B.Sc. Sem 3 Zoology

| Sr No. | Course Type | Course Code | Corse Name | Lecture (hrs.) | Practical (hrs.) | Credits | Examination | | Total Marks |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | Internal | External | |
| 1 | Foundation Compulsory | B301FC | Foundation Compulsory-English | 2 | 0 | 2 | 30 | 70 | 100 |
| 2 | **DISCIPLINE SPECIFIC COURSE (DSC)** | **BZOO301UDSC** | **Principles of Ecology** | **3** | **0** | **3** | **30** | **70** | **100** |
| 3 | **DISCIPLINE SPECIFIC COURSE (DSC)** | **BZOO302UDSC** | **Chordates- I** | **3** | **0** | **3** | **30** | **70** | **100** |
| 4 | DISCIPLINE SPECIFIC COURSE (DSC) | BBOT301UDSC | Mycology and Phytopathology | 3 | 0 | 3 | 30 | 70 | 100 |
| 5 | DISCIPLINE SPECIFIC COURSE (DSC) | BBOT302UDSC | Archegoniate | 3 | 0 | 3 | 30 | 70 | 100 |
| 6 | **PRACTICAL COURSE (PRA)** | **BZOO301UPRA** | **Zoology practical** | **0** | **6** | **3** | **0** | **100** | **100** |
| 7 | PRACTICAL COURSE (PRA) | BBOT301UPRA | Botany practical | 0 | 6 | 3 | 0 | 100 | 100 |
| 8 | Subject Elective | BZOO301USE/ BZOO302USE | Disaster Management OR Poultry Science | 2 | 0 | 2 | 15 | 35 | 50 |
| 9 | Elective Generic | B301EG | Elective Generic: Personality Development | 2 | 0 | 2 | | 50 | 50 |
| | | Total credit | | 18 | 6 (12 hrs) | 24 | 165 | 635 | 800 |

# Course Structure

## B.Sc. Sem 4 Zoology

| Sr No. | Course Type | Course Code | Corse Name | Lecture (hrs.) | Practical (hrs.) | Credits | Examination | | Total Marks |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | Internal | External | |
| 1 | Foundation Compulsory | B401FC | Foundation Compulsory -English | 2 | 0 | 2 | 30 | 70 | 100 |
| 2 | **DISCIPLINE SPECIFIC COURSE (DSC)** | **BZOO401UDSC** | **Comparative Anatomy of Vertebrates** | **3** | **0** | **3** | **30** | **70** | **100** |
| 3 | **DISCIPLINE SPECIFIC COURSE (DSC)** | **BZOO402UDSC** | **Chordates II** | **3** | **0** | **3** | **30** | **70** | **100** |
| 4 | DISCIPLINE SPECIFIC COURSE (DSC) | BBOT401DSC | Anatomy and Angiosperms | 3 | 0 | 3 | 30 | 70 | 100 |
| 5 | DISCIPLINE SPECIFIC COURSE (DSC) | BBOT402DSC | Economic Botany | 3 | 0 | 3 | 30 | 70 | 100 |
| 6 | **PRACTICAL COURSE (PRA)** | **BZOO401UPRA** | **Zoology practical** | **0** | **6** | **3** | **0** | **100** | **100** |
| 7 | PRACTICAL COURSE (PRA) | BBOT401PRA | Botany practical | 0 | 6 | 3 | 0 | 100 | 100 |
| 8 | Subject Elective | BZOO401USE/ BZOO402USE | Public Health and Management **OR** Applications of Computer in Zoology | 2 | 0 | 2 | 15 | 35 | 50 |
| 9 | Elective Generic | B401EG | Elective Generic: Human Rights | 2 | 0 | 2 | | 50 | 50 |
| | | Total credit | | 18 | 6 (12 hrs) | 24 | 165 | 635 | 800 |

# Course Structure

## B.Sc. SEM 5 Zoology

| Sr. No | course type | course code | course name | | | | Examination | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | Lecture (Hrs.) | Practical (Hrs.) | Credits | internal | External | Total Marks |
| 1 | FOUNDATION COMPULSORY | B501FC | FOUNDATION COMPULSORY-ENGLISH | 2 | 0 | 2 | 30 | 70 | 100 |
| 2 | DISCIPLINE SPECIFIC COURSE (DSC) | BZOO501UDSC | MOLECULAR AND CELLULAR BIOLOGY | 3 | 0 | 3 | 30 | 70 | 100 |
| 3 | DISCIPLINE SPECIFIC COURSE (DSC) | BZOO502UDSC | DEVELOPMENTAL BIOLOGY | 3 | 0 | 3 | 30 | 70 | 100 |
| 4 | DISCIPLINE SPECIFIC COURSE (DSC) | BZOO503UDSC | BIOSTATISSTICS, TOOLS AND TECHNIQUES | 3 | 0 | 3 | 30 | 70 | 100 |
| 5 | DISCIPLINE SPECIFIC COURSE (DSC) | BZOO504UDSC | BIODIVERSITY AND CONSERVATION BIOLOGY | 3 | 0 | 3 | 30 | 70 | 100 |
| 6 | PRACTICAL COURSE (PRA) | BZOO501UPRA | ZOOLOGY PRACTICAL | 0 | 12 | 6 | 0 | 200 | 200 |
| 9 | Elective Generic | B501EG | ENVIRONMENT AND SUSTAINABLE DEVELOPMENT | 2 | 0 | 2 | 0 | 50 | 50 |
| 10 | Elective course | BZOO501USE | FISHERY SCIENCE | 2 | 0 | 2 | 15 | 35 | 50 |
| | | BZOO502USE | AIR POLLUTION | | | | | | |
| | | BZOO503USE | ANIMAL BIOTECHNOLOGY | | | | | | |
| | | **Total** | | **18** | **12** | **24** | **165** | **635** | **800** |

# Course Structure

## B.Sc. SEM 6 Zoology

| Sr. No | course type | course code | course name | | | | Examination | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | Lecture (Hrs.) | Practical (Hrs.) | Credits | internal | External | Total Marks |
| 1 | FOUNDATION COMPULSORY | B601FC | FOUNDATION COMPULSORY-ENGLISH | 2 | 0 | 2 | 30 | 70 | 100 |
| 2 | DISCIPLINE SPECIFIC COURSE (DSC) | BZOO601UDSC | BIOCHEMISTRY AND ANALYTICAL TECHNIQUES | 3 | 0 | 3 | 30 | 70 | 100 |
| 3 | DISCIPLINE SPECIFIC COURSE (DSC) | BZOO602UDSC | GENETICS | 3 | 0 | 3 | 30 | 70 | 100 |
| 4 | DISCIPLINE SPECIFIC COURSE (DSC) | BZOO603UDSC | ANIMAL BEHAVIOUR AND EVOLUTION | 3 | 0 | 3 | 30 | 70 | 100 |
| 5 | DISCIPLINE SPECIFIC COURSE (DSC) | BZOO604UDSC | ECONOMIC ZOOLOGY & TOXICOLOGY | 3 | 0 | 3 | 30 | 70 | 100 |
| 6 | PRACTICAL COURSE (PRA) | BZOO601UPRA | ZOOLOGY PRACTICAL | 0 | 12 | 6 | 0 | 200 | 200 |
| 9 | Elective Generic | B501EG | ENVIRONMENT AND SUSTAINABLE DEVELOPMENT | 2 | 0 | 2 | 0 | 50 | 50 |
| 10 | Elective course | BZOO601USE | ANIMAL ADAPTATIONS | 2 | 0 | 2 | 15 | 35 | 50 |
| | | BZOO602USE | FILD TECHNIQUES IN ZOOLOGY | | | | | | |
| | | BZOO603USE | WILDLIFE BIOLOGY | | | | | | |
| | | **Total** | | **18** | **12** | **24** | **165** | **635** | **800** |

| GOKUL GLOBAL UNIVERSITY, SIDHPUR | | | |
|---|---|---|---|
| **Programme Code** | **BZOO** | **Programme Name** | B.Sc. Zoology |
| **Course Code** | BZOO101UDSC | **Semester** | I |
| **NON-CHORDATES I: PROTISTA TO PSEUDOCOELOMATES** | | | |
| **Course type :** | Discipline Specific Course | **Total Credit :** | 04 |
| **Teaching time (hours)** | | **Examination Marking scheme** | |

| **Theory** (hrs) | **Practical** (hrs) | **Internal** (Marks) | **External** (Marks) | **Total** (Marks) |
|---|---|---|---|---|
| 60 | 00 | 30 | 70 ( Paper of 3 hrs) | 100 |

| Unit | Topic | Content | Hours | Weightage |
|---|---|---|---|---|
| 1 | | **Unit 1 Protista** | 15 | 25% |
| | 1.1 | Grades of body organization: level of organization, body symmetry, formation of germ layers, formation of coelom, body segmentation. | | |
| | 1.2 | General characteristics and classification of protozoa (up to class). | | |
| | 1.3 | Type study: Paramecium , Amoeba (habit and habitat, body structure, locomotion, nutrition, respiration, excretion and reproduction). | | |
| | 1.4 | Life cycle of Plasmodium. | | |
| 2 | | **Unit 2 Porifera & Cnidaria** | 15 | 25% |
| | 2.1 | General characteristics and classification of phylum porifera (up to class). | | |
| | 2.2 | Canal system and types of spicules in sponges. | | |
| | 2.3 | General characteristics and classification of phylum cnidaria (up to class) | | |
| | 2.4 | Type study: Hydra (habit and habitat, external and internal structure, digestive system, respiration, excretion, nervous system, reproduction and regeneration | | |
| 3 | | **Unit 3 Platyhelminths & Nematoda** | 15 | 25% |
| | 3.1 | General characteristics and classification of phylum platyhelminths (up to class). | | |
| | 3.2 | Type study: Fasciola (habit and habitat, structure, digestive system, respiration, excretion, nervous system, reproduction). | | |
| | 3.3 | General characteristics and classification of phylum nematoda (up to class). | | |
| | 3.4 | Type study: Ascaris (habit and habitat, structure, digestive system, respiration, excretion, nervous system, reproduction). | | |
| | | **Unit 4 Diseases** | 15 | 25% |

| | | | | |
|---|---|---|---|---|
| **4** | **4.1** | Protozoan related diseases: infestation, symptoms and treatment (Amoebiasis, Giardiasis, Malaria) | | |
| | **4.2** | Coral and coral reefs | | |
| | **4.3** | Classification and adaptations of parasites | | |
| | **4.4** | Platyhelimithes and nematod related diseases: infestation, symptoms and treatment (Cysticercosis, Ascariasis, Filariasis). | | |

## Suggested Readings:

1) Hickman C. P., et al. (2006) Integrated principals of Zoology, McGraw Hil Higher Education. 931pp. 14th edition.
2) Pechnik J. A. (2015) Biology of the Invertebrates, McGraw Hill Higher Education. 555 pp. 7th edition.
3) Jordan E. L. and Verma P. S. (1993) Invertebrate Zoology, S. Chand publishing. New Delhi.
4) EkambaranathaAyyar, M. and T.N. Ananthakrishnan, (1992) Manual of Zoology Vol. 1 (Invertebrata), parts I and II.S. Viswanathan (Printers and Publishers) Pvt. Ltd; Madras.2.

**Subject Code: BZOO101UDSC** **Semester: I**

**Subject Name: Non-Chordates I: Protista To Pseudocoelomates** **Faculty Name/s: Pranav Patel**

**Course Outcomes:** At the end of the course, students shall be able to

| | |
|---|---|
| CO1 | Students will apply their knowledge of cell biology to selected examples of changes or losses in cell function. These can include responses to environmental or physiological changes, or alterations of cell function brought about by mutation. |
| CO2 | Students will understand the structures and purposes of basic components of prokaryotic and eukaryotic cells, especially macromolecules, membranes, and organelles |
| CO3 | Students will understand how these cellular components are used to generate and utilize energy in cells |
| CO4 | Students will understand the cellular components underlying mitotic cell division. |
| CO5 | |

**CO-PO Competency and Program Indicators (PI)**

| Course Outcomes | Program Outcomes | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
| CO1 | **3** | **2** | **2** | **-** | **-** | **-** | **-** | **2** | **1** | **-** | | |
| CO2 | **3** | **2** | **2** | **-** | **-** | **-** | **-** | **1** | **1** | **-** | | |
| CO3 | **2** | **2** | **1** | **-** | **-** | **-** | **-** | **1** | **2** | **-** | | |
| CO4 | **3** | **2** | **1** | **-** | **-** | **-** | **-** | **2** | **1** | **-** | | |
| CO5 | | | | | | | | | | | | |

**CO-PO & CO-PSO Mapping**

| Course Outcomes | Program Outcomes | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 |
| CO1 | | | | | | | | | | | | | **3** | **-** |
| CO2 | | | | | | | | | | | | | **2** | **-** |
| CO3 | | | | | | | | | | | | | **2** | **-** |
| CO4 | | | | | | | | | | | | | **1** | **-** |
| CO5 | | | | | | | | | | | | | | |

| GOKUL GLOBAL UNIVERSITY, SIDHPUR | | | | |
|---|---|---|---|---|
| **Programme Code** | **BZOO** | **Programme Name** | B.Sc. Zoology | |
| **Course Code** | BZOO101UPRA | **Semester** | I | |
| **Practical Zoology** | | | | |
| **Course type :** | Practical | **Total Credit :** | 02 | |
| **Teaching time (hours)** | | **Examination Marking scheme** | | |
| **Theory** (hrs) | **Practical** (hrs) | **Internal** (Marks) | **External** (Marks) | **Total** (Marks) |
| ------- | 60 | ------ | 50 | 50 |

## LIST OF EXPERIMENTS

1) Study of classification of protozoans (up to class) using (Amoeba, Euglena, Paramecium, Plasmodium).
2) Study of classification of phylum porifera (up to class) using laboratory specimens, models, slides, charts (Sycon or Leucosolenia, Hylonema or Euplectella, Spongilla or Euspongia).
3) Study of classification of phylum cnidaria (up to class) using laboratory specimens, models, slides, charts (Physalia or Hydra, Aurelia, Coral).
4) Study of classification of phylum platyhelminthes (up to class) using laboratory specimens, models, slides, charts (Planaria, Liver fluke or Polystomum, Tap worm).
5) Study of classification of phylum nemetoda (up to class) using laboratory specimens, models, slides, charts (Ascaris or Filariaworm).
6) Study of external morphology of Paramecium and preparation of whole mount slide of Paramecium from culture.
7) Examination of pond water collected from different places for diversity in protista .
8) Study of adult Fasciola hepatica, Taenia solium, Ascaris lumbricoides and its life stages (Slides/micro-photographs) .
9) Study of different body systems of Hydra, Fasciola and Ascaris using models, slides and charts.
10) Study of human parasitic diseases related to protozoan, platyhelmithes and nematode (Malaria, Schistosomiasis, Lymphatic filariasis (Elephantiasis).
11) Field trip and report preparation.

| GOKUL GLOBAL UNIVERSITY, SIDHPUR | | | | |
|---|---|---|---|---|
| **Programme Code** | **BZOO** | **Programme Name** | B.Sc. Zoology | |
| **Course Code** | **BZOO101USE** | **Semester** | I | |
| **WETLAND ECOLOGY** | | | | |
| **Course type :** | Subject Elective | **Total Credit :** | 02 | |
| **Teaching time (hours)** | | **Examination Marking scheme** | | |
| **Theory** (hrs) | **Practical** (hrs) | **Internal** (Marks) | **External** (Marks) | **Total** (Marks) |
| 30 | ------- | 15 | 35 | 50 |

| Unit | Topic | Content | Hours | Weightage |
|---|---|---|---|---|
| 1 | | **Unit 1** | | |
| | **1.1** | History and classification of wetlands. | **15** | **50%** |
| | **1.2** | Types of wetlands; Tidal marshes, mangroves and freshwater marshes. | | |
| | **1.3** | Human impact and management of wetlands. | | |
| | **1.4** | Wetlands laws and protection. | | |
| 2 | | **Unit 2** | **15** | **50%** |
| | **2.1** | Important wetlands of the world. | | |
| | **2.2** | Important wetlands of India. | | |
| | **2.3** | Important wetlands of Gujarat. | | |
| | **2.4** | Threats to the wetland habitat. | | |

**Reference books**

1. Mitsch W. J. and Gosselink J. G. (2015) Wetlands, Wiley publications, 747 pp.
2. Chatrath K. S. J. (1997) Wetlands of India South Asia Books.
3. Kamboj R. D. and Tatu K. (2017) Important wetland destinations of Gujarat-A guide for ecotourist to explore some wetland jewels in Gujarat, GEER foundation, Gandhinagar.

**Subject Code: BZOO101USE** **Semester: I**

**Subject Name: Wetland Ecology** **Faculty Name/s: Pranav Patel**

**Course Outcomes:** At the end of the course, students shall be able to

| | |
|---|---|
| CO1 | Student learn history and classification of wetland |
| CO2 | Students learn types of wetlands |
| CO3 | Students learn human impact and management of wetlands |
| CO4 | Students learn skill and law and protection |
| CO5 | |

**CO-PO Competency and Program Indicators (PI)**

| Course Outcomes | Program Outcomes | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
| CO1 | **3** | **2** | **2** | **-** | **-** | **2** | **1** | **2** | **3** | **-** | | |
| CO2 | **3** | **2** | **2** | **-** | **-** | **2** | **-** | **2** | **2** | **-** | | |
| CO3 | **2** | **3** | **1** | **-** | **-** | **2** | **-** | **1** | **1** | **-** | | |
| CO4 | **1** | **1** | **3** | **-** | **-** | **1** | **2** | **2** | **1** | **-** | | |
| CO5 | | | | | | | | | | | | |

**CO-PO & CO-PSO Mapping**

| Course Outcomes | Program Outcomes | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 |
| CO1 | | | | | | | | | | | | | **3** | **-** |
| CO2 | | | | | | | | | | | | | **2** | **-** |
| CO3 | | | | | | | | | | | | | **3** | **-** |
| CO4 | | | | | | | | | | | | | **2** | **-** |
| CO5 | | | | | | | | | | | | | | |

| GOKUL GLOBAL UNIVERSITY, SIDHPUR | | | | |
|---|---|---|---|---|
| **Programme Code** | **BZOO** | | **Programme Name** | B.Sc. ZOOLOGY |
| **Course Code** | BZOO201UDSC | | **Semester** | II |
| **NON-CHORDATES II: COELOMATES** | | | | |
| **Course type:** | Discipline Specific Course | | **Total Credit:** | 04 |
| **Teaching time (hours)** | | **Examination Marking scheme** | | |
| **Theory** (hrs) | **Practical** (hrs) | **Internal** (Marks) | **External** (Marks) | **Total** (Marks) |
| 60 | 00 | 30 | 70 (Paper of 3 hrs) | 100 |

| Unit | Topic | Content | Hours | Weightage |
|---|---|---|---|---|
| 1 | | **Unit 1 Mollusca** | 15 | 25% |
| | 1.1 | General characteristics and classification of phylum Mollusca (up to class). | | |
| | 1.2 | Type study: Pila (habit and habitat, external features, digestive system, respiratory system, blood vascular system, excretory system, nervous and sensory system and reproductive system) | | |
| | 1.3 | Torsion in gastropods. | | |
| | 1.4 | Pearl culture. | | |
| 2 | | **Unit 2 Annelida** | 15 | 25% |
| | 2.1 | General characteristics and classification of phylum Annelida (up to class). | | |
| | 2.2 | Metamerism in Annelida. | | |
| | 2.3 | Type study: Leech (habit and habitat, external features, digestive system, respiratory system, excretory system, nervous system and reproductive system). | | |
| | 2.4 | Economic importance of annelids. | | |
| 3 | | **Unit 3 Arthropoda** | 15 | 25% |
| | 3.1 | General characteristics and classification of phylum Arthropoda (up to class). | | |
| | 3.2 | Type study: Cockroach (habit and habitat, external features, body wall, endoskeleton, locomotion, digestive system, respiratory system, blood vascular system, excretory system, nervous and sensory system and reproductive system). | | |
| | 3.3 | Metamorphosis in insects. | | |
| | 3.4 | Useful and harmful insects. | | |

| | | | | |
|---|---|---|---|---|
| **4** | | **Unit 4 Echinodermata** | **15** | **25%** |
| | **4.1** | General characteristics and classification of phylum Echinodermata (up to class). | | |
| | **4.2** | Type study: sea star (habit and habitat, external features, body wall, digestive system, circulatory system, water vascular system). | | |
| | **4.3** | Life history, larval development, regeneration and autotomy in star fish. | | |
| | **4.4** | General characteristics and classification of phylum Hemichordata (up to class). | | |

## Reference books

1. Mitsch W. J. and Gosselink J. G. (2015) Wetlands, Wiley publications, 747 pp.
2. Chatrath K. S. J. (1997) Wetlands of India South Asia Books.
3. Kamboj R. D. and Tatu K. (2017) Important wetland destinations of Gujarat-A guide for ecotourist to explore some wetland jewels in Gujarat, GEER foundation, Gandhinagar.

**Subject Code: BZOO201UDSC** **Semester: II**
**Subject Name: Non-Chordates li: Coelomates** **Faculty Name/s: Pranav Patel**

**Course Outcomes:** At the end of the course, students shall be able to

| | |
|---|---|
| CO1 | Students will learn the origin of the fundamental structural unit defines function all living thing |
| CO2 | They will understand about concept and diversity of Non- chordate with an amphasis and distinction in reference to coelom |
| CO3 | Students learn about how organism are classified based in non-chordates and their identification |
| CO4 | Students learn about how organism are classified based in non-chordates on their complexity organization and characters |
| CO5 | |

**CO-PO Competency and Program Indicators (PI)**

| Course Outcomes | Program Outcomes | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
| CO1 | **2** | **3** | **-** | **-** | **-** | **2** | **1** | **3** | **2** | **-** | | |
| CO2 | **3** | **2** | **1** | **-** | **-** | **2** | **-** | **2** | **2** | **-** | | |
| CO3 | **3** | **2** | **1** | **-** | **-** | **2** | **-** | **2** | **1** | **-** | | |
| CO4 | **2** | **1** | **3** | **-** | **-** | **1** | **2** | **2** | **1** | **-** | | |
| CO5 | | | | | | | | | | | | |

**CO-PO & CO-PSO Mapping**

| Course Outcomes | Program Outcomes | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 |
| CO1 | | | | | | | | | | | | | **2** | **-** |
| CO2 | | | | | | | | | | | | | **2** | **-** |
| CO3 | | | | | | | | | | | | | **2** | **-** |
| CO4 | | | | | | | | | | | | | **1** | **-** |
| CO5 | | | | | | | | | | | | | | |

| GOKUL GLOBAL UNIVERSITY, SIDHPUR | | | | |
|---|---|---|---|---|
| **Programme Code** | **BZOO** | **Programme Name** | B.Sc. Zoology | |
| **Course Code** | BZOO201UPRA | **Semester** | II | |
| **Practical Zoology** | | | | |
| **Course type :** | Practical | **Total Credit:** | 02 | |
| **Teaching time (hours)** | | **Examination Marking scheme** | | |
| **Theory** (hrs) | **Practical** (hrs) | **Internal** (Marks) | **External** (Marks) | **Total** (Marks) |
| ------- | 60 | ------ | 50 | 50 |

**LIST OF EXPERIMENTS**

1) Study of classification of phylum Mollusca (up to class) using laboratory specimens, models, slides, charts (Chiton, Dentalium, Pila, Mitilus, Octopus).
2) Study of classification of phylum Annelida (up to class) using laboratory specimens, models, slides, charts (Earthworm, Nereis, Leech).
3) Study of classification of phylum Arthropoda (up to class) using laboratory specimens, models, slides, charts (Peripatus, Limulus, Prawn, Spider, Centipede, Cockroach).
4) Study of classification of phylum Echinodermata (up to class) using laboratory specimens, models, slides, charts (Starfish, Brittle star, Sea urchin, Sea cucumber, Feather star).
5) Study of classification of phylum Hemichordata (up to class) using laboratory specimens, models, slides, charts (Balanoglossus).
6) Study of anatomy of different systems of Pila using charts and models (Digestive system, Nervous system and Reproductive system).
7) Study of anatomy of different systems of leech using charts and models (Digestive system, Nervous system and Reproductive system).
8) Study of anatomy of different systems of cockroach using charts and models (Digestive system, Nervous system and Reproductive system).
9) Study of anatomy of different systems of star fish using charts and models (Digestive system, Water vascular system).
10) Study of histological structure of pharynx, gizzard, typhlosole and ovary of earthworm using permanent slides.
11) Study of mouth parts of Leech.
12) Mounting of mouth parts of housefly, honey bee and mosquito.
13) Study of respiratory spiracles of cockroach
14) Study of radula of pila.
15) Field trip and report preparation

| GOKUL GLOBAL UNIVERSITY, SIDHPUR | | | | |
|---|---|---|---|---|
| **Programme Code** | **BZOO** | | **Programme Name** | B.Sc. Zoology |
| **Course Code** | **BZOO201USE** | | **Semester** | II |
| **ENVIRONMENTAL POLLUTION AND CLIMATE CHANGE** | | | | |
| **Course type :** | Subject Elective | | **Total Credit :** | 02 |
| **Teaching time (hours)** | | **Examination Marking scheme** | | |
| **Theory** (hrs) | **Practical** (hrs) | **Internal** (Marks) | **External** (Marks) | **Total** (Marks) |
| 30 | ------- | 15 | 35 | 50 |

| Unit | Topic | Content | Hours | Weightage |
|---|---|---|---|---|
| 1 | | **Unit 1** | | |
| | **1.1** | Air and Noise pollution: sources and effect. | **15** | **50%** |
| | **1.2** | Water pollution: sources and effect. | | |
| | **1.3** | Soil pollution: sources and effect. | | |
| | **1.4** | Pollution control methods. | | |
| 2 | | **Unit 2** | **15** | **50%** |
| | **2.1** | Greenhouse gases and global warming. | | |
| | **2.2** | Acid rain and Ozone layer destruction. | | |
| | **2.3** | Effect of climate change on public health. | | |
| | **2.4** | Mitigation efforts to deal with climate change. | | |

**Reference books**

1. Mitsch W. J. and Gosselink J. G. (2015) Wetlands, Wiley publications, 747 pp.
2. Chatrath K. S. J. (1997) Wetlands of India South Asia Books.
3. Kamboj R. D. and Tatu K. (2017) Important wetland destinations of Gujarat-A guide for ecotourist to explore some wetland jewels in Gujarat, GEER foundation, Gandhinagar.

**Subject Code: BZOO201USE** **Semester: II**

**Subject Name: Environmental pollution and climate change** **Faculty Name/s: Pranav Patel**

**Course Outcomes:** At the end of the course, students shall be able to

| | |
|---|---|
| CO1 | Students learn about Air and Noise pollution |
| CO2 | Students learn about water pollution |
| CO3 | Students learn about skills of pollution control methods |
| CO4 | Students learn about effect of climate change and public health |
| CO5 | |

**CO-PO Competency and Program Indicators (PI)**

| Course Outcomes | Program Outcomes | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
| CO1 | **3** | **3** | **-** | **-** | **-** | **2** | **1** | **2** | **2** | **-** | | |
| CO2 | **3** | **2** | **1** | **-** | **-** | **2** | **-** | **2** | **2** | **-** | | |
| CO3 | **2** | **3** | **1** | **-** | **-** | **2** | **-** | **1** | **1** | **-** | | |
| CO4 | **1** | **1** | **3** | **-** | **-** | **1** | **1** | **1** | **1** | **-** | | **-** |
| CO5 | | | | | | | | | | | | |

**CO-PO & CO-PSO Mapping**

| Course Outcomes | Program Outcomes | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 |
| CO1 | | | | | | | | | | | | | **3** | **-** |
| CO2 | | | | | | | | | | | | | **2** | **-** |
| CO3 | | | | | | | | | | | | | **2** | **-** |
| CO4 | | | | | | | | | | | | | **2** | **-** |
| CO5 | | | | | | | | | | | | | | |

| GOKUL GLOBAL UNIVERSITY, SIDHPUR | | | | |
|---|---|---|---|---|
| **Programme Code** | **BZOO** | **Programme Name** | B.Sc. Zoology | |
| **Course Code** | BZOO301UDSC | **Semester** | III | |
| **Principles of Ecology** | | | | |
| **Course type:** | Discipline Specific Course | **Total Credit :** | 03 | |
| **Teaching time (hours)** | | **Examination Marking scheme** | | |
| **Theory** (hrs) | **Practical** (hrs) | **Internal** (Marks) | **External** (Marks) | **Total** (Marks) |
| 60 | 00 | 30 | 70 | 100 |

| Unit | Content | Hours | Weightage |
|---|---|---|---|
| 1 | **Unit 1** | 15 | 25% |
| | Introduction to ecology, historical background, branches of ecology. | | |
| | Structure of atmosphere, lithosphere and hydrosphere. | | |
| | Light and radiation: light variation in different environments, light receptors in organisms, effect of light on plants and animals. | | |
| | Temperature: temperature fluctuations in different environments, effect oftemperature on plant and animals, thermal adaptations of plants and animals. | | |
| 2 | **Unit 2** | 15 | 25% |
| | Interspecific interactions: positive interactions- mutualism, commensalism, protocooperation; negative interaction- exploitation, amensalism, competition. | | |
| | Kinds of ecosystems, structure of ecosystem, abiotic and biotic components of Ecosystem. | | |
| | Functions of ecosystem- productivity of ecosystem, types of food chain, types of ecological pyramids, energy flow in ecosystem. | | |
| | Biogeochemical cycles: types of biogeochemical cycles, water cycle, oxygen cycle, carbon cycle, nitrogen cycle, sulphur and phosphorous cycle. | | |
| 3 | **Unit 3** | 15 | 25% |
| | Aquatic ecosystems: sub division of aquatic ecosystems, freshwater ecosystems, lentic and lotic ecosystems. | | |
| | Zonation of marine environment, stratification of marine environment, biotic communities of marine environment. | | |
| | Classification of terrestrial ecosystem: different types of biomes. | | |
| | Zoogeography. | | |

## Suggested Readings:

1) Odum. E.P. 1996 Fundamentals of Ecology. Nataraj Publishers, Dehra Dun.

2) Verma PS and Agrawal Vk, 2010 Cell Biology, Genetics, Molecular Biology, Evolution and Ecology. S. Chand publications. New Delhi.

3) Smith, R.L.1986. Elements of Ecology. Harpet and Row Publishers, New York.



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**Course Outcomes:** At the end of the course, students shall be able to

| | |
|---|---|
| CO1 | Students competition of this course student will understand the population and community characteristics ecosystem development and climax theories |
| CO2 | Knowledge about the type of ecosystem food chains food web energy modals and ecological efficiencies |
| CO3 | They will understand about the paramount role and importance of nature |
| CO4 | It will impact then with the knowledge about the judicious use of existing ecological recourse for sustainable development |
| CO5 | |

**CO-PO Competency and Program Indicators (PI)**

| Course Outcomes | Program Outcomes | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
| CO1 | **3** | **3** | **-** | **-** | **-** | **3** | **2** | **3** | **2** | **-** | | |
| CO2 | **2** | **2** | **1** | **-** | **-** | **3** | **-** | **2** | **3** | **-** | | |
| CO3 | **1** | **2** | **1** | **-** | **-** | **2** | **-** | **2** | **1** | **-** | | |
| CO4 | **2** | **1** | **3** | **-** | **-** | **1** | **2** | **2** | **1** | **-** | | |
| CO5 | | | | | | | | | | | | |

**CO-PO & CO-PSO Mapping**

| Course Outcomes | Program Outcomes | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 |
| CO1 | | | | | | | | | | | | | **3** | **-** |
| CO2 | | | | | | | | | | | | | **2** | **-** |
| CO3 | | | | | | | | | | | | | **2** | **-** |
| CO4 | | | | | | | | | | | | | **1** | **-** |
| CO5 | | | | | | | | | | | | | | |

| GOKUL GLOBAL UNIVERSITY, SIDHPUR | | | |
|---|---|---|---|
| **Programme Code** | **BZOO** | **Programme Name** | B.Sc. Zoology |
| **Course Code** | BZOO302UDSC | **Semester** | III |
| **Chordates- I** | | | |
| **Course type :** | Discipline Specific Course | **Total Credit :** | 03 |
| **Teaching time (hours)** | | **Examination Marking scheme** | |

| **Theory** (hrs) | **Practical** (hrs) | **Internal** (Marks) | **External** (Marks) | **Total** (Marks) |
|---|---|---|---|---|
| 60 | 00 | 30 | 70 | 100 |

| Unit | Content | Hours | Weightage |
|---|---|---|---|
| 1 | **Unit 1** | 15 | 25% |
| | General characters and origin of chordates. | | |
| | Outline classification of chordates | | |
| | Classification and general characters of subphylum Urochordata and Cephalochordata. | | |
| | Type study: *Herdmania*(Urochordata) and *Amphioxus* (Cephalochordata) (habit and habitat, external features and systems) | | |
| 2 | **Unit 2** | 15 | 25% |
| | General characteristics and classification of subphylum vertebrata | | |
| | General characters and classification of fishes (up to orders), differences between Chondrichthyes and Osteichthyes, types of scales and caudal fins | | |
| | Migration and parental care in fishes | | |
| | Type study: *Scloliodon*- dog fish (habit and habitat, external features, digestive system, respiration, blood vascular, nervous and Urinogenital system) | | |
| 3 | **Unit 3** | 15 | 25% |
| | General characteristics and classification of class amphibia | | |
| | Metamorphosis in frog | | |
| | Parental care in amphibia | | |

| | | | |
|---|---|---|---|
| | Type study: *Hoplobatrachustigrinus*- bull frog (habit and habitat, external features, digestive system, respiration, blood vascular, nervous and Urinogenital system) | | |

## Suggested Readings:

1) Hickman C. P., et al. (2006) Integrated principals of Zoology, McGraw Hill Higher Education. 931pp.14th edition.
2) Kotpal R. L. (2010) vertebrates, Rastogi Publications, 882 pp
3) Jordan E. L. and Verma P. S. (2013) Chordate Zoology, S. Chand publishing. New Delhi.

**Subject Code: BZOO302UDSC** **Semester: III**
**Subject Name: Chordates-I** **Faculty Name/s: Pranav Patel**

**Course Outcomes:** At the end of the course, students shall be able to

| | |
|---|---|
| CO1 | Understand the evolution history and relationship between the different classes of chordates |
| CO2 | Know the different characteristic along with their habits habitats and distribution of the chordates |
| CO3 | Understand the significance of the difference in physiological system between the vertebrates |
| CO4 | Distinguish the significance of chordates from other lower organism and comprehend their advantages |
| CO5 | |

**CO-PO Competency and Program Indicators (PI)**

| Course Outcomes | Program Outcomes | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
| CO1 | **3** | **3** | **1** | **-** | **-** | **2** | **2** | **3** | **1** | **-** | | |
| CO2 | **3** | **2** | **1** | **-** | **-** | **2** | **-** | **2** | **2** | **-** | | |
| CO3 | **2** | **2** | **1** | **-** | **-** | **1** | **-** | **2** | **1** | **-** | | |
| CO4 | **2** | **1** | **2** | **-** | **-** | **1** | **2** | **2** | **1** | **-** | | |
| CO5 | | | | | | | | | | | | |

**CO-PO & CO-PSO Mapping**

| Course Outcomes | Program Outcomes | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 |
| CO1 | | | | | | | | | | | | | **2** | **-** |
| CO2 | | | | | | | | | | | | | **2** | **-** |
| CO3 | | | | | | | | | | | | | **2** | **-** |
| CO4 | | | | | | | | | | | | | **1** | **-** |
| CO5 | | | | | | | | | | | | | | |

| GOKUL GLOBAL UNIVERSITY, SIDHPUR | | | | |
|---|---|---|---|---|
| **Programme Code** | **BZOO** | **Programme Name** | B.Sc. Zoology | |
| **Course Code** | **BZOO301USE** | **Semester** | III | |
| **Disaster Management** | | | | |
| **Course type :** | Subject Elective | **Total Credit :** | 02 | |
| **Teaching time (hours)** | | **Examination Marking scheme** | | |
| **Theory** (hrs) | **Practical** (hrs) | **Internal** (Marks) | **External** (Marks) | **Total** (Marks) |
| 30 | ------- | 15 | 35 | 50 |

| Unit | Topic | Content | Hours | Weightage |
|---|---|---|---|---|
| 1 | | **Unit 1** | | |
| | **1.1** | Introduction to disaster | **15** | **50%** |
| | **1.2** | Different types of disasters: Natural and Man made | | |
| | **1.3** | Parameters of disaster risk | | |
| | **1.4** | Levels of disaster as per national guideline | | |
| 2 | | **Unit 2** | **15** | **50%** |
| | **2.1** | Disaster risk assessment | | |
| | **2.2** | Components of disaster management | | |
| | **2.3** | Role of government and NGO in disaster management | | |
| | **2.4** | Case studies in disaster management | | |

**Reference books**

1) Sharma, V.K. (Ed.). 1995. Disaster Management, IIPA, New Delhi.

2) Singh T. 2006 Disaster management Approaches and Strategies, Akansha Publishing House, New Delhi

3) Sinha, D. K. 2006Towards Basics of Natural Disaster Reduction, Research Book Centre, New Delhi.

**Subject Code: BZOO301USE** **Semester: III**
**Subject Name: Poultry Science** **Faculty Name/s: Pranav Patel**

**Course Outcomes:** At the end of the course, students shall be able to

| | |
|---|---|
| CO1 | Students learn about different breeds of fowls |
| CO2 | Students learn about foods and feeding of fowls |
| CO3 | Students learn about different of disease of poultry |
| CO4 | Students learn breeding in fowl |
| CO5 | |

**CO-PO Competency and Program Indicators (PI)**

| Course Outcomes | Program Outcomes | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
| CO1 | **2** | **1** | **-** | **-** | **-** | **2** | **1** | **2** | **2** | **-** | | |
| CO2 | **2** | **2** | **1** | **-** | **-** | **2** | **-** | **2** | **2** | **-** | | |
| CO3 | **2** | **2** | **1** | **-** | **-** | **2** | **-** | **1** | **1** | **-** | | |
| CO4 | **1** | **1** | **2** | **-** | **-** | **1** | **1** | **1** | **1** | **-** | | **-** |
| CO5 | | | | | | | | | | | | |

**CO-PO & CO-PSO Mapping**

| Course Outcomes | Program Outcomes | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 |
| CO1 | | | | | | | | | | | | | **2** | **-** |
| CO2 | | | | | | | | | | | | | **1** | **-** |
| CO3 | | | | | | | | | | | | | **2** | **-** |
| CO4 | | | | | | | | | | | | | **1** | **-** |
| CO5 | | | | | | | | | | | | | | |

| GOKUL GLOBAL UNIVERSITY, SIDHPUR | | | | |
|---|---|---|---|---|
| **Programme Code** | **BZOO** | **Programme Name** | B.Sc. Zoology | |
| **Course Code** | BZOO301UPRA | **Semester** | III | |
| | | | | |
| **Course type :** | Practical | **Total Credit :** | 03 | |
| **Teaching time (hours)** | | **Examination Marking scheme** | | |
| **Theory** (hrs) | **Practical** (hrs) | **Internal** (Marks) | **External** (Marks) | **Total** (Marks) |
| ------- | 60 | ------ | 100 | 100 |

# LIST OF EXPERIMENTS

**Principles of Ecology**

1) Principle and function of Sechi disc, Atmometer, Anemometer, Hygrometer, Hair hygrometer, Lux meter, Rain gauge, Soil thermometer and thermometer.
2) To determine pH, EC, Acidity, Total hardness, calcium hardness, Dissolve oxygen content of given water sample.
3) To determine soli texture, bulk density and particle density of given soil sample.
4) To determine water holding capacity and percolation rate of soil.
5) To determine pH, Chloride, Sulphate and Total Nitrogen, organic matter of given soil sample.
6) Study of effect of temperature and light, thermal adaptations on plant and animals using models or charts.
7) Study of mutualism, commensalism and protocooperation, negative interaction- exploitation, amensalism, competition with example using models or charts.
8) Study of negative interaction- exploitation, amensalism, competition with example using models or charts.
9) Study of abiotic and biotic components, types of food chain, types of ecological pyramids in ecosystem, energy flow of ecosystem using models, or charts.
10) Study of different types of Biological cycles, zonation, stratification and biotic communities of marine environment, biomes, zoogeography using models or charts.

**Chordates – I**

11) Study of classification of subphylum urochordata and cephalochordate (up to Order) using laboratory specimens, models, slides, charts.
12) Study of classification of fishes (up to Order) using laboratory specimens, models, slides, charts.
13) Study of classification of Amphibian up to orders using laboratory specimens, models, slides,charts.
14) Study of Digestive system, Aertial system, venous system, Nervous system, Urinogenital system ofScloliodon using models, slides and charts.
15) Study of Digestive system, Aertial system, venous system, Nervous system, Urinogenital system of Bull frog using models, slides and charts.
16) Study of Embryology of Amphioxus using models, slides and charts.
17) Study of Migration, Parental care, in fishes.
18) Study of Metamorphosis in frog.
19) Study of Parental care in amphibian.
20) Study of Ampullae of lorenzini, scale and internal ear of Dog fish using models, slides and charts (Mounting).
21) Study of buccal cavity, eye and Ear of Bull frog using models, slides and charts (Mounting).

| GOKUL GLOBAL UNIVERSITY, SIDHPUR | | | | |
|---|---|---|---|---|
| **Programme Code** | **MZOO** | **Programme Name** | **M.Sc. Zoology** | |
| **Course Code** | **MZOO302PRA** | **Semester** | **III** | |
| **Developmental Biology and Evolution, Applied Zoology** | | | | |
| **Course type :** | Practical | **Total Credit :** | 03 | |
| **Teaching time (hours)** | | **Examination Marking scheme** | | |
| **Theory** (hrs) | **Practical** (hrs) | **Internal** (Marks) | **External** (Marks) | **Total** (Marks) |
| ------- | 90 | ------ | 75 | 75 |

# LIST OF EXPERIMENTS

## Developmental Biology and Evolution

1. To study stages of gametogenesis using slides or charts.
2. To study embryonic development in fish, frog and chick using charts.
3. Study of different developmental stages of chick embryo using permanent slides orcharts.
4. To study various larval stages of Arthropods.
5. To study various larval stages of Echinoderms.
6. To study evolution of heart in different vertebrates.
7. To study evolution of brain in different vertebrates.
8. Study of fossils.
9. Study of human evolution.

## Applied Zoology

10. Calculation of examples of Hardy-Weinberg principle
11. Generation of GIS enabled files.
12. Geo-referencing of toposheets.
13. Construction of a maps on the GIS platform
14. Data extraction using GIS
15. Processing & classification of satellite image

| GOKUL GLOBAL UNIVERSITY, SIDHPUR | | | | |
|---|---|---|---|---|
| **Programme Code** | **BZOO** | **Programme Name** | B.Sc. Zoology | |
| **Course Code** | BZOO401UDSC | **Semester** | IV | |
| **Comparative Anatomy of Vertebrates** | | | | |
| **Course type :** | Discipline Specific Course | **Total Credit :** | 03 | |
| **Teaching time (hours)** | | **Examination Marking scheme** | | |
| **Theory** (hrs) | **Practical** (hrs) | **Internal** (Marks) | **External** (Marks) | **Total** (Marks) |
| 60 | 00 | 30 | 70 | 100 |

| Unit | Content | Hours | Weightage |
|---|---|---|---|
| 1 | **Unit 1** | 15 | 25% |
| | Vertebrate morphology: definition, scope and importance | | |
| | Development, structure and functions of vertebrate integument and its derivatives (glands, scales, feathers and hair) | | |
| | Comparative account of digestive organs of different vertebrate groups | | |
| | Comparative account of respiratory organs of different vertebrate groups | | |
| 2 | **Unit 2** | 15 | 25% |
| | Overview of f axial and appendicular skeleton of vertebrates | | |
| | Comparative account of skeletal system of different vertebrate groups (skull, pectoral and pelvic girdles, vertebral column, teeth and jaw suspensorium ) | | |
| | Classification of receptors, Brief account of olfactory and auditory receptors in vertebrate | | |
| | Comparative account of urinogenital system in vertebrates | | |
| 3 | **Unit 3** | 15 | 25% |
| | Comparative account of heart in vertebrates | | |
| | Comparative account of aortic arches and portal systems of vibrates. | | |
| | Comparative account of brain and spinal cord of vertebrates | | |
| | Comparative account of peripheral and autonomous nervous system. | | |

## Suggested Readings:

1) Hickman C. P., et al. (2006) Integrated principals of Zoology, McGraw Hill Higher Education. 931pp. 14th edition.
2) Kotpal R. L. (2010) vertebrates, Rastogi Publications, 882 pp
3) Jordan E. L. and Verma P. S. (2013) Chordate Zoology, S. Chand publishing. New Delhi.

**Subject Code: BZOO401USE** **Semester: IV**
**Subject Name: Limnology** **Faculty Name/s: Pranav Patel**

- **Course Outcomes:** At the end of the course, students shall be able to

| | |
|---|---|
| CO1 | limnology is a comprehensive, integrated, scientific understanding of inland waters. |
| CO2 | limnologists are working on construction of artificial wetlands, which could serve as habitats for a variety of animal and plant species and aid in decreasing water pollution. |
| CO3 | Limnology is the study of the structural and functional interrelationships of organisms of inland waters as their dynamic physical, chemical, and biotic environments affect them. |
| CO4 | Freshwater biology is the study of the biological characteristics and interactions of organisms of fresh waters. |
| CO5 | |

- **CO-PO Competency and Program Indicators (PI)**

| Course Outcomes | Program Outcomes | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
| CO1 | **2** | **3** | **-** | **-** | **-** | **1** | **2** | **3** | **2** | **-** | | |
| CO2 | **3** | **1** | **1** | **-** | **-** | **2** | **-** | **2** | **2** | **-** | | |
| CO3 | **2** | **2** | **1** | **-** | **-** | **2** | **-** | **1** | **1** | **-** | | |
| CO4 | **2** | **1** | **3** | **-** | **-** | **1** | **2** | **2** | **2** | **-** | | |
| CO5 | | | | | | | | | | | | |

- **CO-PO & CO-PSO Mapping**

| Course Outcomes | Program Outcomes | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 |
| CO1 | | | | | | | | | | | | | **2** | **-** |
| CO2 | | | | | | | | | | | | | **3** | **-** |
| CO3 | | | | | | | | | | | | | **2** | **-** |
| CO4 | | | | | | | | | | | | | **1** | **-** |
| CO5 | | | | | | | | | | | | | | |

| GOKUL GLOBAL UNIVERSITY, SIDHPUR | | | | |
|---|---|---|---|---|
| **Programme Code** | **BZOO** | **Programme Name** | B.Sc. Zoology | |
| **Course Code** | BZOO402UDSC | **Semester** | IV | |
| **Chordates- II** | | | | |
| **Course type :** | Discipline Specific Course | **Total Credit :** | 03 | |
| **Teaching time (hours)** | | **Examination Marking scheme** | | |
| **Theory** (hrs) | **Practical** (hrs) | **Internal** (Marks) | **External** (Marks) | **Total** (Marks) |
| 60 | 00 | 30 | 70 | 100 |

| Unit | Content | Hours | Weightage |
|---|---|---|---|
| 1 | **Unit 1** | 15 | 25% |
| | General characters and classification of class reptilia | | |
| | Origin, evolution and adaptive radiation in reprtiles. | | |
| | Type study: *Calotis versicolor*- The Garden Lizard (habit and habitat, external features, digestive system, respiration, blood vascular, nervous and Urinogenital system) | | |
| | Introduction to venomous and non- venomous snakes, poison apparatus and biting mechanism in snakes, symptoms and cure of snake bite | | |
| 2 | **Unit 2** | 15 | 25% |
| | General characteristics and classification of class aves | | |
| | Type study: *Columba livia*- The common rock pigeon (habit and habitat, external features, digestive system, respiration, blood vascular, nervous and Urinogenital system) | | |
| | Origin, mechanism, mode and adaptation of bird flight | | |
| | Migration and economic importance of birds | | |
| 3 | **Unit 3** | 15 | 25% |
| | General characteristics and classification of class Mammalia | | |
| | Type study: *Ratttusrattus*- The Rat (habit and habitat, external features, digestive system, respiration, blood vascular, nervous and Urinogenital system) | | |

| | | | |
|---|---|---|---|
| | Adaptations in terrestrial, aquatic and flying mammals | | |
| | Economic importance of mammals | | |

## Suggested Readings:

1) Hickman C. P., et al. (2006) Integrated principals of Zoology, McGraw Hill Higher Education. 931pp.14th edition.
2) Kotpal R. L. (2010) vertebrates, Rastogi Publications, 882 pp
3) Jordan E. L. and Verma P. S. (2013) Chordate Zoology, S. Chand publishing. New Delhi.

**Subject Code: BZOO402UDSC** **Semester: IV**
**Subject Name: Chordates – II** **Faculty Name/s: Pranav Patel**

**Course Outcomes:** At the end of the course, students shall be able to

| | |
|---|---|
| CO1 | Understand the evolutionary history and relationship between the different classes of chordates. |
| CO2 | Know the different characteristics along with their habits and distribution of the chordates. |
| CO3 | Understand the significance of the different in physiological systems between the vertebrates. |
| CO4 | Distinguish the significance of the chordates from other lower organisms and comprehend their advantages |
| CO5 | |

**CO-PO Competency and Program Indicators (PI)**

| Course Outcomes | Program Outcomes | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
| CO1 | **3** | **3** | **-** | **-** | **-** | **2** | **2** | **3** | **2** | **-** | | |
| CO2 | **1** | **1** | **1** | **-** | **-** | **2** | **-** | **2** | **3** | **-** | | |
| CO3 | **2** | **2** | **1** | **-** | **-** | **2** | **-** | **1** | **1** | **-** | | |
| CO4 | **2** | **1** | **3** | **-** | **-** | **1** | **2** | **2** | **2** | **-** | | |
| CO5 | | | | | | | | | | | | |

**CO-PO & CO-PSO Mapping**

| Course Outcomes | Program Outcomes | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 |
| CO1 | | | | | | | | | | | | | **2** | **-** |
| CO2 | | | | | | | | | | | | | **3** | **-** |
| CO3 | | | | | | | | | | | | | **2** | **-** |
| CO4 | | | | | | | | | | | | | **1** | **-** |
| CO5 | | | | | | | | | | | | | | |

| GOKUL GLOBAL UNIVERSITY, SIDHPUR | | | | |
|---|---|---|---|---|
| **Programme Code** | **BZOO** | **Programme Name** | B.Sc. Zoology | |
| **Course Code** | **BZOO401USE** | **Semester** | IV | |
| **Public Health and Management** | | | | |
| **Course type :** | Subject Elective | **Total Credit :** | 02 | |
| **Teaching time (hours)** | | **Examination Marking scheme** | | |
| **Theory** (hrs) | **Practical** (hrs) | **Internal** (Marks) | **External** (Marks) | **Total** (Marks) |
| 30 | ------- | 15 | 35 | 50 |

| Unit | Topic | Content | Hours | Weightage |
|---|---|---|---|---|
| 1 | | **Unit 1** | | |
| | **1.1** | Types and characteristics of wastes. | **15** | **50%** |
| | **1.2** | Biomedical waste handling and disposal, nuclear waste handling and disposal, Waste from thermal power plants. | | |
| | **1.3** | Case histories on Bhopal gas tragedy. | | |
| | **1.4** | Chernobyl disaster, Seveso disaster and Three Mile Island accident and their aftermath. | | |
| 2 | | **Unit 2** | **15** | **50%** |
| | **2.1** | Social and economic factors of disease including role of health services and other organizations. | | |
| | **2.2** | Infectious (Bacterial-Tuberculosis, Typhoid; Viral- AIDS, Poliomyelitis, Hepatitis; Protozoan- Leishmaniasis, Malaria) | | |
| | **2.3** | Lifestyle and Inherited/genetic diseases, Immunological diseases; Cancer; Diseases impacting on Western versus developing societies. | | |
| | **2.4** | Sources of global health data. | | |

**Reference books**

1) Cutter, S.L. (1999). Environmental Risk and Hazards, Prentice-Hall of India Pvt. Ltd., New Delhi.
2) Kolluru R., Bartell S., Pitblado R. and Stricoff, S. (1996). Risk Assessment and Management Handbook. McGraw Hill Inc., New York.
3) Kofi, A.D. (1998). Risk Assessment in Environmental management, John Wiley and sons, Singapore.
4) Joseph, F. L. and Louver, B.D. (1997). Health and Environmental Risk Analysis fundamentals with applications, Prentice Hall, New Jersey.

**Subject Code: BZOO401USE** **Semester: IV**
**Subject Name: Public Health and Management** **Faculty Name/s: Pranav Patel**

**Course Outcomes:** At the end of the course, students shall be able to

| | |
|---|---|
| CO1 | Program graduates will be able to demonstrate the ability to apply principles of leadership, policy development, budgeting and program management in the planning, implementation and evaluation of health programs for individuals and populations. |
| CO2 | improve the quality of public health services, serving as leaders of public sector and nonprofit organizations |
| CO3 | Preventing epidemics and the spread of disease. Preventing injuries. Promoting and encouraging healthy behaviors. Protecting against environmental hazards. |
| CO4 | Public Health helps detect health issues as early as possible and responds appropriately to avoid the development of disease. |
| CO5 | |

**CO-PO Competency and Program Indicators (PI)**

| Course Outcomes | Program Outcomes | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
| CO1 | **2** | **3** | **-** | **-** | **-** | **1** | **2** | **3** | **2** | **-** | | |
| CO2 | **3** | **1** | **1** | **-** | **-** | **2** | **-** | **2** | **2** | **-** | | |
| CO3 | **2** | **2** | **1** | **-** | **-** | **2** | **-** | **1** | **1** | **-** | | |
| CO4 | **2** | **1** | **3** | **-** | **-** | **1** | **2** | **2** | **2** | **-** | | |
| CO5 | | | | | | | | | | | | |

**CO-PO & CO-PSO Mapping**

| Course Outcomes | Program Outcomes | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 |
| CO1 | | | | | | | | | | | | | **2** | **-** |
| CO2 | | | | | | | | | | | | | **3** | **-** |
| CO3 | | | | | | | | | | | | | **2** | **-** |
| CO4 | | | | | | | | | | | | | **1** | **-** |
| CO5 | | | | | | | | | | | | | | |

| GOKUL GLOBAL UNIVERSITY, SIDHPUR | | | | |
|---|---|---|---|---|
| **Programme Code** | **BZOO** | **Programme Name** | B.Sc. Zoology | |
| **Course Code** | BZOO401UPRA | **Semester** | IV | |
| | | | | |
| **Course type :** | Practical | **Total Credit :** | 03 | |
| **Teaching time (hours)** | | **Examination Marking scheme** | | |
| **Theory** (hrs) | **Practical** (hrs) | **Internal** (Marks) | **External** (Marks) | **Total** (Marks) |
| ------- | 60 | ------ | 100 | 100 |

## LIST OF EXPERIMENTS

### Comparative Anatomy Of Vertebrates

1) Study of vertebrate integument and its derivatives (glands, scales, feathers and hair).
2) Comparative account of digestive organs (Stomach), respiratory organs Lung and trachea, Skullof different vertebrate groups.
3) Comparative account of pectoral girdles, pelvic girdles, vertebral column, teeth and Jaw of different vertebrate groups.
4) Study of olfactory receptors,auditory receptors in vertebrate animals.
5) Study of Comparative account of kidney, heart,aortic arches,portal systems,brain of vertebrates.
6) Study of Comparative account of brain, spinal cord, peripheral nervous system, autonomous nervous system of vertebrates.

### Chordates II

7) Study of classification of Class reptilia (up to Order) using laboratory specimens, models, slides, charts.
8) Study of classification of class Aves (up to Order) using laboratory specimens, models, slides, charts.
9) Study of classification of class Mammalia up to orders using laboratory specimens, models, slides, charts.
10) Study of Digestive system, Aertial system, venous system,Nervous system, Urinogenital systemof *Calotis versicolor* using models, slides and charts.
11) Study of Digestive system, Aertial system, venous system,Nervous system,Urinogenital system, of *Columba livia*using models, slides and charts.
12) Study of Digestive system,Aertial system,venous system, Nervous system, Urinogenital system, of*Ratttusrattus*using models, slides and charts.

13) Study of Air sac and gizzard of *Columba livia*using models, slides and charts (mounting).
14) Study of Pectin and cloacae of *Calotis versicolor* using models, slides and charts (mounting).
15) Study of hair and teeth of *Ratttusrattus*using models, slides and charts (mounting). \
16) Study of Adaptations in terrestrial, aquatic, flyingmammals.
17) Study of venomous snakes and non- venomous snakes using models, biting mechanism in snakes using models, slides and charts.

**Program:** Bachelor of science **Subject /Branch:** Zoology

**Year** :2023/24 **Semester:** V

| | | | |
|---|---|---|---|
| **Course title:** | MOLECULAR AND CELLULAR BIOLOGY | **Course code:** | BZOO501UDSC |
| **Course type:** | Discipline Specific Course | **Course credit:** | 03 |

**Teaching Examination Scheme:**

| Teaching (Hours/week) | | | Examination Scheme | | | |
|---|---|---|---|---|---|---|
| Lecture | Tutorial | Practical | Internal | | External | Total |
| | | | Mid | CE | | |
| 3 | 0 | 3 | 20 | 10 | 70 | 100 |

**Content**

| Unit | Description in detail | Credit | Weightage |
|---|---|---|---|
| I | Cells as basic functional unit of living body, cellular classification domains, i.e., eubacteria, archaebacteria, eukaryotes) Prokaryotic cell organization (Prokaryotic cell structure, Bacterial cell walls)<br>Eukaryotic cell organization (Brief idea of structure and function of --- Plasma membrane, Nucleus, Endoplasmic reticulum, Golgi apparatus, Mitochondria, Chloroplast, Lysosome, Peroxisome, cytosol, Plant cell wall, Plant cell vacuole,) | 1 | 33 % |
| II | Importance of carbon molecule (valency, chiral carbon, types of isomers)<br>Concept of intra- and intermolecular interaction (covalent bond, ionic bond, hydrogen bond, hydrophobic interaction, van der Waals interaction)<br>Carbohydrate: Structure, Function and properties of Monosaccharides (Hexoses and pentoses), Disaccharides (sucrose, lactose, maltose), storage & structural polysaccharide (glycogen, starch and cellulose)<br>Lipids: Definition and classification of lipids, Structure and function of fatty acid, storage lipids, structural lipids. | 1 | 33 % |
| III | Nucleic Acids: Composition of Nucleic Acids and Synthesis of Nucleotides<br>Type of RNA (mRNA tRNA rRNA polymerase various types Transcription in Prokaryotes and genetic code<br>DNA Replication in Prokaryotes and Eukaryotes; Enzymes involved in Replication.<br>Lac operon and Tryptophan operon<br>Translation: Process of Protein synthesis. | 1 | 34 % |

**Reference Books:**

1. Verma PS and Agrawal Vk, 2010 Cell Biology, Genetics, Molecular Biology, Evolution and Ecology. S. Chand publications. New Delhi.
2. Powar CB 1983 Cell Biology, Himalaya Publishing House, Mumbai, India
3. David ES, Jones B Cell biology, Organelle structure and function 11
4. Lodishet. al., 2007 Molecular Cell Biology, W.H. Freeman and Company, New York, USA 2.
5. Sambamurty A.V. S. S. 2008 Molecular Biology, Narosa Publishing House, New Delhi

**Subject Code: BZOO501UDSC** **Semester: V**

**Subject Name: MOLECULAR AND CELLULARBIOLOGY** **Faculty Name/s: Mr. Pranav Patel**

**Course Outcomes:** At the end of the course, students shall be able to

| | |
|---|---|
| CO1 | Basic concepts of prokaryotic and eukaryotic cell. |
| CO2 | The structure and functions of various cell organelles. |
| CO3 | Various steps involved in cell cycle and its regulation |

**CO-PO Competency and Program Indicators (PI)**

| Course Outcomes | Program Outcomes | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
| CO1 | **2** | **3** | **-** | **-** | **3** | **3** | **3** | **3** | | | | |
| CO2 | **3** | **1** | **-** | **-** | **2** | **2** | **1** | **1** | | | | |
| CO3 | **3** | **2** | **-** | **-** | **2** | **2** | **3** | **2** | | | | |
| CO4 | **2** | **3** | **-** | **-** | **2** | **3** | **3** | **3** | | | | |
| CO5 | **3** | **3** | **-** | **-** | **3** | **3** | **3** | **3** | | | | |

**CO-PO & CO-PSO Mapping**

| Course Outcomes | Program Outcomes | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 |
| CO1 | | | | | | | | | | | | | **2** | **3** |
| CO2 | | | | | | | | | | | | | **2** | **3** |
| CO3 | | | | | | | | | | | | | **3** | **3** |
| CO4 | | | | | | | | | | | | | **3** | **2** |
| CO5 | | | | | | | | | | | | | **3** | **2** |

**Program:** Bachelor of science **Subject /Branch:** Zoology

**Year** :2023/24 **Semester:** V

| | | | |
|---|---|---|---|
| **Course title :** | DEVELOPMENTAL BIOLOGY | **Course code :** | BZOO502UDSC |
| **Course type :** | Discipline Specific Course | **Course credit :** | 03 |

**Teaching Examination Scheme:**

| Teaching (Hours/week) | | | Examination Scheme | | | |
|---|---|---|---|---|---|---|
| Lecture | Tutorial | Practical | Internal | | External | Total |
| | | | Mid | CE | | |
| 3 | 0 | 3 | 20 | 10 | 70 | 100 |

.

**Content**

| Unit | Description in detail | Credit | Weightage |
|---|---|---|---|
| I | History and concepts of developmental biology<br>Gametogenesis, Spermatogenesis, Oogenesis<br>Male gamete: structure and types of sperms<br>Female gamete: structure, types of eggs, Egg membranes | 1 | 33 % |
| II | Process of fertilization, blocks to polyspermy, physiological changes during fertilization<br>Planes and patterns of cleavage; Types of Blastula; Fate maps (including Techniques)<br>Early development of frog and chick up to gastrulation; Embryonic induction and organizers<br>Organogenesis in frog: formation of neural tube and heart<br>Development of chick embryo | 1 | 33 % |
| III | Gametogenesis: Spermatogenesis and oogenesis w.r.t. mammals, vitellogenesis in birds; Fertilization: external (amphibians), internal (mammals), blocks to polyspermy; Early development of frog and humans (structure of mature egg and its membranes, patterns of cleavage, fate map, up to formation of gastrula); types of morphogenetic movements; Fate of germ layers; Neurulation in frog embryo. | 1 | 34 % |

**Reference Books:**

1. Gilbert, S. F. (2010). Developmental Biology, IX Edition, Sinauer Associates, Inc., Publishers, Sunderland, Massachusetts, USA
2. Balinsky B. I. and Fabian B. C. (1981). An Introduction to Embryology, V Edition, International Thompson Computer Press
3. Carlson, R. F. Patten's Foundations of Embryology 13
4. Kolthoff (2008). Analysis of Biological Development, II Edition, McGraw-Hill Publishers
5. Lewis Wolpert (2002). Principles of Development. II Edition, Oxford University Press

**Subject Code: BZOO502UDSC** **Semester: V**

**Subject Name: DEVELOPMENTAL BIOLOGY** **Faculty Name/s: Mr. Pranav Patel**

**Course Outcomes:** At the end of the course, students shall be able to

| | |
|---|---|
| CO1 | Various processes involved in gametogenesis. |
| CO2 | Early developmental processes occurring in vertebrates. |
| CO3 | Later developmental processes occurring in vertebrates. |

**CO-PO Competency and Program Indicators (PI)**

| Course Outcomes | Program Outcomes | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
| CO1 | **2** | **3** | **-** | **-** | **3** | **3** | **3** | **3** | | | | |
| CO2 | **3** | **1** | **-** | **-** | **2** | **2** | **1** | **1** | | | | |
| CO3 | **2** | **2** | **-** | **-** | **2** | **2** | **3** | **2** | | | | |
| CO4 | **2** | **2** | **-** | **-** | **2** | **3** | **3** | **3** | | | | |
| CO5 | **3** | **2** | **-** | **-** | **3** | **2** | **2** | **3** | | | | |

**CO-PO & CO-PSO Mapping**

| Course Outcomes | Program Outcomes | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 |
| CO1 | | | | | | | | | | | | | **2** | **2** |
| CO2 | | | | | | | | | | | | | **2** | **2** |
| CO3 | | | | | | | | | | | | | **3** | **2** |
| CO4 | | | | | | | | | | | | | **3** | **2** |
| CO5 | | | | | | | | | | | | | **3** | **3** |

**Program:** Bachelor of science **Subject /Branch:** Zoology

**Year** :2023/24 **Semester:** V

| | | | |
|---|---|---|---|
| **Course title :** | BIOSTATISTICS, TOOLS AND TECHNIQUES | **Course code :** | BZOO503UDSC |
| **Course type :** | Discipline Specific Course | **Course credit :** | 03 |

**Teaching Examination Scheme:**

| Teaching (Hours/week) | | | Examination Scheme | | | |
|---|---|---|---|---|---|---|
| Lecture | Tutorial | Practical | Internal | | External | Total |
| | | | Mid | CE | | |
| 3 | 0 | 3 | 20 | 10 | 70 | 100 |

**Content**

| Unit | Description in detail | Credit | Weightage |
|---|---|---|---|
| I | Definition and scope, organizing a statistical survey and presentation of statistically analyzed information<br>Sampling, Measures of central tendency (mean, median and Mode) and dispersion (variance, standard deviation and standard error); Correlation and Regression | 1 | 33 % |
| II | Principle, working procedure and application of Simple, Light and compound microscope<br>Principle and application of Electron (SEM and TEM) microscope<br>Chromatography: Historical prospective<br>Principle and classification of chromatography<br>Principle and application of paper and thin layer chromatography | 1 | 33 % |
| III | Principles and uses of instruments: pH Meter, Calorimeter, Microtome, Spectrophotometer & Centrifuge. Microscopy (light, transmission and scanning electron microscopy) Chromatography and Electrophoresis. | 1 | 34 % |

**Reference Books:**

1. Wilson, K. and Walker, J., (2010). Principles and Techniques of Biochemistry and Molecular Biology, 7th edition, Cambrige University Press (Low price edition), New York. 15
2. Webster J. G., (2009). Bioinstrumentation, Student edition, Wiley India (P) Ltd. New Delhi.
3. Milton, J.S 1992 Statistical Methods in Biological and Health Science. McGrawHill Inc, New York.
4. Schefler, W.C. 1963 Statistics for biological sciences. Addition - Wesely Publication Co., London.

**Subject Code: BZOO503UDSC** **Semester: V**

**Subject Name:** BIOSTATISTICS, TOOLS ANDTECHNIQUES

**Faculty Name/s: Mr. Pranav Patel**

**Course Outcomes:** At the end of the course, students shall be able to

| | |
|---|---|
| CO1 | Various statistical analysis types, uses and significance. |
| CO2 | Working procedure, application and principle of different type light microscopes. |
| CO3 | Functioning of basic laboratory equipment |

**CO-PO Competency and Program Indicators (PI)**

| Course Outcomes | Program Outcomes | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
| CO1 | **2** | **3** | **-** | **-** | **3** | **3** | **3** | **3** | | | | |
| CO2 | **3** | **1** | **-** | **-** | **2** | **2** | **1** | **1** | | | | |
| CO3 | **2** | **2** | **-** | **-** | **2** | **2** | **3** | **2** | | | | |
| CO4 | **2** | **2** | **-** | **-** | **2** | **3** | **3** | **3** | | | | |
| CO5 | **3** | **2** | **-** | **-** | **3** | **2** | **2** | **3** | | | | |

**CO-PO & CO-PSO Mapping**

| Course Outcomes | Program Outcomes | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 |
| CO1 | | | | | | | | | | | | | **2** | **1** |
| CO2 | | | | | | | | | | | | | **2** | **3** |
| CO3 | | | | | | | | | | | | | **3** | **1** |
| CO4 | | | | | | | | | | | | | **3** | **2** |
| CO5 | | | | | | | | | | | | | **3** | **2** |

**Program:** Bachelor of science **Subject / Branch:** Zoology

**Year** : 2023/24 **Semester** : V

| | | | |
|---|---|---|---|
| **Course title :** | BIODIVERSITY AND CONSERVATION BIOLOGY | **Course code :** | BZOO504UDSC |
| **Course type :** | Discipline Specific Course | **Course credit :** | 03 |

**Teaching Examination Scheme:**

| Teaching (Hours/week) | | | Examination Scheme | | | |
|---|---|---|---|---|---|---|
| Lecture | Tutorial | Practical | Internal | | External | Total |
| | | | Mid | CE | | |
| 3 | 0 | 3 | 20 | 10 | 70 | 100 |

**Content**

| Unit | Description in detail | Credit | Weightage |
|---|---|---|---|
| I | Introduction to conservation biology, values of biodiversity and conservation ethics.<br>Patterns and process of biodiversity, losses and threats to biodiversity. Biological consequences of habitat fragmentation, covering barriers and isolation, crowding effect, local and regional extinctions, edge effects, changes in species composition and problem of climate change Population genetics and conservation; community and ecosystem level conservation.<br>Theories, planning and designing conservation reserves; scales of management and cultural context.<br>Conservation outside protected areas. Control of invasive species. Significance of ecological restoration in conservation. | 1 | 33 % |
| II | Biodiversity hotspots of India<br>Important Protected Areas in India and Gujarat<br>Significance of Conservation: Definition, History and Background and types of conservation<br>Significance of conservation; In-situ conservation and Ex-situ conservation.<br>Role of protected areas in biodiversity conservation in India. | 1 | 33 % |
| III | Major Conservation Projects: project tiger, project elephant<br>Conservation significance, Conservation Laws & Policies | 1 | 34 % |

| | | | |
|---|---|---|---|
| | International Union for Conservation of Nature (IUCN), threat categories, Red data book, and role of IUCN in biodiversity conservation<br>National Biodiversity Act (2002)<br>Indian wildlife protection act (1972) | | |

**Reference Books:**

1. Magguran, A.E. (1996). Ecological diversity and its measurements. Princeton University.
2. Gadgil, M. (2002) A methodology mannual for scientific inventorying, monitoring and conservation of Biodiversity.
3. Odum. E.P. 1996 Fundamentals of Ecology. Nataraj Publishers, Dehra Dun.
4. Smith, R.L.1986. Elements of Ecology. Harpet and Row Publishers, New York.
5. Berwer. A.1988 .The Science of ecology. Saunder's college publishing
6. Online Resources

**Subject Code: BZOO504UDSC** **Semester: V**

**Subject Name: BIODIVERSITY ANDCONSERVATION BIOLOGY** **Faculty Name/s: Mr. Pranav Patel**

**Course Outcomes:** At the end of the course, students shall be able to

| | |
|---|---|
| CO1 | Various prospects of biodiversity, its importance and threats. |
| CO2 | Importance of India in terms of biodiversity. |
| CO3 | Conservation efforts taken by the authorities of India. |

**CO-PO Competency and Program Indicators (PI)**

| Course Outcomes | Program Outcomes | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
| CO1 | **2** | **3** | **-** | **-** | **3** | **3** | **3** | **3** | | | | |
| CO2 | **3** | **1** | **-** | **-** | **2** | **2** | **1** | **1** | | | | |
| CO3 | **3** | **2** | **-** | **-** | **2** | **2** | **3** | **2** | | | | |
| CO4 | **2** | **3** | **-** | **-** | **2** | **3** | **3** | **3** | | | | |
| CO5 | **3** | **3** | **-** | **-** | **3** | **3** | **3** | **3** | | | | |

**CO-PO & CO-PSO Mapping**

| Course Outcomes | Program Outcomes | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 |
| CO1 | | | | | | | | | | | | | **2** | **2** |
| CO2 | | | | | | | | | | | | | **2** | **2** |
| CO3 | | | | | | | | | | | | | **3** | **2** |
| CO4 | | | | | | | | | | | | | **3** | **2** |
| CO5 | | | | | | | | | | | | | **3** | **3** |

**Program:** Bachelor of science **Subject /Branch:** Zoology

**Year** :2023/24 **Semester:** V

**Course title:** Fisheries Science **Course code:** BZOO501USE

**Course type :** Elective **Course credit :** 02

**.Teaching Examination Scheme:**

| Teaching (Hours/week) | | | Examination Scheme | | | |
|---|---|---|---|---|---|---|
| Lecture | Tutorial | Practical | Internal | | External | Total |
| | | | Mid | CE | | |
| 2 | 00 | 00 | 10 | 05 | 35 | 50 |

**Content**

| Unit | Description in detail | Credit | Weightage |
|---|---|---|---|
| I | Marine capture fisheries resources of India - Commercially important fisheries in India (Taxonomy; distribution, food and feeding and catch trends of the following fisheries)<br>Oil Sardine fishery Mackerel fishery Bombay duck fishery Pomfret fishery Sole fishery Hilsa fishery<br>Fisheries of Non fish organisms Prawn and Shrimp capture fishery Crab capture fishery Molluscan fisheries Chank fisheries | 1 | 50 % |
| II | Mari Culture Cultivable Crustacean resources and their culture i) Prawn ii) Crabs<br>Cultivable Molluscan resources and their culture i) Mussels ii) Edible oyster iii) Pearl oyster Sea weed culture<br>Fish Culture Methods - Pen culture Cage culture Sewage fed fish culture<br>Integrated fish farming practices Paddy cum fish culture Poultry cum fish culture Live stock fish culture | 1 | 50 % |

**Reference Books:**

1. A Textbook of Fish Biology and Fisheries S. S. Khanna, H. R. Singh
2. A Text Book Of Fishery Science and Indian Fisheries Disha Experts
3. Recirculating Aquaculture Systems: A Guide to Farm Andy Davison

**Subject Code: BZOO501USE** **Semester: V**
**Subject Name: Fisheries Science** **Faculty Name/s: Mr. Pranav Patel**

**Course Outcomes:** At the end of the course, students shall be able to

| | |
|---|---|
| CO1 | Understand the basic nutritional requirements of fishes, recognize different prescription diets onthe animals basic indications for use |
| CO2 | Useful to know about main stages of embryonic & larval development & hormonal changesbehavioral changes that occur across the breeding period. |

**CO-PO Competency and Program Indicators (PI)**

| Course Outcomes | Program Outcomes | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
| CO1 | **2** | **3** | **-** | **-** | **3** | **3** | **3** | **3** | | | | |
| CO2 | **3** | **1** | **-** | **-** | **2** | **2** | **1** | **1** | | | | |
| CO3 | **3** | **2** | **-** | **-** | **2** | **2** | **3** | **2** | | | | |
| CO4 | **2** | **3** | **-** | **-** | **2** | **3** | **3** | **3** | | | | |
| CO5 | **3** | **3** | **-** | **-** | **3** | **3** | **3** | **3** | | | | |

**CO-PO & CO-PSO Mapping**

| Course Outcomes | Program Outcomes | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 |
| CO1 | | | | | | | | | | | | | **2** | **3** |
| CO2 | | | | | | | | | | | | | **3** | **1** |
| CO3 | | | | | | | | | | | | | **2** | **2** |
| CO4 | | | | | | | | | | | | | **2** | **2** |
| CO5 | | | | | | | | | | | | | **3** | **2** |

**Program:** Bachelor of science **Subject /Branch:** Zoology

**Year** :2023/24 **Semester:** V

| | | | |
|---|---|---|---|
| **Course title:** | PRACTICAL ZOOLOGY | **Course code:** | BZOO501UPRA |
| **Course type :** | DISCIPLIN SPECIFIC COURSE | **Course credit :** | 03 |

**Teaching Examination Scheme:**

| Teaching (Hours/week) | | | Examination Scheme | | | |
|---|---|---|---|---|---|---|
| Lecture | Tutorial | Practical | Internal | | External | Total |
| | | | Mid | CE | | |
| 0 | 0 | 180 | 0 | 0 | 200 | 200 |

# LIST OF EXPERIMENTS

## CELL AND MOLECULAR BIOLOGY

1. 1Preparation of temporary stained squash of onion root tip to study various stages ofmitosis.
2. Study of various stages of meiosis.
3. Preparation of permanent slide to show the presence of Barr body in human femaleblood cells/cheek cells.
4. Study of structure of different models of cell membrane using charts or models.
5. Study of structure and function of Endoplasmic reticulum using charts or models.
6. Study of structure and function of Mitochondria using charts or models.
7. Study of structure and function of Golgi apparatus using charts or models.
8. Study of structure and function of Lysosome using charts or models.
9. Study of structure and function of Ribosome using charts or models.
10. Isolation of chloroplast from given sample.
11. Perform staining of mitochondria in given sample.
12. Study of osmosis in grapes.
13. Quantitative estimation of salmon sperm/calf thymus DNA using colorimeter (Diphenylamine reagent) or spectrophotometer (A260 measurement)
14. Quantitative estimation of RNA using Orcinol reaction
15. Study of Prokaryotic cells and Eukaryotic cells, Cell cycle, Watson and Crick modelof DNA, Replication, Transcription in Prokaryotes and Eukaryotes, RNA Polymerases, Translation using charts or models.

## DEVELOPMENTAL BIOLOGY

1. To study the process of spermatogenesis through permanent slides
2. To study the different types of sperm through permanent slides
3. To prepare temporary mount of sperm from collected sample
4. To study the process of oogenesis through permanent slides
5. To study the different types of eggs through permanent slides or specimen
6. To study the different types of cleavage through permanent slides
7. To study the different patterns of cleavage through permanent slides
8. To study blastula and gastrula stages in frog and chick through permanent slides
9. To study structure of egg of hen using fresh or boiled egg
10. To study development of chick embryo with respect to hour of incubation through permanent slides
11. To study permanent mount of chick embryo from fertilized eggs
12. To study torsion and flexion in chick through permanent slides or charts
13. To study formation of various organs in frog through permanent slides of T. S. and L.S. of various organs.
14. To study metamorphosis in frog through modes, permanent slides or live specimens

**Program:** Bachelor of science **Subject /Branch:** Zoology

**Year** :2023/24 **Semester:** V

| | | | |
|---|---|---|---|
| **Course title:** | PRACTICAL ZOOLOGY | **Course code:** | BZOO502UPRA |
| **Course type :** | DISCIPLIN SPECIFIC COURSE | **Course credit :** | 03 |

**Teaching Examination Scheme:**

| Teaching (Hours/week) | | | Examination Scheme | | | |
|---|---|---|---|---|---|---|
| Lecture | Tutorial | Practical | Internal | | External | Total |
| | | | Mid | CE | | |
| 0 | 0 | 180 | 0 | 0 | 200 | 200 |

# LIST OF EXPERIMENTS

## BIOSTATISTICS, TOOLS AND TECHNIQUES IN ZOOLOGY

1. To study different types of charts for data presentation using manual method or MSEXCEL
2. To calculate mean, median and mode using given data set (10 examples)
3. To calculate mean and standard deviation using given data set (10 examples)
4. Examples related to student t test and F test (10 examples)
5. Examples related to chi square test (10 examples)
6. Examples of correlation and regression analysis (10 examples)
7. Principles, working and use of following laboratory instruments: microscope, incubator, pH meter, spectrometer and colorimeter
8. Study of different types of microscopes
9. Separation of biomolecules using thin layer chromatography
10. Separation of amino acids using paper chromatography
11. Study of different types of centrifuge

## BIODIVERSITY AND CONSERVATION BIOLOGY

1. Mapping of different biogeographical realm and study of related fauna
2. Mapping of biodiversity hotspots of the world and study of related fauna
3. Mapping and study of fauna of selected national parks and sanctuaries of India
4. Mapping and study of fauna of national parks of Gujarat
5. Mapping and study of fauna of selected sanctuaries of Gujarat
6. Mapping of distribution of endemic and critically endangered fauna of India
7. Calculation of different biodiversity indices using given data
8. To determine density, abundance, and frequency of occurrence of the vegetation by quadrate method in the field or on given simulation sheet
9. To prepare the report on local faunal diversity.

**Program:** Bachelor of science **Subject /Branch:** Zoology

**Year** :2023/24 **Semester:** VI

| | | | | |
|---|---|---|---|---|
| **Course title :** | Biochemistry and Analytical techniques | **Course code** | : | BZOO601UDSC |
| **Course type :** | Discipline Specific Course | **Course credit** | : | 03 |

.

**Teaching Examination Scheme:**

| Teaching (Hours/week) | | | Examination Scheme | | | |
|---|---|---|---|---|---|---|
| Lecture | Tutorial | Practical | Internal | | External | Total |
| | | | Mid | CE | | |
| 3 | 0 | 3 | 20 | 10 | 70 | 100 |

**Content**

| Unit | Description in detail | Credit | Weightage |
|---|---|---|---|
| I | Basic chemistry for biologist<br>Protein Structure and Function: Amino Acids, Structure of Proteins, Globular Proteins, Fibrous Proteins, Enzymes<br>Introduction to Carbohydrates, Glycolysis, Tricarboxylic Acid Cycle, Gluconeogenesis, Glycogen Metabolism, Metabolism of Monosaccharide's and Disaccharides, Pentose Phosphate Pathway and NADPH, Glycosaminoglycan's and Glycoproteins<br>Characteristics and types of lipids, Metabolism of Dietary Lipids, Fatty Acid and Triacylglycerol | 1 | 33 % |
| II | Amino Acids: Characteristics and types of Amino acids, Conversion of Amino Acids to Specialized Products, Nucleotide Metabolism<br>Integration of Metabolism: Metabolic Effects of Insulin and Glucagon, The Feed/Fast Cycle, Diabetes Mellitus, Obesity. Nutrition, Vitamins<br>Nucleotide metabolism: Characteristics and types of Nucleic acids, Biosynthesis and catabolism of purines and pyrimidine's | 1 | 33 % |

| | | | |
|---|---|---|---|
| | Storage and Expression of Genetic Information: DNA Structureand Replication, RNA Structure and Synthesis, Protein | | |
| III | Electrochemistry: pH and buffers, Potentiometric and Conduct metric titration<br>Microscopy: Light, phase contrast, fluorescence, scanning and transmission electron microscopy and other advanced microscopy | 1 | 34 % |

**Reference Books:**

1. Harper H. A. 1993 Review of Physiological Chemistry (Lange Publications).

2. Lehninger A. l., Nelson D. L. and Cox M.M. 1993. Principles of Biochemistry (CBC Publishers).

3. Rastogi S. C. 2003 Biochemistry (Tata Mc Graw Hill Publishing Co. Ltd.).

**Subject Code: BZOO601UDSC** **Semester: VI**
**Subject Name: Biochemistry and Analytical techniques** **Faculty Name/s: Mr. Pranav Patel**

**Course Outcomes:** At the end of the course, students shall be able to

| | |
|---|---|
| CO1 | Different type of bonds in biological system. |
| CO2 | Function and classification of carbohydrates and lipids. |
| CO3 | Function and classification of proteins. |

**CO-PO Competency and Program Indicators (PI)**

| Course Outcomes | Program Outcomes | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
| CO1 | **2** | **3** | **-** | **-** | **3** | **3** | **3** | **3** | | | | |
| CO2 | **3** | **1** | **-** | **-** | **2** | **2** | **2** | **1** | | | | |
| CO3 | **3** | **2** | **-** | **-** | **2** | **2** | **3** | **2** | | | | |
| CO4 | **2** | **3** | **-** | **-** | **2** | **3** | **2** | **3** | | | | |
| CO5 | **3** | **3** | **-** | **-** | **3** | **2** | **3** | **3** | | | | |

**CO-PO & CO-PSO Mapping**

| Course Outcomes | Program Outcomes | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 |
| CO1 | | | | | | | | | | | | | **2** | **2** |
| CO2 | | | | | | | | | | | | | **2** | **1** |
| CO3 | | | | | | | | | | | | | **3** | **2** |
| CO4 | | | | | | | | | | | | | **3** | **1** |
| CO5 | | | | | | | | | | | | | **3** | **1** |

**Program:** Bachelor of science **Subject /Branch:** Zoology

**Year** :2023/24 **Semester:** VI

| | | | |
|---|---|---|---|
| **Course title :** | GENETICS | **Course code :** | BZOO602UDSC |
| **Course type :** | Discipline Specific Course | **Course credit :** | 03 |

**Teaching Examination Scheme:**

| Teaching (Hours/week) | | | Examination Scheme | | | |
|---|---|---|---|---|---|---|
| Lecture | Tutorial | Practical | Internal | | External | Total |
| | | | Mid | CE | | |
| 3 | 0 | 3 | 20 | 10 | 70 | 100 |

**Content**

| Unit | Description in detail | Credit | Weightage |
|---|---|---|---|
| I | History of Genetics: Pre- Mendelian genetic concepts: Preformation, Epigenesis, Inheritance of acquired characters and Mutation theory. Heredity and Environment: Concepts of Phenotype, Genotype, Heredity, variation, Pure lines and Inbred lines. | 1 | 33 % |
| II | Genes are DNA – DNA is the genetic material, DNA is a double helix, DNA replication is semiconservative, mutations change the sequence of DNA, a gene codes for a single polypeptide, recombination occurs by physical exchange of DNA, genetic code is triplet. | 1 | 33 % |
| III | Mutation – Occurrence, kinds of Mutation, spontaneous & induced Mutation, Mutagens, detection of Mutation, Lethal Mutations, Biochemical Mutations, Phenotypic effects of Mutation, Molecular basis of Mutation, Significance & Practical applications of Mutation. | 1 | 34 % |

**Reference Books:**

1. Verma P. S. and Agrawal V. K. 2010 Cell Biology, Genetics, Molecular Biology, Evolution and Ecology, S. Chand & Company Ltd.
2. Gardner, E.J., Simmons, M.J., Snustad, D.P. (2008). Principles of Genetics. VIII Edition. Wiley India
3. Snustad, D.P., Simmons, M.J. (2009). Principles of Genetics. V Edition. John Wiley and Sons Inc
4. Klug, W.S., Cummings, M.R., Spencer, C.A. (2012). Concepts of Genetics. X Edition. Benjamin Cummings

**Subject Code: BZOO602UDSC** **Semester: VI**

**Subject Name: GENETICS** **Faculty Name/s: Mr. Pranav Patel**

5.

6. **Course Outcomes:** At the end of the course, students shall be able to

| | |
|---|---|
| CO1 | Basic concepts of genetics. |
| CO2 | Structure, organization and types of chromosome in animals. |
| CO3 | Basic concepts of human genetics |

7.

8. **CO-PO Competency and Program Indicators (PI)**

| Course Outcomes | Program Outcomes | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
| CO1 | **1** | **3** | **-** | **-** | **3** | **3** | **3** | **3** | | | | |
| CO2 | **3** | **1** | **-** | **-** | **2** | **2** | **2** | **2** | | | | |
| CO3 | **3** | **1** | **-** | **-** | **3** | **2** | **3** | **2** | | | | |
| CO4 | **2** | **3** | **-** | **-** | **2** | **3** | **3** | **3** | | | | |
| CO5 | **3** | **3** | **-** | **-** | **3** | **3** | **2** | **3** | | | | |

9.

10. **CO-PO & CO-PSO Mapping**

| Course Outcomes | Program Outcomes | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 |
| CO1 | | | | | | | | | | | | | **2** | **1** |
| CO2 | | | | | | | | | | | | | **2** | **2** |
| CO3 | | | | | | | | | | | | | **3** | **1** |
| CO4 | | | | | | | | | | | | | **3** | **-** |
| CO5 | | | | | | | | | | | | | **3** | **-** |

**Program:** Bachelor of science **Subject /Branch:** Zoology

**Year** :2023/24 **Semester:** VI

| | | | |
|---|---|---|---|
| **Course title :** | ANIMAL BEHAVIOUR AND EVOLUTION | **Course code :** | BZOO603UDSC |
| **Course type :** | Discipline Specific Course | **Course credit :** | 03 |

**Teaching Examination Scheme:**

| Teaching (Hours/week) | | | Examination Scheme | | | |
|---|---|---|---|---|---|---|
| Lecture | Tutorial | Practical | Internal | | External | Total |
| | | | Mid | CE | | |
| 3 | 0 | 3 | 20 | 10 | 70 | 100 |

**Content**

| Unit | Description in detail | Credit | Weightage |
|---|---|---|---|
| I | Introduction and history of animal behavior.<br>Concepts of animal behavior: Motivation, fixed action pattern, sign stimulus, innatebehavior.<br>Imprinting animals.<br>Learning behavior.<br>Approaches and methods to study animal behavior | 1 | 33 % |
| II | Brief history of evolution.<br>Direct and indirect evidences of evolution.<br>Theories of evolution, Hardy-Weinberg law.<br>Isolation and speciation.<br>Living fossils and Human evolution | 1 | 33 % |
| III | Communication in animals.<br>Parental care: Types and affecting factors.<br>Social organization in mammals.<br>Role of pheromones in animal behavior.<br>Role of hormones in animal behavior | 1 | 34 % |

**Reference Books:**

1. Alcock J. 2013 Animal Behavior: An Evolutionary Approach, 10th edition (Sinauer Associates, Inc.)
2. Bolhuis J. J. and Giraldeau L. (eds) 2005 The behaviour of animals (Blackwell Pub.)
3. Breed and Moore 2011 Animal Behavior, 1st Edition (Academic Press)
4. Mathur R. 2008 Animal behaviour (Rastogi Pub.: India)
5. Riddle M. (1996) Evolution. 2nd edn. Blackwell.

**Subject Code: BZOO603UDSC** **Semester: VI**

**Subject Name: ANIMAL BEHAVIOUR ANDEVOLUTION** **Faculty Name/s: Mr. Pranav Patel**

**Course Outcomes:** At the end of the course, students shall be able to

| | |
|---|---|
| CO1 | Concepts and different types of animal behavior. |
| CO2 | Different modes of animal communication. |
| CO3 | Reasons and outcomes of evolution based upon various theories. |

**CO-PO Competency and Program Indicators (PI)**

| Course Outcomes | Program Outcomes | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
| CO1 | **2** | **3** | **-** | **-** | **3** | **3** | **3** | **3** | | | | |
| CO2 | **3** | **2** | **-** | **-** | **2** | **2** | **2** | **1** | | | | |
| CO3 | **3** | **2** | **-** | **-** | **2** | **2** | **3** | **2** | | | | |
| CO4 | **2** | **3** | **-** | **-** | **2** | **3** | **3** | **3** | | | | |
| CO5 | **3** | **3** | **-** | **-** | **3** | **3** | **3** | **3** | | | | |

**CO-PO & CO-PSO Mapping**

| Course Outcomes | Program Outcomes | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 |
| CO1 | | | | | | | | | | | | | **3** | **-** |
| CO2 | | | | | | | | | | | | | **3** | **-** |
| CO3 | | | | | | | | | | | | | **2** | **-** |
| CO4 | | | | | | | | | | | | | **2** | **-** |
| CO5 | | | | | | | | | | | | | **3** | **-** |

**Program:** Bachelor of science **Subject /Branch:** Zoology

**Year** :2023/24 **Semester:** VI

| **Course title :** | ECONOMIC ZOOLOGY AND TOXICOLOGY | **Course code :** | BZOO604UDSC |
|---|---|---|---|
| **Course type :** | Discipline Specific Course | **Course credit :** | 03 |

**Teaching Examination Scheme:**

| Teaching (Hours/week) | | | Examination Scheme | | | |
|---|---|---|---|---|---|---|
| Lecture | Tutorial | Practical | Internal | | External | Total |
| | | | Mid | CE | | |
| 3 | 0 | 3 | 20 | 10 | 70 | 100 |

**Content**

| Unit | Description in detail | Credit | Weightage |
|---|---|---|---|
| I | Introduction and entrepreneurship scope of economic zoology.<br>Insect pest of economically important crops.<br>Household insect pest Economic importance of insets: Apiculture, Sericulture, Lac culture.<br>Insect pest management. | 1 | 33 % |
| II | Breeds of cow, buffalo, goat and their importance in dairy industry.<br>Importance of mammals in wool and leather industry.<br>Importance of animals in pharmaceutical. | 1 | 33 % |
| III | Economic Zoology - Apiculture, Lac Culture, Seri Culture and Prawn Culture. Toxicology. Introduction, Scope, Division and Goal of Toxicology. Toxic Chemicals: Fertilizers, Pesticides, Automobile, Heavy Metals. | 1 | 34 % |

**Reference Books:**

1. David B.V. and Ananthkrishnan T. N. 2004. General and Applied Entomology. TataMcGraw Hill, New Delhi.
2. Duntson P. A. 2004. The Insects: Structure, Function and Biodiversity. Kalyani Publ., New Delhi.
3. Mathur and Upadhyay A textbook of Entomology. Aman publication house, India.
4. G.S Shukla and V. B Upadhyay. Economic Zoology , , Rastoi Publications
5. A.A. Khan. Encyclopedia of Economic Zoology Anmol Publications

**Subject Code: BZOO604UDSC** **Semester: VI**
**Subject Name: ECONOMIC ZOOLOGY ANDTOXICOLOGY** **Faculty Name/s: Mr. Pranav Patel**

**Course Outcomes:** At the end of the course, students shall be able to

| | |
|---|---|
| CO1 | Scope of economic zoology, harmful and beneficial aspects of pest. |
| CO2 | Different marine and fresh water aquaculture practices in India. |
| CO3 | Basic understanding of the field of toxicology |

**CO-PO Competency and Program Indicators (PI)**

| Course Outcomes | Program Outcomes | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
| CO1 | **2** | **3** | **-** | **-** | **3** | **3** | **3** | **3** | | | | |
| CO2 | **3** | **2** | **-** | **-** | **2** | **2** | **2** | **2** | | | | |
| CO3 | **3** | **2** | **-** | **-** | **2** | **2** | **2** | **2** | | | | |
| CO4 | **2** | **3** | **-** | **-** | **2** | **3** | **2** | **3** | | | | |
| CO5 | **3** | **3** | **-** | **-** | **3** | **3** | **3** | **3** | | | | |

**CO-PO & CO-PSO Mapping**

| Course Outcomes | Program Outcomes | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 |
| CO1 | | | | | | | | | | | | | **2** | **3** |
| CO2 | | | | | | | | | | | | | **2** | **3** |
| CO3 | | | | | | | | | | | | | **3** | **3** |
| CO4 | | | | | | | | | | | | | **3** | **2** |
| CO5 | | | | | | | | | | | | | **3** | **2** |

**Program:** Bachelor of science **Subject /Branch:** Zoology

**Year** :2023/24 **Semester:** VI

| | | | |
|---|---|---|---|
| **Course title:** | WILDLIFE BIOLOGY | **Course code:** | BZOO603USE |
| **Course type :** | Elective | **Course credit :** | 02 |

**Teaching Examination Scheme:**

| Teaching (Hours/week) | | | Examination Scheme | | | |
|---|---|---|---|---|---|---|
| Lecture | Tutorial | Practical | Internal | | External | Total |
| | | | Mid | CE | | |
| 2 | 00 | 00 | 10 | 05 | 35 | 50 |

**Content**

| Unit | Description in detail | Credit | Weightage |
|---|---|---|---|
| I | Estimating number of wildlife (Census techniques)<br>Measuring habitat use and occupancy<br>Wildlife habitat evaluation techniques<br>Wildlife population monitoring techniques | 1 | 50 % |
| II | Human-wildlife Interaction<br>Management and mitigation of conflicts<br>Conservation outreach programmers<br>Immobilization and rescue of wildlife | 1 | 50 % |

**Reference Books:**

1. T A Bookhout 1996. Research and Management Techniques for Wildlife and Habitats. The Wildlife Society, ML
2. D E Wilson 2002. Measuring and Monitoring Biological Diversity: Standard Methods. The Smithsonian Institution, USA
3. J P Sands et al. 2012. Wildlife Science: Connecting Research with Management. CRCPress, Taylor and Francis Group

**Subject Code: BZOO603USE** **Semester: VI**

**Subject Name: WILDLIFE BIOLOGY** **Faculty Name/s: Mr. Pranav Patel**

**Course Outcomes:** At the end of the course, students shall be able to

| | |
|---|---|
| CO1 | Students will realize that people are dependent on intact habitats that sustain the variousorganisms we need to produce food, medicines, clothing, and other materials. |
| CO2 | Students will learn about certain species' roles in an ecosystem. Students will discover that lifecan be found almost everywhere on earth. |

**CO-PO Competency and Program Indicators (PI)**

| Course Outcomes | Program Outcomes | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
| CO1 | **2** | **3** | **-** | **-** | **3** | **3** | **3** | **3** | | | | |
| CO2 | **3** | **1** | **-** | **-** | **2** | **2** | **1** | **1** | | | | |
| CO3 | **3** | **2** | **-** | **-** | **2** | **2** | **3** | **2** | | | | |
| CO4 | **2** | **3** | **-** | **-** | **2** | **3** | **3** | **3** | | | | |
| CO5 | **3** | **3** | **-** | **-** | **3** | **3** | **3** | **3** | | | | |

**CO-PO & CO-PSO Mapping**

| Course Outcomes | Program Outcomes | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 |
| CO1 | | | | | | | | | | | | | **2** | **3** |
| CO2 | | | | | | | | | | | | | **2** | **3** |
| CO3 | | | | | | | | | | | | | **3** | **3** |
| CO4 | | | | | | | | | | | | | **3** | **2** |
| CO5 | | | | | | | | | | | | | **3** | **2** |

**Program:** Bachelor of science **Subject /Branch:** Zoology

**Year** :2022/23 **Semester:** VI

| | | | |
|---|---|---|---|
| **Course title:** | PRACTICAL ZOOLOGY | **Course code:** | BZOO601UPRA |
| **Course type :** | Discipline Specific Course | **Course credit :** | 03 |

**Teaching Examination Scheme:**

| Teaching (Hours/week) | | | Examination Scheme | | | |
|---|---|---|---|---|---|---|
| Lecture | Tutorial | Practical | Internal | | External | Total |
| | | | Mid | CE | | |
| 0 | 0 | 180 | 0 | 0 | 200 | 200 |

# LIST OF EXPERIMENTS

## BIOCHEMISTRY

1. Detection of monosaccharides: Glucose, fructose
2. Detection of disaccharides: Lactose, Maltose, Sucrose
3. Detection of Polysaccharides: Starch, casein
4. Detection of protein: Egg albumin, Pepton
5. Detection of oil through biochemical test
6. Preparation of ball and stick model of following molecules: Glucose, Fructose, Galactose, Maltose, Lactose, Sucrose, Amino acids, Glycerol
7. Detection of enzymatic activity on starch at normal temperature/Ph
8. Detection of enzymatic activity on starch at low temperature/Acidic pH
9. Detection of enzymatic activity on starch at high temperature/basic pH
10. To study lock and key mechanism of enzyme action through model/chart

## GENETICS

1. To study structure of chromosome through permanent slide of mitosis
2. To study structure of chromosome through temporary preparation of onion root tip
3. To study process of meiosis through permanent slides
4. To prepare temporary mounting of giant polytene chromosome from salivary gland of Chironomus larva
5. To solve problems of post-Mendelian genetics
6. To solve problem of sex-linked inheritance
7. To prepare and study normal karyotype
8. To prepare and study abnormal karyotype
9. To study inheritance in humans through pe-degree analysis
10. To study types of twins through charts/photos

**Program:** Bachelor of science **Subject /Branch:** Zoology

**Year :**2022/23 **Semester:** VI

| | | | |
|---|---|---|---|
| **Course title:** | PRACTICAL ZOOLOGY | **Course code:** | BZOO602UPRA |
| **Course type :** | Discipline Specific Course | **Course credit :** | 03 |

**Teaching Examination Scheme:**

| Teaching (Hours/week) | | | Examination Scheme | | | |
|---|---|---|---|---|---|---|
| Lecture | Tutorial | Practical | Internal | | External | Total |
| | | | Mid | CE | | |
| 0 | 0 | 180 | 0 | 0 | 200 | 200 |

# LIST OF EXPERIMENT

## ANIMAL BEHAVIOUR AND EVOLUTION

1. To study nests and nesting habits of the birds and social insects.
2. To study the behavioral responses of red gram flour beetle to dry and humid conditions.
3. To study the behavioral responses of red gram flour beetle to light and dark conditions.
4. To study geotaxis behavior in earthworm.
5. To study the phototaxis behavior in earthworm.
6. To study instruments for different methods of learning behavior
7. To study trial and error method of learning in human through Maze/ playing cards
8. To study learning behavior in rat zigzag maze
9. To study parental care in invertebrate and vertebrates using museum specimen or field visit
10. Prepare an ethogram of behavior performed by any animal

## ECONOMIC ZOOLOGY AND TOXICOLOGY

1. To study identification, damage and control of insect pest of sugarcane and pulse crop.
2. To study identification, damage and control of insect pest of vegetables and fruits
3. To study identification, damage and control of house hold insect pest
4. To study life cycle of honey bee and method of apiculture
5. To study life cycle of lac insect and method of lac culture
6. To study life cycle of silk worm and method of sericulture
7. To study identification and economic importance of selected freshwater fishes of India
8. To study identification and economic importance of selected marine fishes of India
9. To study method of pearl culture
10. To study identification and economic importance of selected prawns of India